Department of Defense
Fiscal Year (FY) 2020 Budget Estimates

March 2019

Navy

Justification Book Volume 2 of 5

Research, Development, Test & Evaluation, Navy

Budget Activity 4

The estimated cost of this report for the Department of the Navy (DON) is $75,978.

The estimated total cost for supporting the DON budget justification material is approximately $1,803,116 for the 2019 fiscal year. This includes $81,351 in supplies and $1,721,765 in labor.

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Department of Defense Appropriations Act, 2020

Research, Development, Test and Evaluation, Navy

For expenses necessary for basic and applied scientific research, development, test and evaluation, including maintenance, rehabilitation, lease, and operation of facilities and equipment, $20,434,909,000 to remain available for obligation until September 30, 2021.

FY 2020 Overseas Contingency Operations funding can be separated into the following categories:

OCO for Direct War Costs ($37,000,000): OCO for Direct War costs are those combat or direct combat support costs that will not continue to be expended once combat operations end at major contingency locations.

OCO for Enduring Requirements ($127,410,000): OCO for Enduring Requirements are enduring in-theater and in-CONUS costs that will likely remain after combat operations cease, and have previously been funded in OCO.

OCO for Base Requirements ($0): OCO for Base Requirements is OCO funding for base budget requirements in support of the National Defense Strategy. The Budget requests these funds in OCO to comply with the base budget defense caps included in the Budget Control Act of 2011.

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Department of Defense
FY 2020 President's Budget
Exhibit R-1 FY 2020 President's Budget
Total Obligational Authority
(Dollars in Thousands)

Appropriation	FY 2018 (Base + OCO)	FY 2019 Base Enacted	FY 2019 OCO Enacted	FY 2019 Total Enacted
Research, Development, Test & Eval, Navy	18,465,332	18,490,002	167,812	18,657,814
Total Research, Development, Test & Evaluation	18,465,332	18,490,002	167,812	18,657,814

Department of Defense
FY 2020 President's Budget
Exhibit R-1 FY 2020 President's Budget
Total Obligational Authority
(Dollars in Thousands)

Appropriation	FY 2020 Base	FY 2020 OCO for Base Requirements	FY 2020 OCO for Direct War and Enduring Costs	FY 2020 Total OCO	FY 2020 Total (Base + OCO)
Research, Development, Test & Eval, Navy	20,270,499		164,410	164,410	20,434,909
Total Research, Development, Test & Evaluation	20,270,499		164,410	164,410	20,434,909

Department of Defense
FY 2020 President's Budget
Exhibit R-1 FY 2020 President's Budget
Total Obligational Authority
(Dollars in Thousands)

Summary Recap of Budget Activities	FY 2018 (Base + OCO)	FY 2019 Base Enacted	FY 2019 OCO Enacted	FY 2019 Total Enacted
Basic Research	604,634	679,772		679,772
Applied Research	975,419	1,018,795		1,018,795
Advanced Technology Development	900,071	851,710		851,710
Advanced Component Development & Prototypes	4,210,640	4,139,479	33,300	4,172,779
System Development & Demonstration	6,037,909	5,863,466	1,100	5,864,566
Management Support	1,388,936	1,023,070		1,023,070
Operational Systems Development	4,347,723	4,913,710	133,412	5,047,122
Total Research, Development, Test & Evaluation	18,465,332	18,490,002	167,812	18,657,814

Summary Recap of FYDP Programs				
Strategic Forces	192,820	240,310		240,310
General Purpose Forces	1,514,837	1,914,231	16,130	1,930,361
Intelligence and Communications	816,404	608,772		608,772
Research and Development	13,991,927	13,937,905	34,400	13,972,305
Central Supply and Maintenance	40,084	73,844		73,844
Administration and Associated Activities	1,820	1,579		1,579
Space	49,738	42,858		42,858
Classified Programs	1,857,702	1,670,503	117,282	1,787,785
Total Research, Development, Test & Evaluation	18,465,332	18,490,002	167,812	18,657,814

Department of Defense
FY 2020 President's Budget
Exhibit R-1 FY 2020 President's Budget
Total Obligational Authority
(Dollars in Thousands)

Summary Recap of Budget Activities	FY 2020 Base	FY 2020 OCO for Base Requirements	FY 2020 OCO for Direct War and Enduring Costs	FY 2020 Total OCO	FY 2020 Total (Base + OCO)
Basic Research	605,978				605,978
Applied Research	936,453				936,453
Advanced Technology Development	742,210				742,210
Advanced Component Development & Prototypes	5,559,062		40,006	40,006	5,599,068
System Development & Demonstration	6,332,033		1,122	1,122	6,333,155
Management Support	990,464				990,464
Operational Systems Development	5,104,299		123,282	123,282	5,227,581
Total Research, Development, Test & Evaluation	20,270,499		164,410	164,410	20,434,909
Summary Recap of FYDP Programs					
Strategic Forces	239,019				239,019
General Purpose Forces	1,835,959		15,000	15,000	1,850,959
Intelligence and Communications	692,089				692,089
Research and Development	15,828,006		41,128	41,128	15,869,134
Central Supply and Maintenance	44,961				44,961
Administration and Associated Activities	1,460				1,460
Space	15,868				15,868
Classified Programs	1,613,137		108,282	108,282	1,721,419
Total Research, Development, Test & Evaluation	20,270,499		164,410	164,410	20,434,909

Department of the Navy
FY 2020 President's Budget
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Total Obligational Authority
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Summary Recap of Budget Activities	FY 2018 (Base + OCO)	FY 2019 Base Enacted	FY 2019 OCO Enacted	FY 2019 Total Enacted
Basic Research	604,634	679,772		679,772
Applied Research	975,419	1,018,795		1,018,795
Advanced Technology Development	900,071	851,710		851,710
Advanced Component Development & Prototypes	4,210,640	4,139,479	33,300	4,172,779
System Development & Demonstration	6,037,909	5,863,466	1,100	5,864,566
Management Support	1,388,936	1,023,070		1,023,070
Operational Systems Development	4,347,723	4,913,710	133,412	5,047,122
Total Research, Development, Test & Evaluation	18,465,332	18,490,002	167,812	18,657,814

Summary Recap of FYDP Programs				
Strategic Forces	192,820	240,310		240,310
General Purpose Forces	1,514,837	1,914,231	16,130	1,930,361
Intelligence and Communications	816,404	608,772		608,772
Research and Development	13,991,927	13,937,905	34,400	13,972,305
Central Supply and Maintenance	40,084	73,844		73,844
Administration and Associated Activities	1,820	1,579		1,579
Space	49,738	42,858		42,858
Classified Programs	1,857,702	1,670,503	117,282	1,787,785
Total Research, Development, Test & Evaluation	18,465,332	18,490,002	167,812	18,657,814

Department of the Navy
FY 2020 President's Budget
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(Dollars in Thousands)

Summary Recap of Budget Activities	FY 2020 Base	FY 2020 OCO for Base Requirements	FY 2020 OCO for Direct War and Enduring Costs	FY 2020 Total OCO	FY 2020 Total (Base + OCO)
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Applied Research	936,453				936,453
Advanced Technology Development	742,210				742,210
Advanced Component Development & Prototypes	5,559,062		40,006	40,006	5,599,068
System Development & Demonstration	6,332,033		1,122	1,122	6,333,155
Management Support	990,464				990,464
Operational Systems Development	5,104,299		123,282	123,282	5,227,581
Total Research, Development, Test & Evaluation	20,270,499		164,410	164,410	20,434,909
Summary Recap of FYDP Programs					
Strategic Forces	239,019				239,019
General Purpose Forces	1,835,959		15,000	15,000	1,850,959
Intelligence and Communications	692,089				692,089
Research and Development	15,828,006		41,128	41,128	15,869,134
Central Supply and Maintenance	44,961				44,961
Administration and Associated Activities	1,460				1,460
Space	15,868				15,868
Classified Programs	1,613,137		108,282	108,282	1,721,419
Total Research, Development, Test & Evaluation	20,270,499		164,410	164,410	20,434,909

Department of the Navy
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(Dollars in Thousands)

Appropriation: 1319N Research, Development, Test & Eval, Navy

Line No	Program Element Number	Item	Act	FY 2018 (Base + OCO)	FY 2019 Base Enacted	FY 2019 OCO Enacted	FY 2019 Total Enacted	Sec
1	0601103N	University Research Initiatives	01	137,515	161,433		161,433	U
2	0601152N	In-House Laboratory Independent Research	01	19,035	19,237		19,237	U
3	0601153N	Defense Research Sciences	01	448,084	499,102		499,102	U
	Basic	Research		604,634	679,772		679,772	
4	0602114N	Power Projection Applied Research	02	23,028	27,643		27,643	U
5	0602123N	Force Protection Applied Research	02	182,614	180,549		180,549	U
6	0602131M	Marine Corps Landing Force Technology	02	54,526	63,212		63,212	U
7	0602235N	Common Picture Applied Research	02	35,846	36,348		36,348	U
8	0602236N	Warfighter Sustainment Applied Research	02	48,606	65,782		65,782	U
9	0602271N	Electromagnetic Systems Applied Research	02	83,640	76,497		76,497	U
10	0602435N	Ocean Warfighting Environment Applied Research	02	72,530	89,998		89,998	U
11	0602651M	Joint Non-Lethal Weapons Applied Research	02	6,230	6,299		6,299	U
12	0602747N	Undersea Warfare Applied Research	02	59,644	78,049		78,049	U
13	0602750N	Future Naval Capabilities Applied Research	02	147,219	137,701		137,701	U
14	0602782N	Mine and Expeditionary Warfare Applied Research	02	35,430	38,214		38,214	U
15	0602792N	Innovative Naval Prototypes (INP) Applied Research	02	160,884	154,085		154,085	U

Department of the Navy
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Appropriation: 1319N Research, Development, Test & Eval, Navy

Line No	Program Element Number	Item	Act	FY 2020 Base	FY 2020 OCO for Base Requirements	FY 2020 OCO for Direct War and Enduring Costs	FY 2020 Total OCO	FY 2020 Total (Base + OCO)	Sec
1	0601103N	University Research Initiatives	01	116,850				116,850	U
2	0601152N	In-House Laboratory Independent Research	01	19,121				19,121	U
3	0601153N	Defense Research Sciences	01	470,007				470,007	U
	Basic	Research		605,978				605,978	
4	0602114N	Power Projection Applied Research	02	18,546				18,546	U
5	0602123N	Force Protection Applied Research	02	119,517				119,517	U
6	0602131M	Marine Corps Landing Force Technology	02	56,604				56,604	U
7	0602235N	Common Picture Applied Research	02	49,297				49,297	U
8	0602236N	Warfighter Sustainment Applied Research	02	63,825				63,825	U
9	0602271N	Electromagnetic Systems Applied Research	02	83,497				83,497	U
10	0602435N	Ocean Warfighting Environment Applied Research	02	63,894				63,894	U
11	0602651M	Joint Non-Lethal Weapons Applied Research	02	6,346				6,346	U
12	0602747N	Undersea Warfare Applied Research	02	57,075				57,075	U
13	0602750N	Future Naval Capabilities Applied Research	02	154,755				154,755	U
14	0602782N	Mine and Expeditionary Warfare Applied Research	02	36,074				36,074	U
15	0602792N	Innovative Naval Prototypes (INP) Applied Research	02	153,062				153,062	U

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Appropriation: 1319N Research, Development, Test & Eval, Navy

Line No	Program Element Number	Item	Act	FY 2018 (Base + OCO)	FY 2019 Base Enacted	FY 2019 OCO Enacted	FY 2019 Total Enacted	Sec
16	0602861N	Science and Technology Management - ONR Field Acitivities	02	65,222	64,418		64,418	U
		Applied Research		975,419	1,018,795		1,018,795	
17	0603123N	Force Protection Advanced Technology	03	52,785	32,615		32,615	U
18	0603271N	Electromagnetic Systems Advanced Technology	03	9,231	8,804		8,804	U
19	0603640M	USMC Advanced Technology Demonstration (ATD)	03	164,992	174,809		174,809	U
20	0603651M	Joint Non-Lethal Weapons Technology Development	03	13,090	13,313		13,313	U
21	0603673N	Future Naval Capabilities Advanced Technology Development	03	215,946	214,184		214,184	U
22	0603680N	Manufacturing Technology Program	03	66,173	58,657		58,657	U
23	0603729N	Warfighter Protection Advanced Technology	03	42,895	41,377		41,377	U
24	0603747N	Undersea Warfare Advanced Technology	03	9,657				U
25	0603758N	Navy Warfighting Experiments and Demonstrations	03	63,867	65,885		65,885	U
26	0603782N	Mine and Expeditionary Warfare Advanced Technology	03	14,826	39,672		39,672	U
27	0603801N	Innovative Naval Prototypes (INP) Advanced Technology Development	03	246,609	202,394		202,394	U
		Advanced Technology Development		900,071	851,710		851,710	
28	0603207N	Air/Ocean Tactical Applications	04	47,422	29,747		29,747	U
29	0603216N	Aviation Survivability	04	5,450	7,050		7,050	U

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(Dollars in Thousands)

Appropriation: 1319N Research, Development, Test & Eval, Navy

Line No	Program Element Number	Item	Act	FY 2020 Base	FY 2020 OCO for Base Requirements	FY 2020 OCO for Direct War and Enduring Costs	FY 2020 Total OCO	FY 2020 Total (Base + OCO)	Sec
16	0602861N	Science and Technology Management - ONR Field Acitivities	02	73,961				73,961	U
		Applied Research		936,453				936,453	
17	0603123N	Force Protection Advanced Technology	03	35,286				35,286	U
18	0603271N	Electromagnetic Systems Advanced Technology	03	9,499				9,499	U
19	0603640M	USMC Advanced Technology Demonstration (ATD)	03	172,847				172,847	U
20	0603651M	Joint Non-Lethal Weapons Technology Development	03	13,307				13,307	U
21	0603673N	Future Naval Capabilities Advanced Technology Development	03	231,907				231,907	U
22	0603680N	Manufacturing Technology Program	03	60,138				60,138	U
23	0603729N	Warfighter Protection Advanced Technology	03	4,849				4,849	U
24	0603747N	Undersea Warfare Advanced Technology	03						U
25	0603758N	Navy Warfighting Experiments and Demonstrations	03	67,739				67,739	U
26	0603782N	Mine and Expeditionary Warfare Advanced Technology	03	13,335				13,335	U
27	0603801N	Innovative Naval Prototypes (INP) Advanced Technology Development	03	133,303				133,303	U
		Advanced Technology Development		742,210				742,210	
28	0603207N	Air/Ocean Tactical Applications	04	32,643		2,400	2,400	35,043	U
29	0603216N	Aviation Survivability	04	11,919				11,919	U

Department of the Navy
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(Dollars in Thousands)

Appropriation: 1319N Research, Development, Test & Eval, Navy

Line No	Program Element Number	Item	Act	FY 2018 (Base + OCO)	FY 2019 Base Enacted	FY 2019 OCO Enacted	FY 2019 Total Enacted	Sec
30	0603251N	Aircraft Systems	04	693	793		793	U
31	0603254N	ASW Systems Development	04	7,466	7,044		7,044	U
32	0603261N	Tactical Airborne Reconnaissance	04	3,692	3,540		3,540	U
33	0603382N	Advanced Combat Systems Technology	04	4,450	39,240		39,240	U
34	0603502N	Surface and Shallow Water Mine Countermeasures	04	69,906	120,348		120,348	U
35	0603506N	Surface Ship Torpedo Defense	04	24,174	7,100		7,100	U
36	0603512N	Carrier Systems Development	04	9,184	5,440		5,440	U
37	0603525N	PILOT FISH	04	111,278	136,533		136,533	U
38	0603527N	RETRACT LARCH	04	32,608	11,745	18,000	29,745	U
39	0603536N	RETRACT JUNIPER	04	126,210	113,679		113,679	U
40	0603542N	Radiological Control	04	716	740		740	U
41	0603553N	Surface ASW	04	1,092	1,122		1,122	U
42	0603561N	Advanced Submarine System Development	04	91,927	105,809		105,809	U
43	0603562N	Submarine Tactical Warfare Systems	04	13,597	12,374		12,374	U
44	0603563N	Ship Concept Advanced Design	04	23,856	74,603		74,603	U
45	0603564N	Ship Preliminary Design & Feasibility Studies	04	18,369	13,348		13,348	U
46	0603570N	Advanced Nuclear Power Systems	04	329,500	256,137		256,137	U
47	0603573N	Advanced Surface Machinery Systems	04	22,406	27,109		27,109	U
48	0603576N	CHALK EAGLE	04	188,927	29,353		29,353	U

Department of the Navy
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Appropriation: 1319N Research, Development, Test & Eval, Navy

Line No	Program Element Number	Item	Act	FY 2020 Base	FY 2020 OCO for Base Requirements	FY 2020 OCO for Direct War and Enduring Costs	FY 2020 Total OCO	FY 2020 Total (Base + OCO)	Sec
30	0603251N	Aircraft Systems	04	1,473				1,473	U
31	0603254N	ASW Systems Development	04	7,172				7,172	U
32	0603261N	Tactical Airborne Reconnaissance	04	3,419				3,419	U
33	0603382N	Advanced Combat Systems Technology	04	64,694				64,694	U
34	0603502N	Surface and Shallow Water Mine Countermeasures	04	507,000				507,000	U
35	0603506N	Surface Ship Torpedo Defense	04	15,800				15,800	U
36	0603512N	Carrier Systems Development	04	4,997				4,997	U
37	0603525N	PILOT FISH	04	291,148				291,148	U
38	0603527N	RETRACT LARCH	04	11,980		22,000	22,000	33,980	U
39	0603536N	RETRACT JUNIPER	04	129,163				129,163	U
40	0603542N	Radiological Control	04	689				689	U
41	0603553N	Surface ASW	04	1,137				1,137	U
42	0603561N	Advanced Submarine System Development	04	148,756				148,756	U
43	0603562N	Submarine Tactical Warfare Systems	04	11,192				11,192	U
44	0603563N	Ship Concept Advanced Design	04	81,846				81,846	U
45	0603564N	Ship Preliminary Design & Feasibility Studies	04	69,084				69,084	U
46	0603570N	Advanced Nuclear Power Systems	04	181,652				181,652	U
47	0603573N	Advanced Surface Machinery Systems	04	25,408				25,408	U
48	0603576N	CHALK EAGLE	04	64,877				64,877	U

Department of the Navy
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Appropriation: 1319N Research, Development, Test & Eval, Navy

Line No	Program Element Number	Item	Act	FY 2018 (Base + OCO)	FY 2019 Base Enacted	FY 2019 OCO Enacted	FY 2019 Total Enacted	Sec
49	0603581N	Littoral Combat Ship (LCS)	04	49,308	37,997		37,997	U
50	0603582N	Combat System Integration	04	15,471	16,351		16,351	U
51	0603595N	Ohio Replacement	04	775,624	542,846		542,846	U
52	0603596N	LCS Mission Modules	04	100,470	103,559		103,559	U
53	0603597N	Automated Test and Analysis	04	24,145	37,931		37,931	U
54	0603599N	Frigate Development	04	137,655	132,775		132,775	U
55	0603609N	Conventional Munitions	04	13,699	9,307		9,307	U
56	0603635M	Marine Corps Ground Combat/Support System	04	771				U
57	0603654N	Joint Service Explosive Ordnance Development	04	77,409	47,857	13,900	61,757	U
58	0603713N	Ocean Engineering Technology Development	04	8,853	5,915		5,915	U
59	0603721N	Environmental Protection	04	23,237	19,811		19,811	U
60	0603724N	Navy Energy Program	04	42,425	32,656		32,656	U
61	0603725N	Facilities Improvement	04	2,794	5,301		5,301	U
62	0603734N	CHALK CORAL	04	237,402	267,477		267,477	U
63	0603739N	Navy Logistic Productivity	04	2,882	2,913		2,913	U
64	0603746N	RETRACT MAPLE	04	287,865	318,878		318,878	U
65	0603748N	LINK PLUMERIA	04	375,595	381,268		381,268	U
66	0603751N	RETRACT ELM	04	52,080	58,192		58,192	U
67	0603764N	LINK EVERGREEN	04	47,115				U

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Appropriation: 1319N Research, Development, Test & Eval, Navy

Line No	Program Element Number	Item	Act	FY 2020 Base	FY 2020 OCO for Base Requirements	FY 2020 OCO for Direct War and Enduring Costs	FY 2020 Total OCO	FY 2020 Total (Base + OCO)	Sec
49	0603581N	Littoral Combat Ship (LCS)	04	9,934				9,934	U
50	0603582N	Combat System Integration	04	17,251				17,251	U
51	0603595N	Ohio Replacement	04	419,051				419,051	U
52	0603596N	LCS Mission Modules	04	108,505				108,505	U
53	0603597N	Automated Test and Analysis	04	7,653				7,653	U
54	0603599N	Frigate Development	04	59,007				59,007	U
55	0603609N	Conventional Munitions	04	9,988				9,988	U
56	0603635M	Marine Corps Ground Combat/Support System	04	86,464				86,464	U
57	0603654N	Joint Service Explosive Ordnance Development	04	33,478		14,178	14,178	47,656	U
58	0603713N	Ocean Engineering Technology Development	04	5,619				5,619	U
59	0603721N	Environmental Protection	04	20,564				20,564	U
60	0603724N	Navy Energy Program	04	26,514				26,514	U
61	0603725N	Facilities Improvement	04	3,440				3,440	U
62	0603734N	CHALK CORAL	04	346,800				346,800	U
63	0603739N	Navy Logistic Productivity	04	3,857				3,857	U
64	0603746N	RETRACT MAPLE	04	258,519				258,519	U
65	0603748N	LINK PLUMERIA	04	403,909				403,909	U
66	0603751N	RETRACT ELM	04	63,434				63,434	U
67	0603764N	LINK EVERGREEN	04	184,110				184,110	U

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(Dollars in Thousands)

Appropriation: 1319N Research, Development, Test & Eval, Navy

Line No	Program Element Number	Item	Act	FY 2018 (Base + OCO)	FY 2019 Base Enacted	FY 2019 OCO Enacted	FY 2019 Total Enacted	Sec
68	0603790N	NATO Research and Development	04	8,752	9,652		9,652	U
69	0603795N	Land Attack Technology	04	16,684	5,700	1,400	7,100	U
70	0603851M	Joint Non-Lethal Weapons Testing	04	23,934	27,581		27,581	U
71	0603860N	Joint Precision Approach and Landing Systems - Dem/Val	04	103,984	101,566		101,566	U
72	0603925N	Directed Energy and Electric Weapon Systems	04	92,856	142,814		142,814	U
73	0604014N	F/A -18 Infrared Search and Track (IRST)	04		108,689		108,689	U
74	0604027N	Digital Warfare Office	04	14,476	20,000		20,000	U
75	0604028N	Small and Medium Unmanned Undersea Vehicles	04		16,717		16,717	U
76	0604029N	Unmanned Undersea Vehicle Core Technologies	04		27,483		27,483	U
77	0604030N	Rapid Prototyping, Experimentation and Demonstration.	04	25,225	28,596		28,596	U
78	0604031N	Large Unmanned Undersea Vehicles	04	23,886	60,304		60,304	U
79	0604112N	Gerald R. Ford Class Nuclear Aircraft Carrier (CVN 78 - 80)	04	82,549	83,121		83,121	U
80	0604126N	Littoral Airborne MCM	04	11,314	14,625		14,625	U
81	0604127N	Surface Mine Countermeasures	04	12,525	15,527		15,527	U
82	0604272N	Tactical Air Directional Infrared Countermeasures (TADIRCM)	04	51,311	47,278		47,278	U
83	0604286M	Marine Corps Additive Manufacturing Technology Development	04	6,168				U

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68	0603790N	NATO Research and Development	04	7,697				7,697	U
69	0603795N	Land Attack Technology	04	9,086		1,428	1,428	10,514	U
70	0603851M	Joint Non-Lethal Weapons Testing	04	28,466				28,466	U
71	0603860N	Joint Precision Approach and Landing Systems - Dem/Val	04	51,341				51,341	U
72	0603925N	Directed Energy and Electric Weapon Systems	04	118,169				118,169	U
73	0604014N	F/A -18 Infrared Search and Track (IRST)	04	113,456				113,456	U
74	0604027N	Digital Warfare Office	04	50,120				50,120	U
75	0604028N	Small and Medium Unmanned Undersea Vehicles	04	32,527				32,527	U
76	0604029N	Unmanned Undersea Vehicle Core Technologies	04	54,376				54,376	U
77	0604030N	Rapid Prototyping, Experimentation and Demonstration.	04	36,197				36,197	U
78	0604031N	Large Unmanned Undersea Vehicles	04	68,310				68,310	U
79	0604112N	Gerald R. Ford Class Nuclear Aircraft Carrier (CVN 78 - 80)	04	121,310				121,310	U
80	0604126N	Littoral Airborne MCM	04	17,248				17,248	U
81	0604127N	Surface Mine Countermeasures	04	18,735				18,735	U
82	0604272N	Tactical Air Directional Infrared Countermeasures (TADIRCM)	04	68,346				68,346	U
83	0604286M	Marine Corps Additive Manufacturing Technology Development	04						U

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84	0604289M	Next Generation Logistics	04		6,073		6,073	U
85	0604320M	Rapid Technology Capability Prototype	04	16,443	7,107		7,107	U
86	0604454N	LX (R)	04	9,431	5,549		5,549	U
87	0604536N	Advanced Undersea Prototyping	04	64,038	112,669		112,669	U
88	0604636N	Counter Unmanned Aircraft Systems (C-UAS)	04					U
89	0604659N	Precision Strike Weapons Development Program	04	20,279	91,833		91,833	U
90	0604707N	Space and Electronic Warfare (SEW) Architecture/Engineering Support	04	41,214	7,230		7,230	U
91	0604786N	Offensive Anti-Surface Warfare Weapon Development	04	163,843	139,261		139,261	U
92	0303354N	ASW Systems Development - MIP	04	8,278	8,889		8,889	U
93	0304240M	Advanced Tactical Unmanned Aircraft System	04	5,200	17,561		17,561	U
94	0304240N	Advanced Tactical Unmanned Aircraft System	04		9,300		9,300	U
95	0304270N	Electronic Warfare Development - MIP	04	527	466		466	U
		Advanced Component Development & Prototypes		4,210,640	4,139,479	33,300	4,172,779	
96	0603208N	Training System Aircraft	05	16,343	12,798		12,798	U
97	0604212N	Other Helo Development	05	26,423	23,579		23,579	U
98	0604214M	AV-8B Aircraft - Eng Dev	05		46,363		46,363	U
99	0604214N	AV-8B Aircraft - Eng Dev	05	41,261				U

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84	0604289M	Next Generation Logistics	04	4,420				4,420	U
85	0604320M	Rapid Technology Capability Prototype	04	4,558				4,558	U
86	0604454N	LX (R)	04	12,500				12,500	U
87	0604536N	Advanced Undersea Prototyping	04	181,967				181,967	U
88	0604636N	Counter Unmanned Aircraft Systems (C-UAS)	04	5,500				5,500	U
89	0604659N	Precision Strike Weapons Development Program	04	718,148				718,148	U
90	0604707N	Space and Electronic Warfare (SEW) Architecture/Engineering Support	04	5,263				5,263	U
91	0604786N	Offensive Anti-Surface Warfare Weapon Development	04	65,419				65,419	U
92	0303354N	ASW Systems Development - MIP	04	9,991				9,991	U
93	0304240M	Advanced Tactical Unmanned Aircraft System	04	21,157				21,157	U
94	0304240N	Advanced Tactical Unmanned Aircraft System	04						U
95	0304270N	Electronic Warfare Development - MIP	04	609				609	U
		Advanced Component Development & Prototypes		5,559,062		40,006	40,006	5,599,068	
96	0603208N	Training System Aircraft	05	15,514				15,514	U
97	0604212N	Other Helo Development	05	28,835				28,835	U
98	0604214M	AV-8B Aircraft - Eng Dev	05	27,441				27,441	U
99	0604214N	AV-8B Aircraft - Eng Dev	05						U

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100	0604215N	Standards Development	05	2,711	3,771		3,771	U
101	0604216N	Multi-Mission Helicopter Upgrade Development	05	5,313	16,611		16,611	U
102	0604218N	Air/Ocean Equipment Engineering	05	5,583	15,582		15,582	U
103	0604221N	P-3 Modernization Program	05	1,331	2,134		2,134	U
104	0604230N	Warfare Support System	05	19,004	9,729		9,729	U
105	0604231N	Tactical Command System	05	37,609	54,300		54,300	U
106	0604234N	Advanced Hawkeye	05	283,497	210,565		210,565	U
107	0604245M	H-1 Upgrades	05		54,320		54,320	U
108	0604245N	H-1 Upgrades	05	59,806				U
109	0604261N	Acoustic Search Sensors	05	36,310	42,485		42,485	U
110	0604262N	V-22A	05	176,804	135,504		135,504	U
111	0604264N	Air Crew Systems Development	05	7,174	30,980		30,980	U
112	0604269N	EA-18	05	137,029	242,719		242,719	U
113	0604270N	Electronic Warfare Development	05	50,613	83,624		83,624	U
114	0604273M	Executive Helo Development	05		245,064		245,064	U
115	0604273N	Executive Helo Development	05	430,647				U
116	0604274N	Next Generation Jammer (NGJ)	05	584,538	449,429		449,429	U
117	0604280N	Joint Tactical Radio System - Navy (JTRS-Navy)	05	5,172	3,272		3,272	U
118	0604282N	Next Generation Jammer (NGJ) Increment II	05	55,194	93,482		93,482	U

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100	0604215N	Standards Development	05	3,642				3,642	U
101	0604216N	Multi-Mission Helicopter Upgrade Development	05	19,196				19,196	U
102	0604218N	Air/Ocean Equipment Engineering	05						U
103	0604221N	P-3 Modernization Program	05						U
104	0604230N	Warfare Support System	05	8,601				8,601	U
105	0604231N	Tactical Command System	05	77,232				77,232	U
106	0604234N	Advanced Hawkeye	05	232,752				232,752	U
107	0604245M	H-1 Upgrades	05	65,359				65,359	U
108	0604245N	H-1 Upgrades	05						U
109	0604261N	Acoustic Search Sensors	05	47,013				47,013	U
110	0604262N	V-22A	05	185,105				185,105	U
111	0604264N	Air Crew Systems Development	05	21,172				21,172	U
112	0604269N	EA-18	05	143,585				143,585	U
113	0604270N	Electronic Warfare Development	05	116,811				116,811	U
114	0604273M	Executive Helo Development	05	187,436				187,436	U
115	0604273N	Executive Helo Development	05						U
116	0604274N	Next Generation Jammer (NGJ)	05	524,261				524,261	U
117	0604280N	Joint Tactical Radio System - Navy (JTRS-Navy)	05	192,345				192,345	U
118	0604282N	Next Generation Jammer (NGJ) Increment II	05	111,068				111,068	U

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119	0604307N	Surface Combatant Combat System Engineering	05	340,760	379,116		379,116	U
120	0604311N	LPD-17 Class Systems Integration	05	665	939		939	U
121	0604329N	Small Diameter Bomb (SDB)	05	99,286	96,980		96,980	U
122	0604366N	Standard Missile Improvements	05	114,802	190,881		190,881	U
123	0604373N	Airborne MCM	05	15,203	8,351		8,351	U
124	0604378N	Naval Integrated Fire Control - Counter Air Systems Engineering	05	24,801	33,429		33,429	U
125	0604501N	Advanced Above Water Sensors	05	84,507	33,884		33,884	U
126	0604503N	SSN-688 and Trident Modernization	05	142,167	126,932		126,932	U
127	0604504N	Air Control	05	68,012	61,498		61,498	U
128	0604512N	Shipboard Aviation Systems	05	174,034	13,710		13,710	U
129	0604518N	Combat Information Center Conversion	05	4,294	19,263		19,263	U
130	0604522N	Air and Missile Defense Radar (AMDR) System	05	49,643	27,008		27,008	U
131	0604530N	Advanced Arresting Gear (AAG)	05		172,173		172,173	U
132	0604558N	New Design SSN	05	117,887	180,233		180,233	U
133	0604562N	Submarine Tactical Warfare System	05	44,703	80,324		80,324	U
134	0604567N	Ship Contract Design/ Live Fire T&E	05	65,857	71,062		71,062	U
135	0604574N	Navy Tactical Computer Resources	05	4,745	4,642		4,642	U
136	0604580N	Virginia Payload Module (VPM)	05	70,579				U
137	0604601N	Mine Development	05	24,640	21,747		21,747	U

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119	0604307N	Surface Combatant Combat System Engineering	05	415,625				415,625	U
120	0604311N	LPD-17 Class Systems Integration	05	640				640	U
121	0604329N	Small Diameter Bomb (SDB)	05	50,096				50,096	U
122	0604366N	Standard Missile Improvements	05	232,391				232,391	U
123	0604373N	Airborne MCM	05	10,916				10,916	U
124	0604378N	Naval Integrated Fire Control - Counter Air Systems Engineering	05	33,379				33,379	U
125	0604501N	Advanced Above Water Sensors	05	34,554				34,554	U
126	0604503N	SSN-688 and Trident Modernization	05	84,663				84,663	U
127	0604504N	Air Control	05	44,923				44,923	U
128	0604512N	Shipboard Aviation Systems	05	10,632				10,632	U
129	0604518N	Combat Information Center Conversion	05	16,094				16,094	U
130	0604522N	Air and Missile Defense Radar (AMDR) System	05	55,349				55,349	U
131	0604530N	Advanced Arresting Gear (AAG)	05	123,490				123,490	U
132	0604558N	New Design SSN	05	121,010				121,010	U
133	0604562N	Submarine Tactical Warfare System	05	62,426				62,426	U
134	0604567N	Ship Contract Design/ Live Fire T&E	05	46,809				46,809	U
135	0604574N	Navy Tactical Computer Resources	05	3,692				3,692	U
136	0604580N	Virginia Payload Module (VPM)	05						U
137	0604601N	Mine Development	05	28,964				28,964	U

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138	0604610N	Lightweight Torpedo Development	05	21,057	63,147		63,147	U
139	0604654N	Joint Service Explosive Ordnance Development	05	7,449	7,107		7,107	U
140	0604657M	USMC Ground Combat/Supporting Arms Systems - Eng Dev	05					U
141	0604703N	Personnel, Training, Simulation, and Human Factors	05	24,229	6,539		6,539	U
142	0604727N	Joint Standoff Weapon Systems	05	418	441		441	U
143	0604755N	Ship Self Defense (Detect & Control)	05	160,475	180,391	1,100	181,491	U
144	0604756N	Ship Self Defense (Engage: Hard Kill)	05	214,132	193,244		193,244	U
145	0604757N	Ship Self Defense (Engage: Soft Kill/EW)	05	126,037	120,210		120,210	U
146	0604761N	Intelligence Engineering	05	44,855	25,965		25,965	U
147	0604771N	Medical Development	05	36,392	38,095		38,095	U
148	0604777N	Navigation/ID System	05	74,984	126,026		126,026	U
149	0604800M	Joint Strike Fighter (JSF) - EMD	05	157,162	66,566		66,566	U
150	0604800N	Joint Strike Fighter (JSF) - EMD	05	105,648	65,494		65,494	U
151	0604810M	Joint Strike Fighter Follow On Modernization (FoM) - Marine Corps	05	139,369				U
152	0604810N	Joint Strike Fighter Follow On Modernization (FoM) - Navy	05	138,308				U
153	0605013M	Information Technology Development	05	14,497	11,030		11,030	U
154	0605013N	Information Technology Development	05	120,387	242,110		242,110	U

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138	0604610N	Lightweight Torpedo Development	05	148,349				148,349	U
139	0604654N	Joint Service Explosive Ordnance Development	05	8,237				8,237	U
140	0604657M	USMC Ground Combat/Supporting Arms Systems - Eng Dev	05	22,000				22,000	U
141	0604703N	Personnel, Training, Simulation, and Human Factors	05	5,500				5,500	U
142	0604727N	Joint Standoff Weapon Systems	05	18,725				18,725	U
143	0604755N	Ship Self Defense (Detect & Control)	05	192,603		1,122	1,122	193,725	U
144	0604756N	Ship Self Defense (Engage: Hard Kill)	05	137,268				137,268	U
145	0604757N	Ship Self Defense (Engage: Soft Kill/EW)	05	97,363				97,363	U
146	0604761N	Intelligence Engineering	05	26,710				26,710	U
147	0604771N	Medical Development	05	8,181				8,181	U
148	0604777N	Navigation/ID System	05	40,755				40,755	U
149	0604800M	Joint Strike Fighter (JSF) - EMD	05	1,710				1,710	U
150	0604800N	Joint Strike Fighter (JSF) - EMD	05	1,490				1,490	U
151	0604810M	Joint Strike Fighter Follow On Modernization (FoM) - Marine Corps	05						U
152	0604810N	Joint Strike Fighter Follow On Modernization (FoM) - Navy	05						U
153	0605013M	Information Technology Development	05	1,494				1,494	U
154	0605013N	Information Technology Development	05	384,162				384,162	U

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155	0605024N	Anti-Tamper Technology Support	05	3,900	5,618		5,618	U
156	0605212M	CH-53K RDTE	05		336,945		336,945	U
157	0605212N	CH-53K RDTE	05	329,367				U
158	0605215N	Mission Planning	05	36,108	32,714		32,714	U
159	0605217N	Common Avionics	05	47,338	51,486		51,486	U
160	0605220N	Ship to Shore Connector (SSC)	05	31,583	1,444		1,444	U
161	0605327N	T-AO 205 Class	05	1,895	1,298		1,298	U
162	0605414N	Unmanned Carrier Aviation (UCA)	05	194,176	518,942		518,942	U
163	0605450M	Joint Air-to-Ground Missile (JAGM)	05		16,559		16,559	U
164	0605450N	Joint Air-to-Ground Missile (JAGM)	05	14,457				U
165	0605500N	Multi-mission Maritime Aircraft (MMA)	05	11,422	34,196		34,196	U
166	0605504N	Multi-Mission Maritime (MMA) Increment III	05	123,752	163,809		163,809	U
167	0605611M	Marine Corps Assault Vehicles System Development & Demonstration	05	150,381	66,137		66,137	U
168	0605813M	Joint Light Tactical Vehicle (JLTV) System Development & Demonstration	05	19,467				U
169	0204202N	DDG-1000	05	134,664	140,264		140,264	U
170	0303267N	Auctioned Spectrum Relocation Fund***	05	97,558				U
171	0303467N	SENSR Spectrum Pipeline SRF***	05	1,773				U
172	0304785N	Tactical Cryptologic Systems	05	22,762	42,398		42,398	U

***Funding in this Program Element was transferred during the year of execution from the Spectrum Relocation Fund (SRF) in support of the Advanced Wireless Services 3 (AWS-3) auction and is associated with the reallocation or sharing of the 1755-1780 MHz and 1695-1710 MHz bands. The SRF is administered by the Office of Management and Budget (OMB), which approves SRF transfers to federal agencies on an annual basis in consultation with the National Telecommunications and Information Administration (NTIA).

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155	0605024N	Anti-Tamper Technology Support	05	4,882				4,882	U
156	0605212M	CH-53K RDTE	05	516,955				516,955	U
157	0605212N	CH-53K RDTE	05						U
158	0605215N	Mission Planning	05	75,886				75,886	U
159	0605217N	Common Avionics	05	43,187				43,187	U
160	0605220N	Ship to Shore Connector (SSC)	05	4,909				4,909	U
161	0605327N	T-AO 205 Class	05	1,682				1,682	U
162	0605414N	Unmanned Carrier Aviation (UCA)	05	671,258				671,258	U
163	0605450M	Joint Air-to-Ground Missile (JAGM)	05	18,393				18,393	U
164	0605450N	Joint Air-to-Ground Missile (JAGM)	05						U
165	0605500N	Multi-mission Maritime Aircraft (MMA)	05	21,472				21,472	U
166	0605504N	Multi-Mission Maritime (MMA) Increment III	05	177,234				177,234	U
167	0605611M	Marine Corps Assault Vehicles System Development & Demonstration	05	77,322				77,322	U
168	0605813M	Joint Light Tactical Vehicle (JLTV) System Development & Demonstration	05	2,105				2,105	U
169	0204202N	DDG-1000	05	111,435				111,435	U
170	0303267N	Auctioned Spectrum Relocation Fund***	05						U
171	0303467N	SENSR Spectrum Pipeline SRF***	05						U
172	0304785N	Tactical Cryptologic Systems	05	101,339				101,339	U

***Funding in this Program Element was transferred during the year of execution from the Spectrum Relocation Fund (SRF) in support of the Advanced Wireless Services 3 (AWS-3) auction and is associated with the reallocation or sharing of the 1755-1780 MHz and 1695-1710 MHz bands. The SRF is administered by the Office of Management and Budget (OMB), which approves SRF transfers to federal agencies on an annual basis in consultation with the National Telecommunications and Information Administration (NTIA).

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173	0306250M	Cyber Operations Technology Development	05	2,960	6,808		6,808	U
		System Development & Demonstration		6,037,909	5,863,466	1,100	5,864,566	
174	0604256N	Threat Simulator Development	06	89,491	94,576		94,576	U
175	0604258N	Target Systems Development	06	18,737	10,981		10,981	U
176	0604759N	Major T&E Investment	06	68,977	90,514		90,514	U
177	0605126N	Joint Theater Air and Missile Defense Organization	06	140	48		48	U
178	0605152N	Studies and Analysis Support - Navy	06	4,438	3,942		3,942	U
179	0605154N	Center for Naval Analyses	06	44,302	42,693		42,693	U
180	0605285N	Next Generation Fighter	06		5,000		5,000	U
181	0605502N	Small Business Innovative Research	06	407,133				U
182	0605804N	Technical Information Services	06	1,280	1,029		1,029	U
183	0605853N	Management, Technical & International Support	06	135,102	86,932		86,932	U
184	0605856N	Strategic Technical Support	06	3,909	4,231		4,231	U
185	0605861N	RDT&E Science and Technology Management	06	1,104	1,072		1,072	U
186	0605863N	RDT&E Ship and Aircraft Support	06	105,019	97,471		97,471	U
187	0605864N	Test and Evaluation Support	06	369,056	373,834		373,834	U
188	0605865N	Operational Test and Evaluation Capability	06	20,298	21,554		21,554	U

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173	0306250M	Cyber Operations Technology Development	05	26,406				26,406	U
		System Development & Demonstration		6,332,033		1,122	1,122	6,333,155	
174	0604256N	Threat Simulator Development	06	66,678				66,678	U
175	0604258N	Target Systems Development	06	12,027				12,027	U
176	0604759N	Major T&E Investment	06	85,348				85,348	U
177	0605126N	Joint Theater Air and Missile Defense Organization	06						U
178	0605152N	Studies and Analysis Support - Navy	06	3,908				3,908	U
179	0605154N	Center for Naval Analyses	06	47,669				47,669	U
180	0605285N	Next Generation Fighter	06	20,698				20,698	U
181	0605502N	Small Business Innovative Research	06						U
182	0605804N	Technical Information Services	06	988				988	U
183	0605853N	Management, Technical & International Support	06	102,401				102,401	U
184	0605856N	Strategic Technical Support	06	3,742				3,742	U
185	0605861N	RDT&E Science and Technology Management	06						U
186	0605863N	RDT&E Ship and Aircraft Support	06	93,872				93,872	U
187	0605864N	Test and Evaluation Support	06	394,020				394,020	U
188	0605865N	Operational Test and Evaluation Capability	06	25,145				25,145	U

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Line No	Program Element Number	Item	Act	FY 2018 (Base + OCO)	FY 2019 Base Enacted	FY 2019 OCO Enacted	FY 2019 Total Enacted	Sec
189	0605866N	Navy Space and Electronic Warfare (SEW) Support	06	16,274	16,227		16,227	U
190	0605867N	SEW Surveillance/Reconnaissance Support	06					U
191	0605873M	Marine Corps Program Wide Support	06	21,423	21,538		21,538	U
192	0605898N	Management HQ - R&D	06	43,266	41,765		41,765	U
193	0606355N	Warfare Innovation Management	06	27,759	41,918		41,918	U
194	0606942M	Assessments and Evaluations Cyber Vulnerabilities	06		7,000		7,000	U
195	0606942N	Assessments and Evaluations Cyber Vulnerabilities	06		48,800		48,800	U
196	0305327N	Insider Threat	06		1,682		1,682	U
197	0902498N	Management Headquarters (Departmental Support Activities)	06	1,749	1,579		1,579	U
198	0909999N	Financing for Cancelled Account Adjustments	06	71				U
199	1206867N	SEW Surveillance/Reconnaissance Support	06	9,408	8,684		8,684	U
		Management Support		1,388,936	1,023,070		1,023,070	
201	0604014N	F/A -18 Infrared Search and Track (IRST)	07	68,087				U
202	0604227N	HARPOON Modifications	07		5,197		5,197	U
203	0604840M	F-35 C2D2	07		234,107		234,107	U
204	0604840N	F-35 C2D2	07		227,998		227,998	U

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189	0605866N	Navy Space and Electronic Warfare (SEW) Support	06	15,773				15,773	U
190	0605867N	SEW Surveillance/Reconnaissance Support	06	8,402				8,402	U
191	0605873M	Marine Corps Program Wide Support	06	37,265				37,265	U
192	0605898N	Management HQ - R&D	06	39,673				39,673	U
193	0606355N	Warfare Innovation Management	06	28,750				28,750	U
194	0606942M	Assessments and Evaluations Cyber Vulnerabilities	06						U
195	0606942N	Assessments and Evaluations Cyber Vulnerabilities	06						U
196	0305327N	Insider Threat	06	2,645				2,645	U
197	0902498N	Management Headquarters (Departmental Support Activities)	06	1,460				1,460	U
198	0909999N	Financing for Cancelled Account Adjustments	06						U
199	1206867N	SEW Surveillance/Reconnaissance Support	06						U
		Management Support		990,464				990,464	
201	0604014N	F/A -18 Infrared Search and Track (IRST)	07						U
202	0604227N	HARPOON Modifications	07	2,302				2,302	U
203	0604840M	F-35 C2D2	07	422,881				422,881	U
204	0604840N	F-35 C2D2	07	383,741				383,741	U

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205	0607658N	Cooperative Engagement Capability (CEC)	07	88,088	128,815		128,815	U
206	0607700N	Deployable Joint Command and Control	07	3,093	3,127		3,127	U
207	0101221N	Strategic Sub & Weapons System Support	07	130,652	148,379		148,379	U
208	0101224N	SSBN Security Technology Program	07	35,105	41,959		41,959	U
209	0101226N	Submarine Acoustic Warfare Development	07	9,439	11,311		11,311	U
210	0101402N	Navy Strategic Communications	07	17,624	38,661		38,661	U
211	0204136N	F/A-18 Squadrons	07	133,544	204,886		204,886	U
212	0204163N	Fleet Telecommunications (Tactical)	07	8,465	1,344		1,344	U
213	0204228N	Surface Support	07	20,587	9,708		9,708	U
214	0204229N	Tomahawk and Tomahawk Mission Planning Center (TMPC)	07	100,011	252,395		252,395	U
215	0204311N	Integrated Surveillance System	07	55,164	71,959		71,959	U
216	0204313N	Ship-Towed Array Surveillance Systems	07		15,454		15,454	U
217	0204413N	Amphibious Tactical Support Units (Displacement Craft)	07	2,346	6,073		6,073	U
218	0204460M	Ground/Air Task Oriented Radar (G/ ATOR)	07	53,605	44,579		44,579	U
219	0204571N	Consolidated Training Systems Development	07	64,585	104,903		104,903	U
220	0204574N	Cryptologic Direct Support	07	2,355	4,544		4,544	U

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205	0607658N	Cooperative Engagement Capability (CEC)	07	127,924				127,924	U
206	0607700N	Deployable Joint Command and Control	07						U
207	0101221N	Strategic Sub & Weapons System Support	07	157,676				157,676	U
208	0101224N	SSBN Security Technology Program	07	43,354				43,354	U
209	0101226N	Submarine Acoustic Warfare Development	07	6,815				6,815	U
210	0101402N	Navy Strategic Communications	07	31,174				31,174	U
211	0204136N	F/A-18 Squadrons	07	213,715				213,715	U
212	0204163N	Fleet Telecommunications (Tactical)	07						U
213	0204228N	Surface Support	07	36,389				36,389	U
214	0204229N	Tomahawk and Tomahawk Mission Planning Center (TMPC)	07	320,134				320,134	U
215	0204311N	Integrated Surveillance System	07	88,382				88,382	U
216	0204313N	Ship-Towed Array Surveillance Systems	07	14,449				14,449	U
217	0204413N	Amphibious Tactical Support Units (Displacement Craft)	07	6,931				6,931	U
218	0204460M	Ground/Air Task Oriented Radar (G/ATOR)	07	23,891				23,891	U
219	0204571N	Consolidated Training Systems Development	07	129,873				129,873	U
220	0204574N	Cryptologic Direct Support	07						U

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221	0204575N	Electronic Warfare (EW) Readiness Support	07	49,094	66,889		66,889	U
222	0205601N	HARM Improvement	07	70,415	120,762		120,762	U
223	0205604N	Tactical Data Links	07	75,523	88,979		88,979	U
224	0205620N	Surface ASW Combat System Integration	07	28,410	26,321		26,321	U
225	0205632N	MK-48 ADCAP	07	48,740	68,255		68,255	U
226	0205633N	Aviation Improvements	07	120,940	134,823		134,823	U
227	0205675N	Operational Nuclear Power Systems	07	127,445	117,028		117,028	U
228	0206313M	Marine Corps Communications Systems	07	170,529	172,683	16,130	188,813	U
229	0206335M	Common Aviation Command and Control System (CAC2S)	07	6,976	4,760		4,760	U
230	0206623M	Marine Corps Ground Combat/ Supporting Arms Systems	07	68,941	100,850		100,850	U
231	0206624M	Marine Corps Combat Services Support	07	24,915	29,905		29,905	U
232	0206625M	USMC Intelligence/Electronic Warfare Systems (MIP)	07	30,630	37,821		37,821	U
233	0206629M	Amphibious Assault Vehicle	07	53,404	20,690		20,690	U
234	0207161N	Tactical AIM Missiles	07	34,063	40,121		40,121	U
235	0207163N	Advanced Medium Range Air-to-Air Missile (AMRAAM)	07	29,486	28,235		28,235	U
239	0303109N	Satellite Communications (SPACE)	07					U
240	0303138N	Consolidated Afloat Network Enterprise Services (CANES)	07	24,197	23,697		23,697	U

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221	0204575N	Electronic Warfare (EW) Readiness Support	07	82,325				82,325	U
222	0205601N	HARM Improvement	07	138,431				138,431	U
223	0205604N	Tactical Data Links	07						U
224	0205620N	Surface ASW Combat System Integration	07	29,572				29,572	U
225	0205632N	MK-48 ADCAP	07	85,973				85,973	U
226	0205633N	Aviation Improvements	07	125,461				125,461	U
227	0205675N	Operational Nuclear Power Systems	07	106,192				106,192	U
228	0206313M	Marine Corps Communications Systems	07	143,317		15,000	15,000	158,317	U
229	0206335M	Common Aviation Command and Control System (CAC2S)	07	4,489				4,489	U
230	0206623M	Marine Corps Ground Combat/ Supporting Arms Systems	07	51,788				51,788	U
231	0206624M	Marine Corps Combat Services Support	07	37,761				37,761	U
232	0206625M	USMC Intelligence/Electronic Warfare Systems (MIP)	07	21,458				21,458	U
233	0206629M	Amphibious Assault Vehicle	07	5,476				5,476	U
234	0207161N	Tactical AIM Missiles	07	19,488				19,488	U
235	0207163N	Advanced Medium Range Air-to-Air Missile (AMRAAM)	07	39,029				39,029	U
239	0303109N	Satellite Communications (SPACE)	07	34,344				34,344	U
240	0303138N	Consolidated Afloat Network Enterprise Services (CANES)	07	22,873				22,873	U

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241	0303140N	Information Systems Security Program	07	49,310	44,228		44,228	U
243	0305192N	Military Intelligence Program (MIP) Activities	07	6,934	6,081		6,081	U
244	0305204N	Tactical Unmanned Aerial Vehicles	07	7,770	8,529		8,529	U
245	0305205N	UAS Integration and Interoperability	07	20,848	24,663		24,663	U
246	0305208M	Distributed Common Ground/Surface Systems	07	13,338	7,610		7,610	U
247	0305208N	Distributed Common Ground/Surface Systems	07	40,150	42,846		42,846	U
248	0305220N	MQ-4C Triton	07	94,115	14,395		14,395	U
249	0305231N	MQ-8 UAV	07	62,656	24,143		24,143	U
250	0305232M	RQ-11 UAV	07	2,002	524		524	U
251	0305234N	Small (Level 0) Tactical UAS (STUASL0)	07	4,827	5,265		5,265	U
252	0305239M	RQ-21A	07	10,500	6,000		6,000	U
253	0305241N	Multi-Intelligence Sensor Development	07	93,020	81,231		81,231	U
254	0305242M	Unmanned Aerial Systems (UAS) Payloads (MIP)	07	18,392	5,956		5,956	U
255	0305421N	RQ-4 Modernization	07	224,249	219,403		219,403	U
256	0308601N	Modeling and Simulation Support	07	5,038	7,097		7,097	U
257	0702207N	Depot Maintenance (Non-IF)	07	35,463	46,560		46,560	U
258	0708730N	Maritime Technology (MARITECH)	07	4,621	27,284		27,284	U

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241	0303140N	Information Systems Security Program	07	41,853				41,853	U
243	0305192N	Military Intelligence Program (MIP) Activities	07	8,913				8,913	U
244	0305204N	Tactical Unmanned Aerial Vehicles	07	9,451				9,451	U
245	0305205N	UAS Integration and Interoperability	07	42,315				42,315	U
246	0305208M	Distributed Common Ground/Surface Systems	07	22,042				22,042	U
247	0305208N	Distributed Common Ground/Surface Systems	07						U
248	0305220N	MQ-4C Triton	07	11,784				11,784	U
249	0305231N	MQ-8 UAV	07	29,618				29,618	U
250	0305232M	RQ-11 UAV	07	509				509	U
251	0305234N	Small (Level 0) Tactical UAS (STUASL0)	07	11,545				11,545	U
252	0305239M	RQ-21A	07	10,914				10,914	U
253	0305241N	Multi-Intelligence Sensor Development	07	70,612				70,612	U
254	0305242M	Unmanned Aerial Systems (UAS) Payloads (MIP)	07	3,704				3,704	U
255	0305421N	RQ-4 Modernization	07	202,346				202,346	U
256	0308601N	Modeling and Simulation Support	07	7,119				7,119	U
257	0702207N	Depot Maintenance (Non-IF)	07	38,182				38,182	U
258	0708730N	Maritime Technology (MARITECH)	07	6,779				6,779	U

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259	1203109N	Satellite Communications (SPACE)	07	40,330	34,174		34,174	U
9999	9999999999	Classified Programs		1,857,702	1,670,503	117,282	1,787,785	U
		Operational Systems Development		4,347,723	4,913,710	133,412	5,047,122	
Total Research, Development, Test & Eval, Navy				18,465,332	18,490,002	167,812	18,657,814	

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259	1203109N	Satellite Communications (SPACE)	07	15,868				15,868	U
9999	9999999999	Classified Programs		1,613,137		108,282	108,282	1,721,419	U
		Operational Systems Development		5,104,299		123,282	123,282	5,227,581	
Total Research, Development, Test & Eval, Navy				20,270,499		164,410	164,410	20,434,909	

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14	02	0602782N	Mine & Exp Warfare Applied Res	Volume 1 - 225
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20	03	0603651M	JT Non-Lethal Wpns Tech Dev	Volume 1 - 305
21	03	0603673N	(U)Future Naval Capabilities Advanced Tech Dev	Volume 1 - 309
22	03	0603680N	(U)Manufacturing Technology Program	Volume 1 - 325
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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy											Date: March 2019	
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0603207N *I Air/Ocean Tactical Applications*							
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
Total Program Element	616.037	47.422	29.747	32.643	2.400	35.043	36.157	36.269	37.143	37.882	Continuing	Continuing
2341: *METOC Data Acquisition*	172.047	5.276	3.471	4.662	2.400	7.062	6.089	6.181	7.858	8.016	Continuing	Continuing
2342: *METOC Data Assimilation and Mod*	251.206	20.959	17.441	21.168	-	21.168	22.355	22.382	22.004	22.438	Continuing	Continuing
2343: *Tactical METOC Applications*	163.724	11.448	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	175.172
2344: *Precise Time and Astrometry*	15.533	4.992	4.556	2.467	-	2.467	3.293	3.209	3.079	3.141	Continuing	Continuing
2363: *Remote Sensing Capability Development*	11.128	3.874	0.324	0.327	-	0.327	0.328	0.328	0.000	0.000	0.000	16.309
3207: *Fleet Synthetic Training*	2.399	0.243	0.266	0.283	-	0.283	0.305	0.326	0.332	0.339	Continuing	Continuing
3404: *Tactical Environmental Support*	0.000	0.315	2.595	2.619	-	2.619	2.643	2.672	2.684	2.738	Continuing	Continuing
3405: *Decision Support Products & Dissemination*	0.000	0.315	1.094	1.117	-	1.117	1.144	1.171	1.186	1.210	Continuing	Continuing

A. Mission Description and Budget Item Justification

The Air Tactical Applications (AOTA) Program Element (PE) is aligned with the Navy's maritime strategy to enhance the future mission capabilities of the Navy-Marine Corps Meteorological and Oceanographic (METOC) Team supporting naval warfighters worldwide. New state-of-the art government and commercial technologies are identified, transitioned, demonstrated and then integrated into Combat Systems and programs of record to provide capabilities that provide real-time and near-real-time operational effects of the physical environment on the performance of combat forces and their new and emerging platforms, sensors, systems and munitions. The AOTA program element focuses on sensing and characterizing and predicting the littoral and deep-strike battlespace in the context of regional conflicts and crisis response scenarios.

Projects in this PE transition state-of-the art sensing, assimilation, modeling and decision aid technologies from government and commercial sources. Unique project development efforts include atmospheric and oceanographic data assimilation techniques, forecast models, data base management systems and associated software for use in mainframe, desktop and laptop computers. Model data, products and services can be used by forward-deployed personnel or in a reach-back mode to optimize sensor placement and force allocation decisions. Global Geospatial Information and Services efforts within this program address the bathymetric needs of the Navy. Also developed are algorithms to process new satellite sensor data for integration into Navy and Marine Corps decision support systems and for display as part of the common operational and tactical pictures. In addition, the projects provide for demonstration and validation of specialized atmospheric and oceanographic instrumentation and measurement techniques, new sensors, communications and interfaces. Included are new capabilities to assess, predict and enhance the

performance of current and emerging undersea warfare and mine warfare weapons systems. AOTA capabilities are designed to support the latest versions of the Global Command and Control System and specific unit-level combat systems. This PE develops technological upgrades for the U.S. Naval Observatory's Master Clock system to meet requirements of Department of Defense communications, cryptographic, intelligence, geolocation, and targeting systems; develops near-real-time earth orientation predictions; develops very precise determination of positions of both faint and bright stars; and supports satellite tracking and space debris studies.

Major emphasis areas include the Naval Integrated Tactical Environmental System Next Generation (NITES-Next) and the METOC Data Acquisition, the METOC Data Assimilation & Modeling, the Precise Timing and Astrometry, the Fleet Synthetic Training, the Tactical Environmental Support, Decision Support Products & Dissemination, the Earth System Prediction Capability projects, and the Remote Sensing Capability Development.

Due to the number of efforts in this PE, the programs described herein are representative of the work included in this PE.

B. Program Change Summary ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	48.365	29.747	33.642	-	33.642
Current President's Budget	47.422	29.747	32.643	2.400	35.043
Total Adjustments	-0.943	0.000	-0.999	2.400	1.401
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.943	0.000			
• Program Adjustments	0.000	0.000	-0.344	-	-0.344
• Rate/Misc Adjustments	0.000	0.000	-0.655	2.400	1.745

Change Summary Explanation

The FY2020 funding request for project 2341 was reduced by $0.58 million to account for the availability of prior year execution balances. Funding increases for project 2341 are for the development of automated mission planning and route selection aids in support of TRITON MQ-4C hazardous weather avoidance(Priority T-1a); allowing evaluation of the utility of SPIRE ionospheric data for modeling the ionosphere.

The FY2020 funding request for project 2342 was reduced by $1.685 million to account for the availability of prior year execution balances. Funding increases for project 2342 are for the global Navy Earth System Model as it transitions from Initial Operational Capability (IOC) to its Full Operational configuration and maturation of the Regional Arctic Prediction System and the Navy's Environmental Prediction sysTem Using the NUMA corE (NEPTUNE) next generation dynamic core.

The FY2020 funding request for project 2344 was reduced by $0.479 million to account for the availability of prior year execution balances

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603207N / *Air/Ocean Tactical Applications*	Project (Number/Name) 2341 / *METOC Data Acquisition*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
2341: *METOC Data Acquisition*	172.047	5.276	3.471	4.662	2.400	7.062	6.089	6.181	7.858	8.016	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The major work of the Meteorology and Oceanography (METOC) Data Acquisition Project is to provide future mission capabilities to warfighters allowing them to detect and monitor the conditions of the physical environment throughout the entire battlespace. The most promising new sensor technologies (including unmanned vehicles, tactical sensor exploitation, in-situ sensors) are transitioned from the government's and commercial industry's technology base. These new sensor technologies are demonstrated, validated and integrated into operational programs for warfighters. These new sensor capabilities provide timely and accurate METOC data to operational and tactical commanders. METOC data requirements have evolved with emphasis on naval warfare shifting to littoral and deep strike battlespace. The need to accurately characterize dynamic conditions are crucial in planning and executing warfare operations and effectively allocating force weapon and sensor systems. Routinely available data sources, such as climatology, oceanographic and meteorological numerical models are necessary but not sufficient to support the littoral and deep strike regions. Operational sensors are deployed great distances from the target area of interest. The challenge is to collect and disseminate METOC data in variable and dynamic littoral environmental conditions or in denied, remote or inaccessible areas over extended periods of time.

This project: 1) provides the means to rapidly and automatically acquire a broad array of METOC data using off-board and on-board sensors; 2) provides an on-scene assessment capability for the tactical commander; 3) provides the tactical commander with real-time METOC data and products for operational use; 4) demonstrates and validates the use of tactical workstations and desktop computers for processing and display of METOC data and products; 5) demonstrates and validates techniques which employ data compression, connectivity and interface technologies to obtain, store, process, distribute and display these METOC data and products; 6) develops new charting and bathymetric survey techniques necessary to reduce the existing shortfall in coastal hydrographic survey requirements; 7) develops an expanded database for predictive METOC models in areas of interest; and 8) supports the development of radar weather using through-the-sensor techniques. Major emphasis area Tactical Oceanographic Capabilities project.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Meteorological and Oceanographic (METOC) Data Acquisition	5.276	3.471	4.662	2.400	7.062
Articles:	-	-	-	-	-
Description: Efforts falling within the Meteorology and Oceanography (METOC) Collections Project provide future scientific and technological warfighting capabilities that detect and continuously monitor environmental (atmospheric, sea surface, oceanographic and seabed) conditions throughout the battlespace. The Navy's mission continues to require focus on blue-water operations, littoral and deep-strike (inland) battlespaces. Each of these operating areas (and the transitions between them) has its own dynamic and complex environmental characteristics and behaviors that require modifying METOC Collections and associated sensing strategies					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 2341 / *METOC Data Acquisition*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
and methodologies. Without reliable characterization of ocean and atmosphere in these operating areas, the Navy risks ineffective allocation and employment of warfighters and weapon systems, and the sensors that fully enable them. Fleet Naval METOC has updated the definition and structure of the METOC program along the lines of operational mission needs. This update focuses on the operational characteristics of Tasking, Collection, Processing, Exploitation, and Dissemination (TCPED) of METOC data and information. Identified efforts supporting METOC are realigned to projects and activities that align to the TCPED updated program structure. ***FY 2019 Plans:*** Continue all efforts of FY18 less those noted as completed. The effort also plans to focus on each category as described below: - Continue: Implement a "rapid innovation" weather-ocean capability that emphasizes observing systems. - Continue: Assimilate satellite optical data streams into the Coupled Ocean-Atmosphere Mesoscale Prediction System ocean model component. - Complete: Test, validate, and transition new components for data assimilation capabilities for global and mesoscale atmospheric models that address multiple scales. - Complete: Supplement efforts in a FY17-19 Rapid Transition Project to solve the overall Forward ocean data assimilation problem and integrate results into Anti-submarine Warfare Tactical Decision Aids. - Complete: Provide technical support to passive microwave and weather satellite follow-on remote sensing projects for all phases of pre- and post-launch sensor calibration, algorithm validation, data exploitation, dissemination and quality control of critical synoptic atmospheric and geophysical environmental data products. - Complete: Develop and test a Navy Coupled Ocean Data Assimilation-based capability for forward platforms to assimilate collected oceanographic data into an oceanographic model field in an acoustically consistent way. - Complete: Develop, validate and transition bias correction for extended-range forecasts in the global and regional coupled systems, using information from the satellite observations to measure the bias and guide the correction. - Complete: Collect in-situ transmission loss from tactical platforms in support of a Low Frequency Bottom Loss database. - Complete: Develop a methodology for creating a bottom backscattering database in Deep Water, i.e., water depths deeper than the continental rise, and apply the methodology to regions of operational interest to create a Prototype Deep Ocean Bottom Scattering database.					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 2341 / *METOC Data Acquisition*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
- Complete: Characterize/assess biological scattering and attenuation at tactical frequencies, known to have a significant impact on mid-frequency active sonar systems.					
FY 2020 Base Plans: Continue with implementing a "rapid innovation" weather-ocean capability that emphasizes observing systems. Continue assimilating satellite optical data streams into the Coupled Ocean-Atmosphere Mesoscale Prediction System ocean model component. The effort will also focus on each category as described below: Forward-based Navy coupled ocean data assimilation (NCODA). Emphasize Compression Integration, Integration of NCODA-Forward processing and algorithms, Modifications to bathythermograph (BT) Manager, integration of the BT-SSP (sound speed profile) and BT Manager modules, New Data Visualization. Develop automated mission planning and route selection aids in support of TRITON MQ-4C hazardous weather avoidance (Priority T-1a). Weather variables will include probability of icing, turbulence, thunderstorms, and cross-winds at air base for both takeoff and landing. Increases automation of Aerographers Mate (AG) mission planning, route selection, and weather briefing materials that will improve C2 and vehicle autonomy with greater platform-to-operator (AG) ratio, and automated planning (Priority T-1b). Improves platform-to-operator ratio supports guidance that many METOC billets supporting TRITON will not be renewed in FY19. Towed Array Ballasting System Construct prototype and integrate onto operational platform. Acoustic Towed Array Miniaturization Construct "build 2, 45mm footprint" into three prototype arrays with 3-different node spacings. Signal Processing Fully implement R-Theta algorithm. Remote Sea-Test Demonstrate technology in ONR-sponsored West Pacific sea-test. The capability delivered will be to provide operational high-resolution satellite visible/infrared (Vis/IR) and passive microwave (PMW) sea ice concentration retrievals for improved sea ice forecasts and safe navigation in the Arctic. Users will be sea ice forecasters and personnel operating in the ice environment either surface or subsurface.					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 2341 / *METOC Data Acquisition*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
The utility of SPIRE ionospheric data for modeling the ionosphere was evaluated in two parts split across fiscal year FY18 and FY19. In part 2 (FY19), a representative sample of SPIRE data (which includes at a minimum two contiguous days of data) acquired and ingested into an ionospheric data assimilative model. The performance of the model runs with SPIRE data will be compared to the performance of model runs without SPIRE data to demonstrate the overall impact of the data. Since it is anticipated that the volume of SPIRE data will grow substantially, the impact of the SPIRE data will be measured as a function of the density of SPIRE data samples in the vicinity of the independent ionospheric observations. This will provide for an estimation of the utility of larger constellations of SPIRE satellites with higher sample densities than the representative SPIRE data used in this study. Conclude the effort to Collect in-situ transmission loss (TL) from tactical platforms in support of Naval Oceanographic Office's (NAVOCEANO's) Low Frequency Bottom Loss (LFBL) database that developed efficient algorithm to perform inversion of TL data to produce geo-acoustic parameters of the local environment. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Funding increases from FY 2019 to FY 2020 for the development of automated mission planning and route selection aids in support of TRITON MQ-4C hazardous weather avoidance(Priority T-1a); allowing evaluation of the utility of SPIRE ionospheric data for modeling the ionosphere. The FY 2020 funding request for project 2341 was reduced by $0.58 million to account for the availability of prior year execution balances.					
Accomplishments/Planned Programs Subtotals	5.276	3.471	4.662	2.400	7.062

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• RDTEN/0604218N/2345: *FLEET METOC EQUIPMENT*	0.755	0.672	0.217	-	0.217	0.620	0.577	0.487	0.497	Continuing	Continuing

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 2341 / *METOC Data Acquisition*

D. Acquisition Strategy

Acquisition, management and contracting strategies are to support the Meteorological and Oceanographic (METOC) Data Acquisition Project to develop, demonstrate, and validate METOC data collection methods and sensors, and to evolve the ability to provide timely and accurate METOC data and products to the Tactical Commander, all with management oversight by the Navy.

E. Performance Metrics

Goal: Develop techniques and tools to acquire Meteorological and Oceanographic (METOC) data to improve the accuracy of global and regional scale meteorological and oceanographic forecast models. Wherever applicable, and based on favorable Science & Technology (S&T) assessments, tasks shall leverage or transition existing Small Business Innovative Research and/or RDT&E Budget Activity (BA) 2 and 3 S&T work. Metric -- Tasks will address no less than 75% of applicable capability gaps and requirements.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 2341 / *METOC Data Acquisition*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
METOC (DATA) Collections	WR	NRL : Washington, DC	80.932	0.432	Nov 2017	0.431	Nov 2018	2.510	Dec 2019	-		2.510	Continuing	Continuing	Continuing
METOC Future Mission Capabilities	WR	SSC PAC : California	23.063	0.000		0.000		0.050	Oct 2019	-		0.050	Continuing	Continuing	Continuing
METOC Future Mission Capabilities	Various	Various : Various	45.516	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Tactical Oceanography Capabilities / Undersea Warfare (TOC USW)	Various	Various : Various	5.764	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Littoral Battlespace Sensing - Autonomous Undersea Vehicle	Various	Various : Various	8.422	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Tactical Oceanography Capabilities / Undersea Warfare (TOC USW)	WR	NSWC : Bethesda, MD	1.193	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
METOC Future Mission Capabilities	C/FP	APPLIED SCIENCE ASSOCIATED : RHODE ISLAND	0.226	0.000		0.000		0.200	Oct 2019	-		0.200	Continuing	Continuing	Continuing
METOC (DATA) Collections	C/FP	University of Washington : Seattle, WA	0.000	0.050	Nov 2017	0.470	Nov 2018	0.102	Oct 2019	-		0.102	Continuing	Continuing	Continuing
METOC (DATA) Collections	C/FP	METRON : Reston, VA	0.000	0.314	Nov 2017	0.110	Dec 2018	0.300	Dec 2019	-		0.300	Continuing	Continuing	Continuing
METOC Future Mission Capabilities	C/FP	SAIC : Virginia	1.781	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
METOC Future Mission Capabilities	C/FP	CSC : Virginia	0.731	0.000		0.000		0.700	Dec 2019	-		0.700	Continuing	Continuing	Continuing
METOC (DATA) Collections	WR	NRL : Monterry,CA Stennis Space Center, MS	0.000	1.689	Nov 2017	0.915	Dec 2018	0.300	Dec 2019	-		0.300	Continuing	Continuing	Continuing
METOC Future Mission Capabilities	C/CPFF	GDIT : Virginia	0.138	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603207N / *Air/Ocean Tactical Applications*	Project (Number/Name) 2341 / *METOC Data Acquisition*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
METOC (DATA) Collections	C/FP	Penn State University : PA	0.000	2.791	Nov 2017	1.545	Dec 2018	0.000		-		0.000	Continuing	Continuing	Continuing
		Subtotal	167.766	5.276		3.471		4.162		-		4.162	Continuing	Continuing	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
METOC Future Mission Capabilities	C/CPIF	Various : Various	2.672	0.000		0.000		0.000		2.400	Oct 2019	2.400	0.000	5.072	-
Littoral Battlespace Sensing - Autonomous Undersea Vehicle	C/FP	SAIC : Virginia	0.600	0.000		0.000		0.000		-		0.000	0.000	0.600	-
Tactical Oceanography Capabilities / Undersea Warfare (TOC USW)	WR	SSC PAC : California	0.247	0.000		0.000		0.000		-		0.000	0.000	0.247	-
METOC Future Mission Capabilities	C/CPFF	PSS/BAH : California	0.066	0.000		0.000		0.000		-		0.000	0.000	0.066	-
		Subtotal	3.585	0.000		0.000		0.000		2.400		2.400	0.000	5.985	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
METOC Future Mission Capabilities	Various	Various : Various	0.200	0.000		0.000		0.200	Nov 2019	-		0.200	0.000	0.400	-
		Subtotal	0.200	0.000		0.000		0.200		-		0.200	0.000	0.400	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603207N / *Air/Ocean Tactical Applications*	Project (Number/Name) 2341 / *METOC Data Acquisition*	

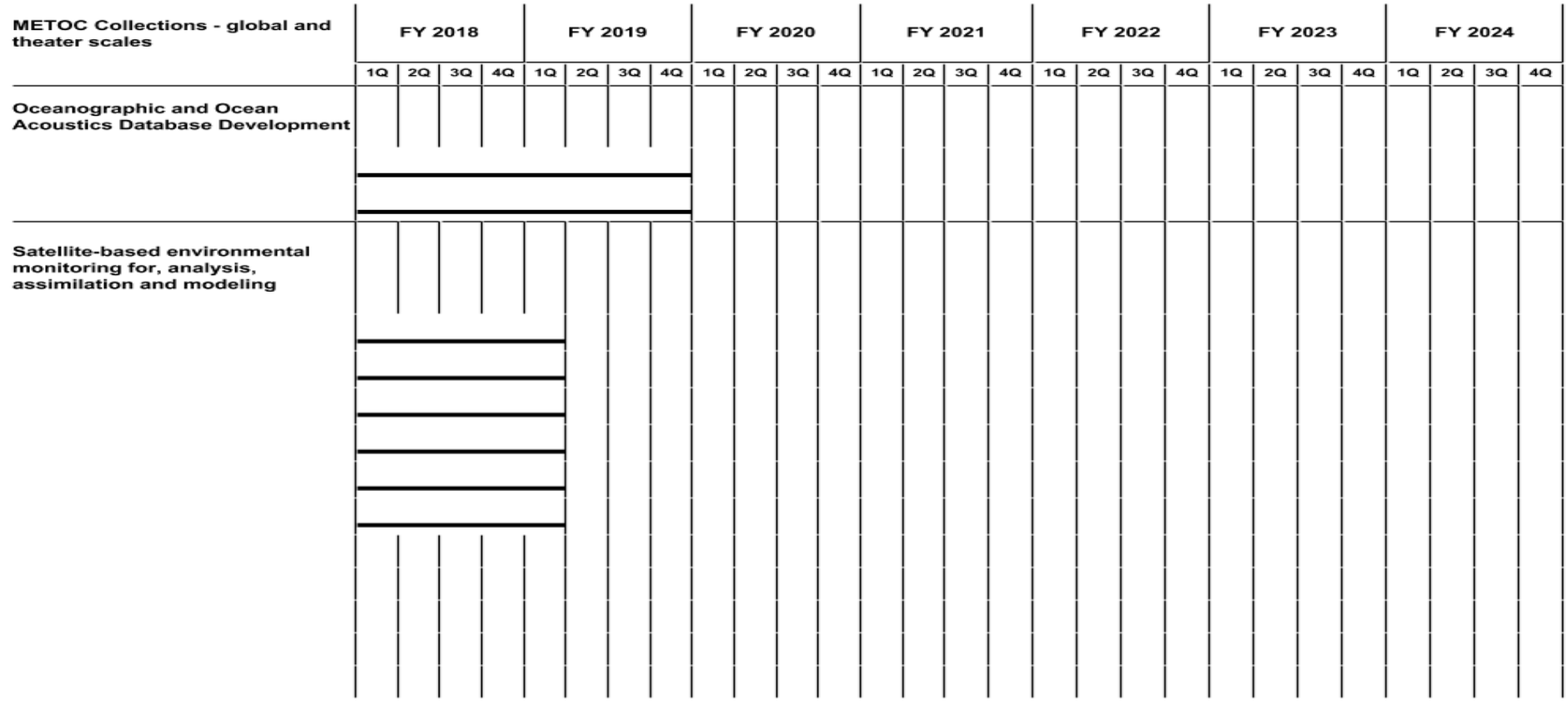
Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Acquisition Workforce	Various	Not Specified : Not Specified	0.096	0.000		0.000		0.050	Oct 2019	-		0.050	0.000	0.146	-
METOC Future Mission Capabilities Management Support	C/FP	BAH : Virginia	0.400	0.000		0.000		0.250	Oct 2019	-		0.250	0.000	0.650	-
		Subtotal	0.496	0.000		0.000		0.300		-		0.300	0.000	0.796	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	172.047	5.276		3.471		4.662		2.400		7.062	Continuing	Continuing	N/A

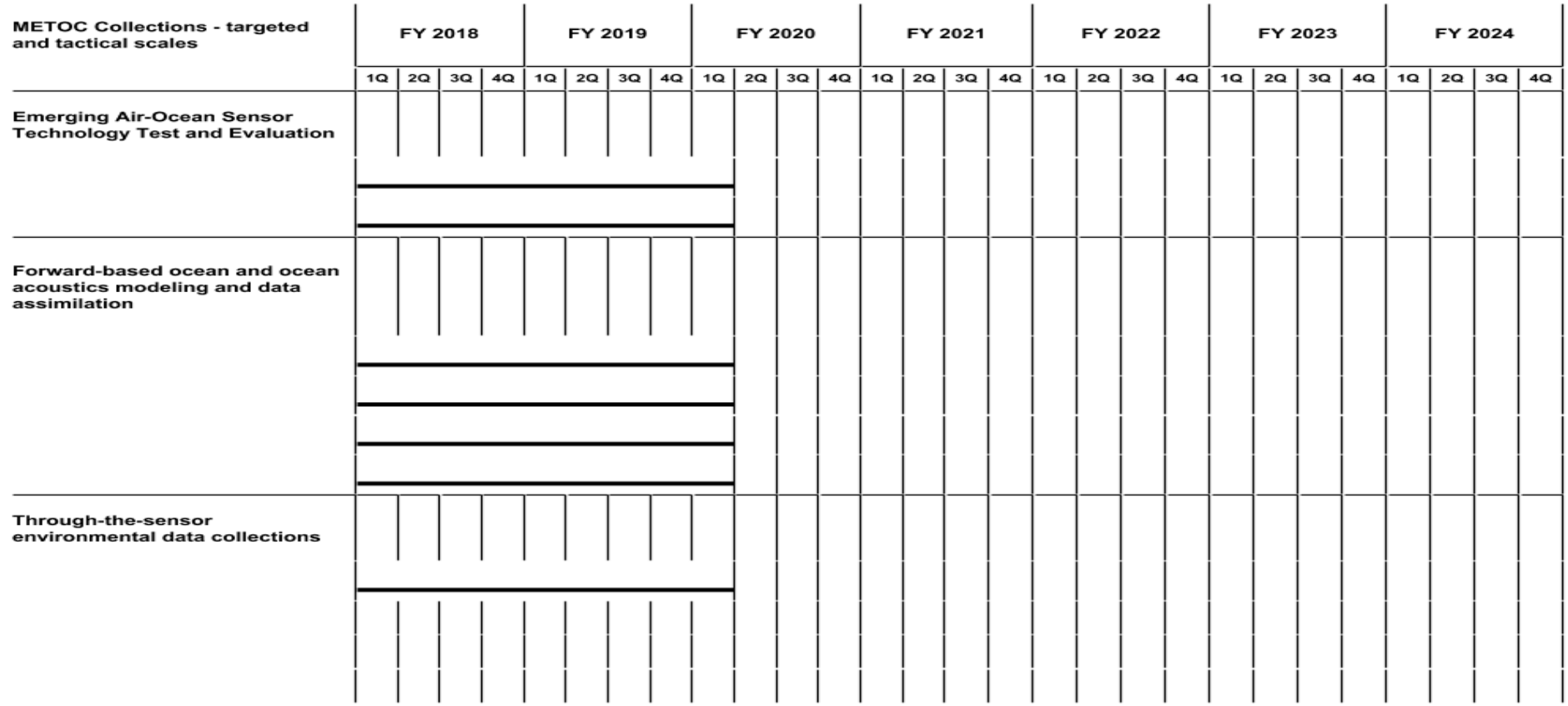
Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 2341 / *METOC Data Acquisition*



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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 2341 / *METOC Data Acquisition*



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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 2341 / *METOC Data Acquisition*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
METOC Collections - global and theater scales				
Oceanographic and Ocean Acoustics Database Development: Deep Ocean Bottom Backscattering Database -- ARL-PSU	1	2018	4	2019
Oceanographic and Ocean Acoustics Database Development: Deep Ocean Bottom Backscattering Database -- NPS	1	2018	4	2019
Oceanographic and Ocean Acoustics Database Development: "Use of Mobile Acoustic Source for In-situ Transmission	1	2018	1	2019
Satellite-based environmental monitoring for, analysis, assimilation and modeling: Atmospheric Data Assimilation -- NRL-MRY	1	2018	1	2019
Satellite-based environmental monitoring for, analysis, assimilation and modeling: "DoD MW Sensors Special Sensor Microwave Imager Sounder (SSMIS),	1	2018	1	2019
Satellite-based environmental monitoring for, analysis, assimilation and modeling: Operational Satellite Sea Ice Products -- NRL-DC	1	2018	1	2019
Satellite-based environmental monitoring for, analysis, assimilation and modeling: Satellite Optical Data for Coupled Ocean-Atmosphere Models -- NRL-SSC	1	2018	1	2019
Satellite-based environmental monitoring for, analysis, assimilation and modeling: RTP: Flux Correction for Coupled System Extended Forecasts using Satellite Observations -- NRL-MRY	1	2018	1	2019
Satellite-based environmental monitoring for, analysis, assimilation and modeling: RTP: Flux Correction for Coupled System Extended Forecasts using Satellite Observations -- NRL-SSC	1	2018	1	2019
METOC Collections - targeted and tactical scales				
Emerging Air-Ocean Sensor Technology Test and Evaluation: ESTTE - LBS-G AN (Ambient Noise) -- SSC-PAC	1	2018	1	2020

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
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	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Emerging Air-Ocean Sensor Technology Test and Evaluation: ESTTE - SHARC RFR -- Various	1	2018	1	2020
Forward-based ocean and ocean acoustics modeling and data assimilation: NCODA-Forward Collaborative Integration -- METRON Scientific Solutions, Inc.	1	2018	1	2020
Forward-based ocean and ocean acoustics modeling and data assimilation: NCODA-Forward Collaborative Integration -- NRL-DC	1	2018	1	2020
Forward-based ocean and ocean acoustics modeling and data assimilation: NCODA-Forward Collaborative Integration -- NSWCCD / METRON	1	2018	1	2020
Forward-based ocean and ocean acoustics modeling and data assimilation: RTP: An NCODA-based Capability for Forward Ocean Data Assimilation -- NRL-SSC	1	2018	1	2020
Through-the-sensor environmental data collections: P-8 Environmental Data Sensing -- SSC-LANT	1	2018	1	2020

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603207N / *Air/Ocean Tactical Applications*	Project (Number/Name) 2342 / *METOC Data Assimilation and Mod*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
2342: *METOC Data Assimilation and Mod*	251.206	20.959	17.441	21.168	-	21.168	22.355	22.382	22.004	22.438	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Battlespace Data Assimilation and Prediction Project (2342) enables the future warfighter to leverage observed environmental data gathered under Project 2341 (METOC Data Acquisition) by assimilating data into and fusing them with sophisticated high-resolution (spatial and temporal) assessment and prediction models made possible by high-performance computing. These models gain increasing importance as weapons and sensors grow in sophistication and complexity, making them all the more sensitive to the effects of the natural environment. Meteorology and Oceanography (METOC) Processing enables full understanding of the limitations and constraints imposed by ocean and atmosphere, in space and time, thus quantifying and minimizing their impact on weapons, sensors, and mission. However, METOC Processing itself is limited by the temporal and spatial resolutions at which data are collected and numerically analyzed and predicted. Thus Projects 2341 and 2342 must remain aggressive in delivering higher and higher resolutions, demanding greater and greater computational and database capacities. METOC Processing efforts must also rise to the challenge of assimilating smaller-scale phenomena, particularly in the littorals, and predicting their spatial and temporal effects, as stated by Fleet and Force Commanders who require remote autonomous, clandestine, littoral battlespace sensing in near-shore areas to enable Sea Shield & Sea Basing. This next step in the Information Warfare (IW) Tasking, Collection, Processing, Exploitation and Dissemination (TCPED) continuum, METOC Processing, is critical to fully characterize the physical battlespace environment in real-time and in predictive/forecasting modes, and gives the warfighter a decisive advantage in the complex blue-water, littoral and deep-strike battlespaces.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Battlespace Data Assimilation and Prediction	10.314	8.443	21.168	0.000	21.168
Articles:	-	-	-	-	-
Description: The Battlespace Data Assimilation and Prediction Project (2342) enables the future warfighter to leverage observed environmental data gathered under Project 2341 (METOC Collections) by assimilating data into and fusing them with sophisticated high-resolution (spatial and temporal) assessment and prediction models made possible by high-performance computing. These models gain increasing importance as weapons and sensors grow in sophistication and complexity, making them all the more sensitive to the effects of the natural environment. METOC Processing enables full understanding of the limitations and constraints imposed by ocean and atmosphere, in space and time, thus quantifying and minimizing their impact on weapons, sensors and mission. However, METOC Processing itself is limited by the temporal and spatial resolutions at which data are collected and numerically analyzed and predicted. Thus Projects 2341 and 2342 must remain aggressive in delivering higher and higher resolutions, demanding greater and greater computational and database capacities.					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 2342 / *METOC Data Assimilation and Mod*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
METOC Processing efforts must also rise to the challenge of assimilating smaller-scale phenomena, particularly in the littorals, and predicting their spatial and temporal effects, as stated by Fleet and Force Commanders who require remote autonomous, clandestine, littoral battlespace sensing in near-shore areas to enable Sea Shield & Sea Basing. This next step in the TCPED continuum, METOC Processing, is critical to fully characterize the physical battlespace environment in real-time and in predictive / forecasting modes, and gives the warfighter a decisive advantage in the complex blue-water, littoral and deep-strike battlespaces. ***FY 2019 Plans:*** - Complete: Advance the use of satellite observations targeting battlespace environment characterization, supporting global and mesoscale models currently at resolutions of 5-30km horizontally; with vertical extents from the surface and boundary layer, through the models depth which reaches up to ~80km. - Complete: Advance the capability and forecast skills of the Navy's global numerical weather prediction system NAVGEM and to transition improvements and new technologies into operational NAVGEM. - Complete: Work toward transition of emerging short term (5 day) high-resolution analysis and forecast capabilities to Fleet Numerical Meteorology and Oceanography Center (FNMOC) that address small-scale (meso- and micro-scale) atmospheric, coupled (atmospheric-land-ocean-wave), tropical cyclone, and mesoscale ensemble prediction using the current small-scale Coupled Ocean/Atmosphere Mesoscale Prediction System (COAMPS?). - Complete: Deliver capability to rapidly relocate and exercise a high-resolution coupled air-ocean-wave environmental assimilation and prediction system. - Complete: Improve the passive acoustic model, NSPE, and uBand and provide ongoing NSPE and uBand support to operational community, with special focus on guiding implementation within the Ocean Observing Systems (OOS) Performance Prediction & Mitigation project. - Complete: Work toward transition of product algorithms to improve environmental characterization and tropical cyclone structural and intensity analysis through sensor data visualization, customized imagery, automated sensor data fusion, and automated image analysis. - Complete: Take advantage of real-time spectrum operations (RTSO)-based through-the-sensor (TTS) observations to improve the characterization of the electromagnetic environment. - Complete: Work toward transition of a high resolution global weather prediction system NAVGEM with resolution of approximately T1023L100 (13 km horizontal resolution and 100 vertical layers) that is highly competitive in predictive skill with other operational global NWP systems.					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 2342 / *METOC Data Assimilation and Mod*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
- Complete: Work toward transition of a probabilistic tropical cyclone forecasting system, which represents the key uncertainties associated with initial and boundary conditions, based on a COAMPS-TC ensemble and fully integrated into the COAMPS-OS. - Complete: Work toward delivery of a global Naval ocean/ice nowcasting and forecasting capability based on the Hybrid Coordinate Ocean Model (HYCOM) two-way coupled to the Community Ice Code (CICE) and using the Navy Coupled Ocean Data Assimilation (NCODA) that runs daily at production centers. - Complete: Work toward delivery of an in-situ submarine (BQH-9) capability to produce an estimate of the seabed bottom loss (BL), and deliver data to NAVO for inclusion in the HFBL database. - Complete: Improve the accuracy of Tactical Decision Aids (TDA) acoustic performance calculations in support of surface ship operations by reconciling Fleet sonar data with the Ocean-Atmosphere Master Library (OAML) models and databases, and also starts to test candidate parameterizations for the high-frequency bottom loss (HFBL) database. - Complete: Work toward implementation of new remote sensing data assimilation and determine impacts on NAAPS (aerosol) forecast skill and deliver code to FNMOC. - Complete: Post-process the first moment of NUOPC ensemble forecasts of low-level temperature and humidity, with comparative analysis of EM/EO conditions in raw and bias-corrected grids. - Complete: Prepare the Navy Aerosol Analysis and Prediction System (NAAPS) to run using fields from NAVGEM v2.0. - Complete: Leverage an existing prototype of a probabilistic aerosol forecasting system that has been ported to the Navy DoD Supercomputing Resource Center (DSRC) computers and continue work towards developing it as a quasi- operational system. - Complete: Develop an improved boundary roughness reflection loss (or forward loss) model that will improve accuracy in propagation and reverberation modeling with particular focus on mid frequencies (1-3 kHz). - Continue: Reduce NAVGEM's error in the calculations of the EAAMF, which are provided to the Naval Observatory for calculation of the changes in the length of day (LOD). - Complete: Improve the hydrodynamic and wave prediction capability of the Coupled Atmosphere-Ocean Mesoscale Prediction System (COAMPS) for the coastal ocean (shelf- break to estuarine and surf zone) environment. - Complete: Improve short-term (7day) forecast skill of global and regional scale ocean and coupled numerical weather prediction by transitioning capabilities to derive, assimilate, and evaluate the impact of assimilating sea surface temperature (SST) and ancillary data from satellite retrievals. - Complete: Develop methodologies for retrieval, quality control, and gridded analysis of remotely sensed satellite observations for measurement of latent, sensible, radiation and momentum fluxes.					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 2342 / *METOC Data Assimilation and Mod*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
- Complete: Provide mission planners and operators with operationally relevant ocean color data and products. - Complete: Improve short term (5-7 day) forecast skill of sea ice predictions by assimilating current and future satellite derived ice products into the Navy's operational ice forecast systems. - Complete: Migrate the OAML library, administrative, and management functions to a cloud-based approach. - Complete: Improve short-term (7 day) forecast skill of global and regional scale ocean and coupled NWP by transitioning capabilities to NAVOCEANO and other operational centers to assimilate satellite and in situ observations in a manner that realistically projects high resolution altimeter and other surface information into the sparsely sampled ocean interior. - Complete: Provide operational multi-sensor high-resolution satellite visible/near-infrared/infrared (Vis/NIR/IR) and passive microwave (PMW) sea ice concentration retrievals for improved sea ice forecasts and safe navigation in both the Arctic and Antarctic. - Complete: Leverage swell data from the Sentinel-1A satellite to generate a monthly climatology of ocean swell, useful as a first guess of the expected climate in mission-critical regions determined in consultation with Navy forecasters; also leverage output from the global wave model run in hind-cast mode to augment the ocean swell database. - Complete: Work toward transition of a 4DVar (4-Dimensional Variance) data assimilation capability with highly nonlinear ocean circulation regimes such as western boundary currents; test 4DVar with very high resolution configurations of regional domains; estimate an analysis error covariance; initialize an ensemble forecast. - Complete: Improve the state of the art of tropical cyclone (TC) forecast guidance and tactical applications for operational decision makers.					
FY 2020 Base Plans: The effort plans to focus on each category as described below : Complete: Reduce Navy Global Environmental Model's (NAVGEM) error in the calculations of the Effective Atmospheric Angular Momentum Functions (EAAMF), which are provided to the Naval Observatory for calculation of the changes in the length of day (LOD). Complete: Naval Research Laboratory (NRL) will transition the 3-grid WaveWatch3 real-time system to replace two existing operational global WaveWatch3 systems (one used now by Fleet Numerical Meteorology and Oceanography Center (FNMOC)-Monterey (MRY) and the other used now by FNMOC-John C. Stennis Space Center (SSC)). Transition will include a Validation Test Report. The majority of the required labor is associated with preparation of this report. NRL will also assist FNMOC with Operational Test (OPTEST). Complete: Leverage a coupled ocean and atmospheric modeling and assimilation system based on Coupled Ocean/Atmosphere Mesoscale Prediction System (COAMPS), Navy Coastal Ocean Model (NCOM) and a					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 2342 / *METOC Data Assimilation and Mod*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
range-dependent acoustic model (RAM). Operationalize the forward coupled ocean-acoustic system at Naval Oceanographic Office (NAVO)/FNMOC which will provide a number of advantages over current capabilities. Reduce runtime for acoustic simulations, reduce error due to the coupling of the models, reduce manpower due to the automation, and provide uncertainty estimates via uband. Complete: Develop and transition to the Fleet Numerical Meteorology and Oceanography Center (FNMOC) the Navy Ionosphere Model for Operations (NIMO), which consists of a physics-based model of the ionosphere and a data assimilation capability that will provide a real-time electron density specification on a global grid with the ability to specify high-resolution configurable regional grids. NIMO will also provide a 24-hour forecast of electron density climatology. The Ionospheric Data Assimilation 4-D (IDA4D) will be coupled with the Navy's Highly Integrated Thermosphere/Ionosphere Demonstration System (Navy-HITIDES) to form NIMO. NIMO and associated data preprocessors will be optimized to run efficiently on the Navy DoD Supercomputing Resource Centers (DSRC). NIMO will form the basis of a future Navy operational ionospheric forecasting system, running at multiple resolutions and fully coupled to operational atmospheric forecast models. Complete: Develop, test, and transition for operational implementation a strongly coupled ocean-atmosphere 4D-Var assimilation system for COAMPS. The new system will provide a unique capability that enables the observations from the atmosphere (ocean) to directly improve the analysis/forecast in the ocean (atmosphere). The US Navy will own the superior capability of accurately and efficiently characterizing the battlespace environment at the ocean-atmosphere interface once the proposed system becomes operational. The coupled DA system will be demonstrated in COAMPS-OS (on-scene) and verified with propagation products as well as traditional metrics. Complete: Substantially increase the skill of the COAMPS-TC (tropical cyclone) model in the prediction of rapid intensification (RI) events and inner-core structure (6.4), and to elucidate the nature of the relationship between inner-core structure and TC intensification prediction and predictability (6.2). Our approach includes (1) Model development Resolution increases and physics improvements for COAMPS-TC, (2) Data assimilation New capabilities for initializing COAMPS-TC, (3) TC structure guidance development structure assessment and prediction, (4) TC forecast post-processing exploiting statistically-corrected RI forecasts for increased skill. Through a synergistic combination of advancements to the COAMPS-TC model, the data assimilation system used to initialize the model, and the aids utilized by the operational warning centers to estimate TC inner-core structure characteristics (subsequently fed into the COAMPS-TC initial state), we aim to address the #1 research priority of both Joint Typhoon Warning Center (JTWC) and National Hurricane Center (NHC) Rapid intensification prediction. Complete: Develop and transition a global ensemble aerosol prediction system, including data assimilation, to FNMOC. This system will provide a new probabilistic aerosol prediction and product capability for enhanced					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 2342 / *METOC Data Assimilation and Mod*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
aerosol data assimilation and downstream Electro-Optical (EO) attenuation modeling. This work leverages BA2 (budget activity 2) efforts that helped optimize the use of ensemble data assimilation methods for aerosol prediction. The Navy Aerosol Analysis Prediction System (ENAAPS) system and Data Assimilation Research Testbed (DART) were ported and tested on Navy DSRC machines as a near-real-time (NRT) system and implemented using Cylc (Cylc [pronounced silk] is a workflow engine for cycling systems - it orchestrates distributed suites of interdependent cycling tasks that may continue to run indefinitely). Under the Rapid Transition Project (RTP), the system will be thoroughly tested for NRT applications with a focus on how the ensemble performs in the forecast, including the ensemble mean and spread. Means for improving system performance will also be tested and implemented as part of NRT ENAAPS, including bias correction, new observations for assimilation, and evaluation of the NAVGEM ensemble impact on ENAAPS forecasts. Complete: Develop and test a Navy Coupled Ocean Data Assimilation (NCODA) -based capability for forward platforms (NCODA-forward) to assimilate collected oceanographic data (e.g. eXpendable BathyThermographs (XBTs), glider, etc./temperature, salinity, etc.) into an oceanographic model field (NCOM or Hybrid Coordinate Ocean Model (HYCOM)) in an acoustically consistent way for operational and tactical analysis and predictions. The proposed capability will provide an estimate of the uncertainty associated with the assimilation process that allows the user to know when the process is reliable and flag cases where the model data cannot be appropriately reconciled with respect to the observations. Production of such uncertainty fields will be used to derive sampling plans to confirm or exclude suspected outliers and reduce excessive uncertainty. Supporting capabilities must also be developed as part of the system to improve compression algorithms to allow more data (temperature, salinity, wind, model error estimates) to be sent to forward platforms and to provide capabilities to assess acoustic integrity of the assimilation process for frequencies of interest. Complete: Implement middle atmosphere processes into a fully coupled global atmosphere/wave/ocean/ land/ice prediction system providing daily predictions out to 16 days, weekly predictions out to 32 days and weekly ensemble predictions to 90 days. Predictions will provide environmental information to meet Navy and Department of Defense (DoD) operations and planning needs throughout the globe from undersea to the upper atmosphere and from the tropics to the poles. The system will be implemented on Navy operational computer systems, and the necessary processing infrastructure will be put in place to provide products for Navy fleet user consumption. Develop an improved algorithm for estimating near-shore bathymetry from Synthetic Aperture Radar (SAR) imagery that would be incorporated into NAVO's operational implementation (using future Commander Naval Meteorology and Oceanography Command (CNMOC) funding). Algorithm improvements have been identified under previous work funded by NRL and CNMOC, and shown to perform significantly better than the existing operational capability on a small test set. The goal of this program is to incorporate those improvements into					

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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
a single system suitable for transition and test it on a larger range of operational data. Specific tasks of this program, based on previously developed improvements, would be (1) incorporate a dynamic box capability based on instantaneous wave parameters; (2) incorporate an automated wave group amplitude metric to determine when to use bathymetry estimates within small spatial extents; (3) determine source and mitigation of wave noise in new "Undispersion" algorithm; (4) perform validation studies using existing test sets; and (5) write report for NAVO implementation. Test assimilation of updated Naval Oceanographic Office (NAVOCEANO) derived swath ice concentration from NOAA-20 VIIRS and AMSR2 into the GOFS 3.1 system. Investigate ability to assimilate sea ice thickness observations and transition into NCODA system. Test sea ice thickness assimilation in GOFS 3.1 and GOFS 3.5 systems. Establish a geologically consistent physics-based seafloor prediction capability coupled with existing operational oceanic and atmospheric prediction systems. This seafloor prediction capability, based on the NRLs Global Predictive Seafloor Model (GPSM) foundation, will produce a geologically and geo-acoustically consistent replacement for the current high-frequency bottom loss (HFBL) values at any point on the seafloor for transition to NAVO. Characterize forecast dropouts, based on 500mb Anomaly Correlation (AC) methods, in the Navy Global Environmental Model (NAVGEM), including forecast statistics, common properties and causes. Develop and implement a fully coupled global atmosphere/wave/ocean/land/ice prediction system providing daily high- resolution deterministic 16-day and lower-resolution ensemble predictions at longer lead times. Optimize scripting for the deterministic and ensemble systems to better manage cycling tasks for model components and data assimilation, resulting in increased modularity, better parallelism, easier debugging through error trapping, and greater reuse. Develop an ensemble prediction system for a fully coupled global atmosphere/wave/ ocean/land/sea ice coupled model for predictions out to 90 days. Develop a fully- coupled data assimilation capability to optimize the use of the observations across fluid interfaces, eliminating the transient inconsistences, increasing forecast skill and representing coupled uncertainties. Evaluate and demonstrate the capabilities of a new generation of atmospheric dynamical systems that allow for variable resolution on the sphere, are highly scalable, and eliminate or mitigate spurious problems near the poles of the globe. Further develop, validate, and evaluate the capability of a fully coupled regional Arctic prediction system. Develop, integrate, and test improvements to the computational performance of models within the Navy global coupled forecast system as well as the coupling infrastructure to ensure that operational partners will meet their production schedules using available computational resources. Improve capabilities for supporting long range Navy planning (lead times of one week and longer). Develop and transition for operational implementation a high resolution global weather prediction system NAVGEM with resolution of approximately T1023L100 (13 km horizontal resolution and 100 vertical layers) that is highly competitive in predictive skill with other operational					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
global numerical weather prediction (NWP) systems. Define, develop, and implement consistent quantitative skill metrics to assess the advancements in the Earth System Prediction Capability (ESPC), taking into account the applications and lead-times for which the ESPC environmental information will be used. Evaluate and validate multi-model extended-range forecasts produced from interagency projects such as the North American Multi-model Ensemble (NMME). Develop the NAVGEM global model to include inline aerosols to simulate aerosol life cycle and perform aerosol direct radiative heating of the atmosphere. Participate in the NMME by re-forecasting the global coupled (NAVGEM-HYCOM- Los Alamos sea ice model (CICE)) Navy ESPC model for years 1999 to 2015. Accelerate the rate of improvement in the US National ESPC and National Unified Operational Prediction Capability (NUOPC), focusing primarily on the current and future generation global modeling enterprise. Develop the NAVGEM global model to address middle atmosphere processes associated with sudden stratospheric warming and extended range prediction. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** FY 2020 increase is associated with increased investment in the global Navy Earth System Model as it transitions from Initial Operational Capability (IOC) to its Full Operational configuration. This includes development and transition of an improved weather model (NAVGEM 3.0) and a greatly improved ocean model (GOFS 4.0) aligned with Task Force Ocean priorities and investment. Additionally increased investment will be focused on maturation of the Regional Arctic Prediction System and the Navy's Environmental Prediction sysTem Using the NUMA corE (NEPTUNE) next generation dynamic core projected for operations by 2025. FY 2020 funding realigned within this project (2342) from Earth System Prediction Capability (ESPC) to Battlespace Data Assimilation and Prediction to synchronize ESPC modeling efforts with other non-ESPC modeling efforts under this project and to better align the modeling efforts for Air/Ocean Tactical Applications.					
Title: Earth System Prediction Capability (ESPC)	10.645	8.998	0.000	0.000	0.000
Articles:	-	-	-	-	-
Description: The Navy Earth System Prediction Capability (ESPC) program will provide a more accurate, longer range, global ocean and atmospheric forecast system for decision support to DoD Maritime Operations through the development of an integrated, coupled atmosphere, ocean, sea ice, land and near-space prediction system with improved deterministic and probabilistic skill over the current operational modeling suite. It will result in increased accuracy for lead times of 1-30 days as well as a new capability for accurate forecasts in the Arctic					

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Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 2342 / *METOC Data Assimilation and Mod*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
at all lead times. Additionally it will seek to develop more computationally efficient environmental prediction for emerging architectures and provide Navy Research and Development (R&D) support to the National ESPC. ***FY 2019 Plans:*** - Continue: Characterize forecast dropouts, based on 500mb Anomaly Correlation (AC) methods, in the Navy Global Environmental Model (NAVGEM), including forecast statistics, common properties and causes. - Continue: Develop and implement a fully coupled global atmosphere/wave/ocean/land/ice prediction system providing daily high- resolution deterministic 16-day and lower-resolution ensemble predictions at longer lead times. - Continue: Optimize scripting for the deterministic and ensemble systems to better manage cycling tasks for model components and data assimilation, resulting in increased modularity, better parallelism, easier debugging through error trapping, and greater reuse. - Continue: Develop an ensemble prediction system for a fully coupled global atmosphere / wave / ocean / land / sea ice coupled model for predictions out to 90 days. - Continue: Develop a fully- coupled data assimilation capability to optimize the use of the observations across fluid interfaces, eliminating the transient inconsistences, increasing forecast skill and representing coupled uncertainties. - Continue: Evaluate and demonstrate the capabilities of a new generation of atmospheric dynamical systems that allow for variable resolution on the sphere, are highly scalable, and eliminate or mitigate spurious problems near the poles of the globe. - Continue: Further develop, validate, and evaluate the capability of a fully coupled regional Arctic prediction system. - Continue: Develop, integrate, and test improvements to the computational performance of models within the Navy global coupled forecast system as well as the coupling infrastructure to ensure that operational partners will meet their production schedules using available computational resources. - Continue: Improve capabilities for supporting long range Navy planning (lead times of one week and longer). - Continue: Develop and transition for operational implementation a high resolution global weather prediction system NAVGEM with resolution of approximately T1023L100 (13 km horizontal resolution and 100 vertical layers) that is highly competitive in predictive skill with other operational global NWP systems. - Continue: Define, develop and implement consistent quantitative skill metrics to assess the advancements in the Earth System Prediction Capability (ESPC), taking into account the applications and lead-times for which the ESPC environmental information will be used.					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
- Continue: Evaluate and validate multi-model extended-range forecasts produced from interagency projects such as the North American Multi-model Ensemble (NMME). - Continue: Develop the NAVGEM global model to include inline aerosols to simulate aerosol life cycle and perform aerosol direct radiative heating of the atmosphere. - Continue: Participate in the North American Multi-Model Ensemble (NMME) by re-forecasting the global coupled (NAVGEM-HYCOM-CICE) Navy ESPC model for years 1999 to 2015. - Continue: Accelerate the rate of improvement in the US National Earth System Prediction Capability (ESPC) and National Unified Operational Prediction Capability (NUOPC), focusing primarily on the current and future generation global modeling enterprise. - Continue: Develop the NAVGEM global model to address middle atmosphere processes associated with sudden stratospheric warming and extended range prediction. ***FY 2020 Base Plans:*** Starting in FY 2020, the Earth System Prediction Capability System is migrated into the Battlespace Data Assimilation and Prediction activity to more align with the modeling efforts for Air/Ocean Tactical Applications. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** FY20 funding realigned within this project (2342) from Earth System Prediction Capability (ESPC) to Battlespace Data Assimilation and Prediction to synchronize ESPC modeling efforts with other non-ESPC modeling efforts under this project and to better align the modeling efforts for Air/Ocean Tactical Applications.					
Accomplishments/Planned Programs Subtotals	20.959	17.441	21.168	0.000	21.168

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• RDTEN/0604218N/2345: *FLEET METOC EQUIPMENT*	0.755	0.672	0.217	-	0.217	0.620	0.577	0.487	0.497	Continuing	Continuing

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
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D. Acquisition Strategy

Acquisition, management and contracting strategies are to support the Meteorological and Oceanographic (METOC) Data Assimilation and Modeling Project to develop, demonstrate, and validate METOC data assimilation and environmental prediction capabilities, enabling timely and accurate delivery of METOC prediction data and products to the Tactical Commander, all with management oversight by the Navy.

E. Performance Metrics

Goal: Develop techniques and tools to assimilate Meteorological and Oceanographic (METOC) data in order to improve the accuracy of global and regional scale meteorological and oceanographic forecast models. Data assimilation is expanded to include new in-situ and remotely-sensed data types, based on operational need. Tasks are directed toward advanced software enabling assimilation of disparate sources on non-synoptic time scales. Acoustic, atmospheric, and oceanographic model development, prototyping and transition is focused on improved model physics, increased resolution, and computational efficiency.
Metric: Tasks will address no less than 75% of applicable capability gaps and requirements.

Goal (ESPC): Develop a more accurate global ocean, atmosphere, wave and sea ice forecast system with longer skillful forecast times from weeks to seasons through integrating and coupling atmosphere, ocean, ice, land and near-space forecast models into a seamless deterministic and ensemble prediction system that significantly improves skill over the current modeling suite. Additionally develop a common modeling architecture to improve cross-Agency collaboration, and greatly more efficient environmental modeling and computational architectures to allow for real-time operational prediction at comparable skill level to international competitors.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
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Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
METOC Future Mission Capabilities	WR	NRL : Washington DC	127.957	0.845	Nov 2017	0.852	Nov 2018	3.450	Nov 2019	-		3.450	Continuing	Continuing	Continuing
METOC Future Mission Capabilities	Various	Various : Various	46.068	0.000		0.000		0.000		-		0.000	0.000	46.068	-
METOC Space-Based Sensing Capabilities	WR	NRL : Washington, DC	17.092	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Tactical Oceanography Capabilities / Undersea Warfare	WR	NRL : Washington, DC	9.480	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Tactical Oceanography Capabilities / Undersea Warfare	C/FP	University of Texas : TX	1.163	0.100	Nov 2017	0.000		0.150	Nov 2019	-		0.150	0.000	1.413	-
Tactical Oceanography Capabilities / Undersea Warfare	WR	NSWC Carderock : West Bethesda, MD	2.090	0.000		0.000		0.150	Dec 2019	-		0.150	Continuing	Continuing	Continuing
Tactical Oceanography Capabilities / Undersea Warfare	WR	NAVOCEANO : Mississippi	0.549	0.000		0.000		0.500	Mar 2020	-		0.500	0.000	1.049	-
Tactical Oceanography Capabilities / Undersea Warfare	C/FP	University of Washington : Seattle, WA	0.850	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Tactical Oceanography Capabilities / Undersea Warfare	C/FP	Johns Hopkins University : MD	0.431	0.000		0.000		0.030	Mar 2020	-		0.030	Continuing	Continuing	Continuing
Tactical Oceanography Capabilities / Undersea Warfare	C/FP	SAIC/QNA : Various	1.876	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
METOC Future Mission Capabilities	C/FP	SAIC/QNA : Various	3.096	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Tactical Oceanography Capabilities / Undersea Warfare	C/FP	Penn Sate University : Pennsylvania	0.125	0.000		0.000		0.000		-		0.000	0.000	0.125	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
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Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Tactical Oceanography Capabilities / Undersea Warfare	WR	SSC LANT : North Charleston	0.050	0.000		0.000		0.000		-		0.000	0.000	0.050	-
Tactical Oceanography Capabilities / Undersea Warfare	C/FP	SPA : Virginia	0.375	0.000		0.000		0.000		-		0.000	0.000	0.375	-
METOC SUPPORT SPACE-SOFTWARE DEVELOPMENT	WR	NRL : WASHINGTON DC	0.515	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Tactical Oceanography Capabilities / Undersea Warfare	C/FP	METRON : Virginia	0.385	0.000		0.000		0.150	Oct 2019	-		0.150	0.000	0.535	-
Tactical Oceanography Capabilities / Undersea Warfare	C/FP	Vencore : Virginia	0.239	0.000		0.000		0.000		-		0.000	0.000	0.239	-
METOC Battlespace Data Assimilation and Prediction	WR	NRL : Monterey, CAl Stennis Space Center,MS	0.000	7.695	Nov 2017	7.194	Dec 2018	4.500	Nov 2019	-		4.500	0.000	19.389	-
Earth Systems Prediction Capability (ONR)	WR	NRL : Washington DC	23.314	8.685	Nov 2017	6.611	Dec 2018	8.569	Dec 2019	-		8.569	Continuing	Continuing	Continuing
ESPC	Various	Various : Various	7.667	0.681	Nov 2017	0.981	Dec 2018	0.000		-		0.000	Continuing	Continuing	Continuing
CHIEF OF NAVAL OPERATIONS SPEED TO FLEET INITIATIVE	WR	NRL : WASHINGTON DC	0.850	0.000		0.000		0.000		-		0.000	1.130	1.980	-
		Subtotal	244.172	18.006		15.638		17.499		-		17.499	Continuing	Continuing	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
METOC Future Mission Capabilities	Various	Various : Various	0.795	0.000		0.000		0.000		-		0.000	0.000	0.795	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
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Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Littoral Battlespace Sensing - Autonomous Undersea Vehicle	C/FP	SAIC : Virginia	0.473	0.000		0.000		0.000		-		0.000	0.000	0.473	-
Tactical Oceanography Capabilities / Undersea Warfare	C/FP	SAIC : Virginia	0.634	0.000		0.000		0.000		-		0.000	0.000	0.634	-
METOC Future Mission Capabilities	C/FP	SAIC : VIRGINIA	0.115	0.100	Nov 2017	0.100	Dec 2018	0.300	Feb 2020	-		0.300	Continuing	Continuing	Continuing
METOC SUPPORT SPACE-PROGRAM SUPPORT	WR	SSC PACIFIC : SAN DIEGO, CA	0.090	0.100	Nov 2017	0.100	Dec 2018	0.641	Feb 2020	-		0.641	Continuing	Continuing	Continuing
Earth System Modeling Framework - Common Software Architecture	Various	Various : Boulder, CO; Various	0.000	0.660	Nov 2017	0.660	Nov 2018	0.641	Nov 2019	-		0.641	0.000	1.961	-
Program Support and Subject Matter Expertise	Various	UW-APL : Seattle, WA	1.563	0.358	Nov 2017	0.358	Dec 2018	0.425	Dec 2019	-		0.425	Continuing	Continuing	Continuing
		Subtotal	3.670	1.218		1.218		2.007		-		2.007	Continuing	Continuing	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Data Analytics and Machine Learning	TBD	Charles River : Boston, MA	0.000	0.234	Nov 2017	0.323	Dec 2018	0.500	Feb 2020	-		0.500	0.000	1.057	-
		Subtotal	0.000	0.234		0.323		0.500		-		0.500	0.000	1.057	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Acquisition Workforce	Various	Various : Various	0.090	0.000		0.000		0.000		-		0.000	0.000	0.090	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 2342 / *METOC Data Assimilation and Mod*

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
METOC Space-Based Sensing Capabilities	Various	Various : Various	1.350	0.000		0.000		0.000		-		0.000	0.000	1.350	-
Tactical Oceanography Capabilities / Undersea Warfare	WR	SSC PAC : San Diego, CA	1.316	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
METOC Future Mission Capabilities	C/FP	PSS/BAH : San Diego, CA	0.216	0.000		0.000		0.000		-		0.000	0.000	0.216	-
METOC Space-Based Sensing Capabilities	C/FP	BAH : VIRGINIA	0.142	0.100	Nov 2017	0.100	Nov 2018	0.400	Mar 2020	-		0.400	Continuing	Continuing	Continuing
METOC Space-Based Sensing Capabilities	WR	SSC PAC : SAN DIEGO, CA	0.213	1.339	Nov 2017	0.100	Nov 2018	0.400	Mar 2020	-		0.400	Continuing	Continuing	Continuing
METOC Acquisition Management	C/CPFF	PSS/BAH : SAN DIEGO, CA	0.037	0.062	Nov 2017	0.062	Nov 2018	0.362	Nov 2019	-		0.362	Continuing	Continuing	Continuing
		Subtotal	3.364	1.501		0.262		1.162		-		1.162	Continuing	Continuing	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	251.206	20.959		17.441		21.168		-		21.168	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 2342 / *METOC Data Assimilation and Mod*

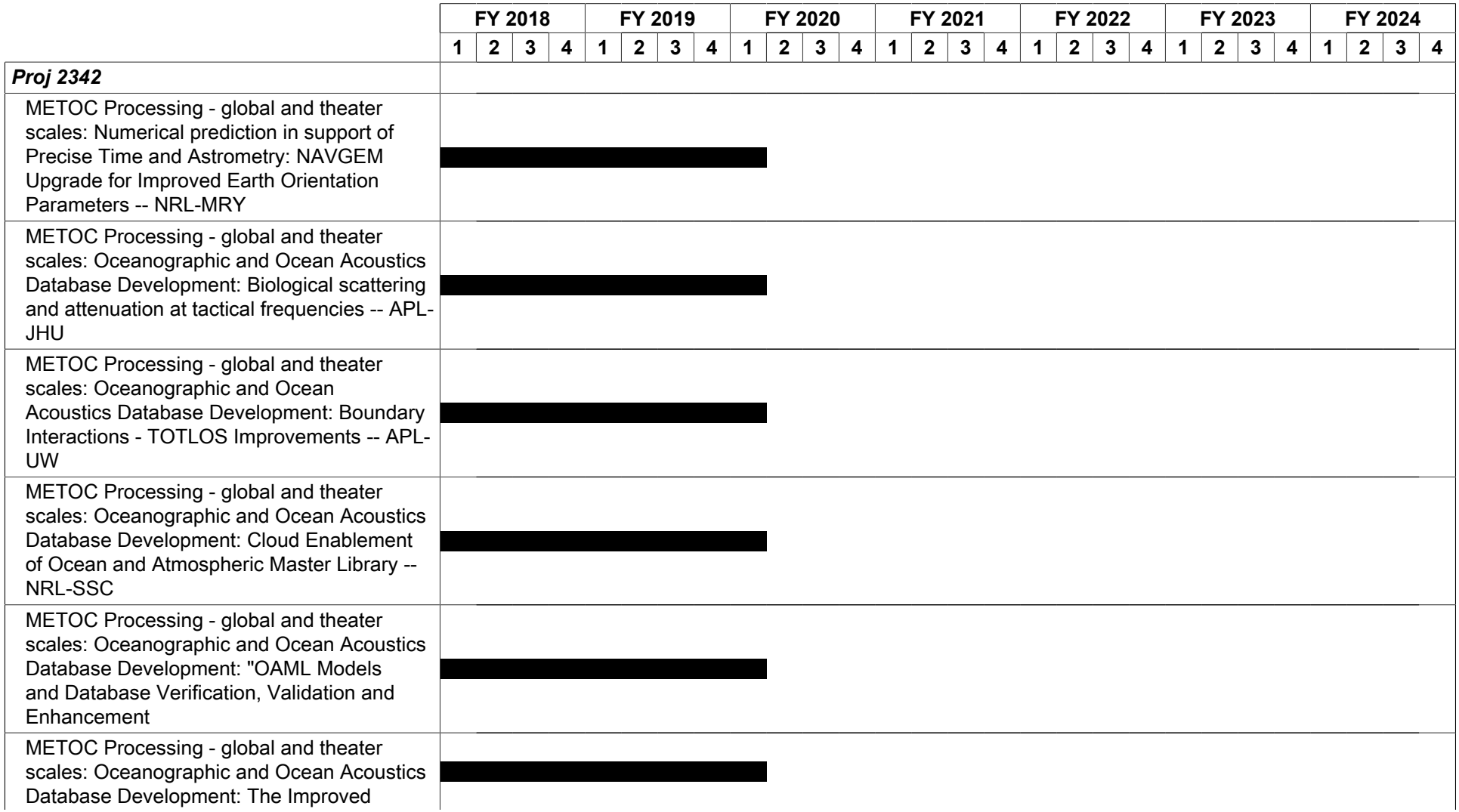


Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 2342 / *METOC Data Assimilation and Mod*

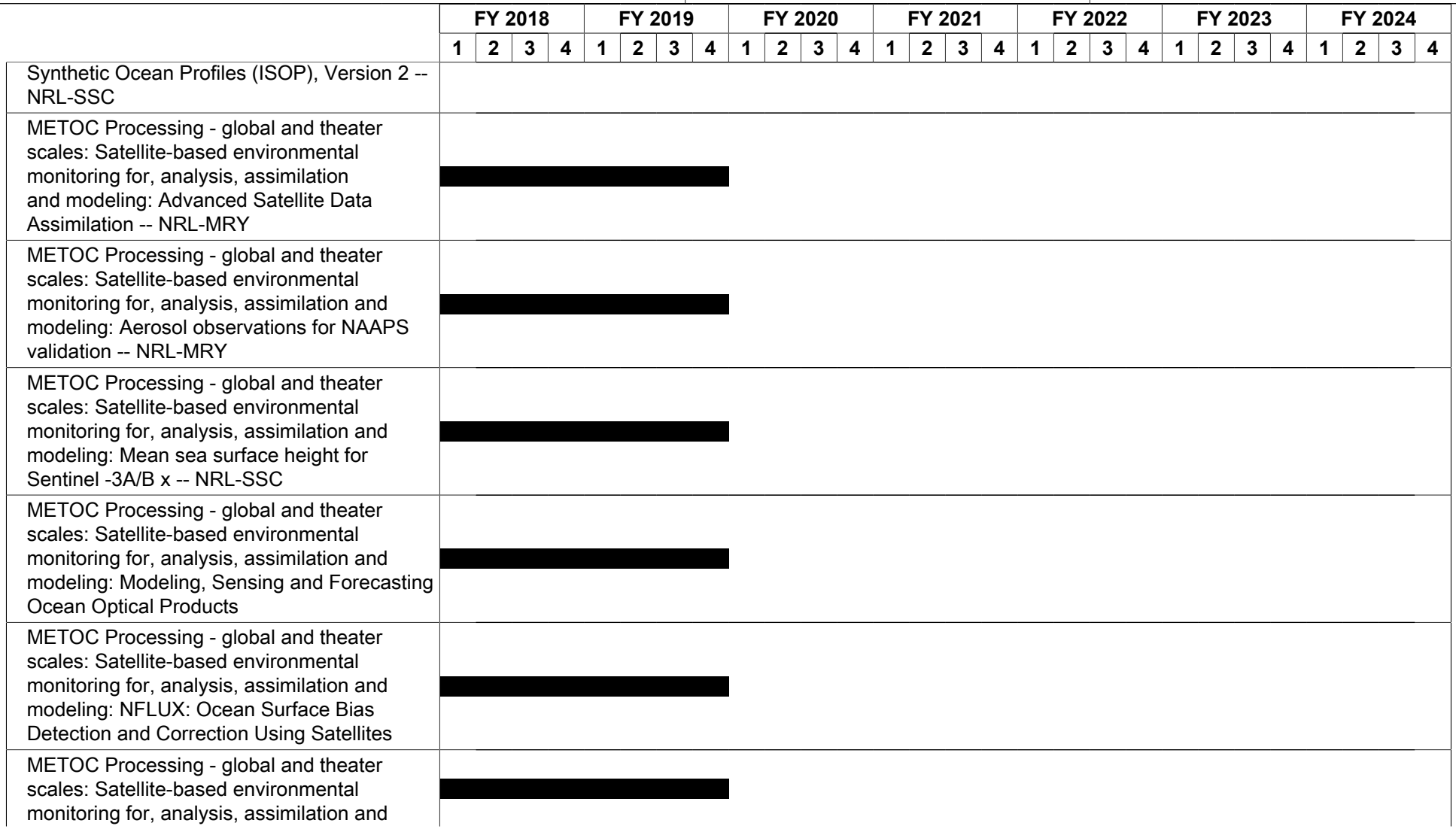


Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 2342 / *METOC Data Assimilation and Mod*

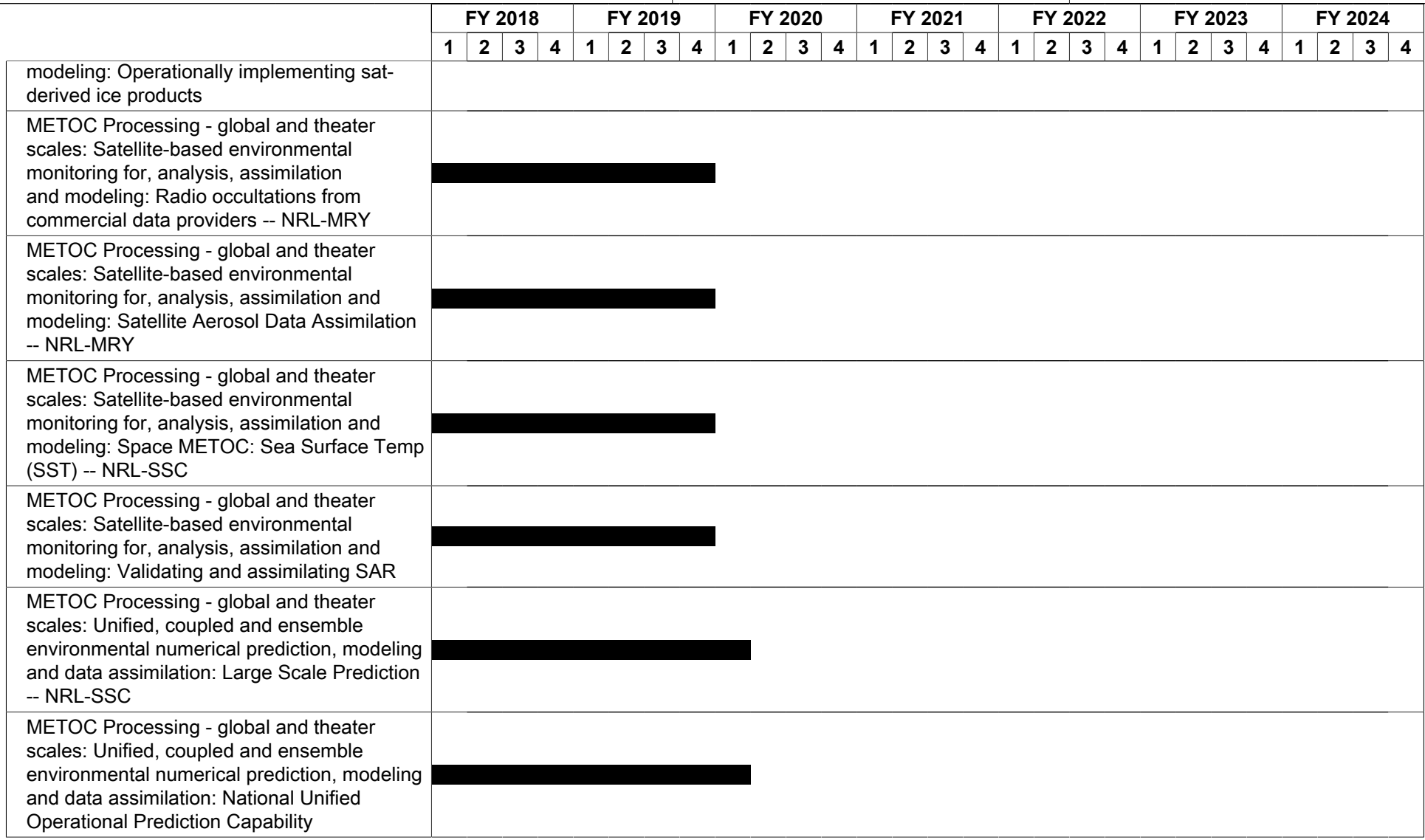


Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 2342 / *METOC Data Assimilation and Mod*

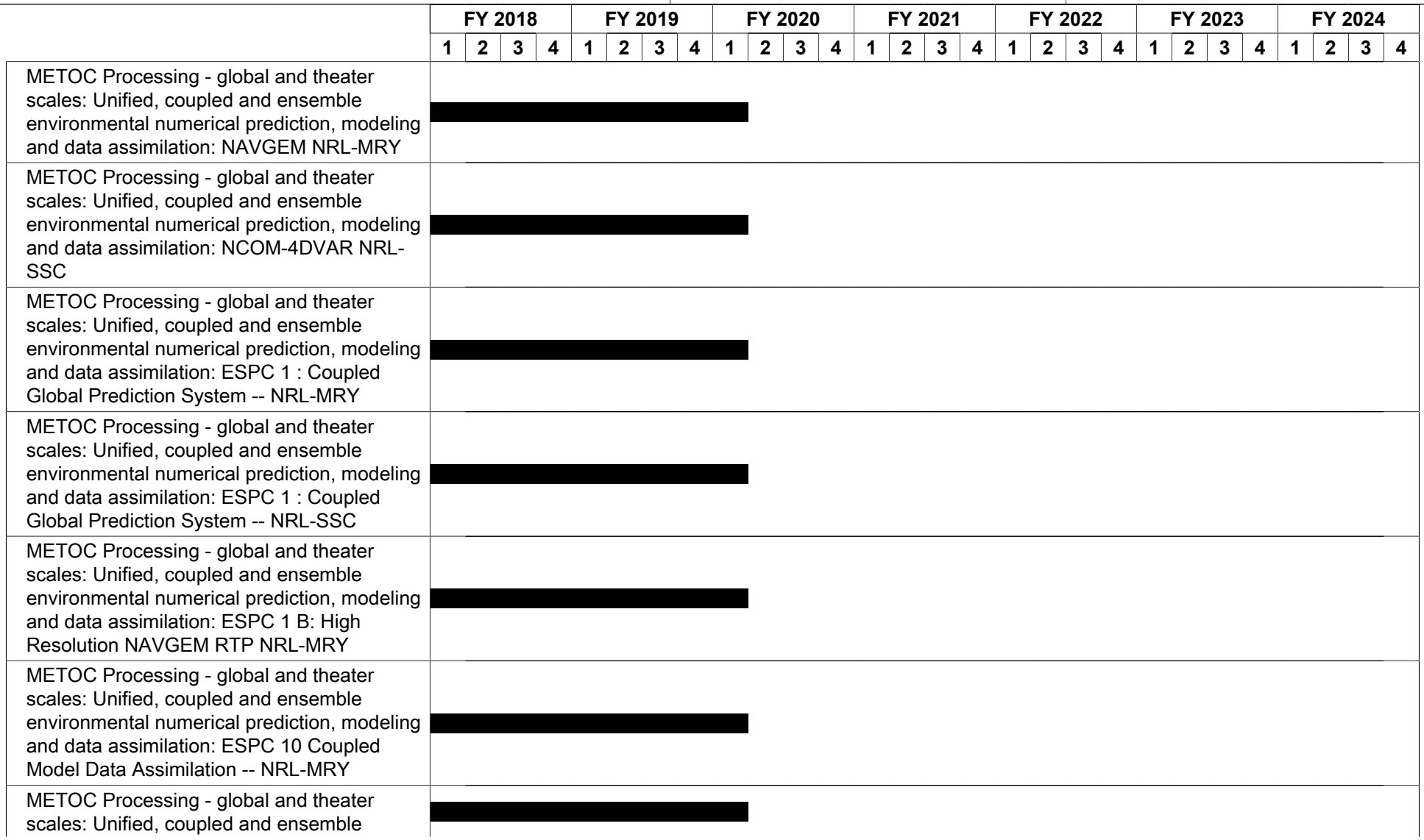


Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 2342 / *METOC Data Assimilation and Mod*

	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
environmental numerical prediction, modeling and data assimilation: ESPC 10 Coupled Model Data Assimilation -- NRL-SSC																												
METOC Processing - global and theater scales: Unified, coupled and ensemble environmental numerical prediction, modeling and data assimilation: ESPC 1D Middle Atmosphere NRL-DC	■	■	■	■	■	■	■	■	■	■	■	■																
METOC Processing - global and theater scales: Unified, coupled and ensemble environmental numerical prediction, modeling and data assimilation: ESPC 1D Middle Atmosphere NRL-MRY	■	■	■	■	■	■	■	■	■	■	■	■																
METOC Processing - global and theater scales: Unified, coupled and ensemble environmental numerical prediction, modeling and data assimilation: ESPC 2: NRL-MRY	■	■	■	■	■	■	■	■	■	■	■	■																
METOC Processing - global and theater scales: Unified, coupled and ensemble environmental numerical prediction, modeling and data assimilation: ESPC 2: NRL-SSC	■	■	■	■	■	■	■	■	■	■	■	■																
METOC Processing - global and theater scales: Unified, coupled and ensemble environmental numerical prediction, modeling and data assimilation: ESPC 3: Coupled Global Ensemble Prediction System	■	■	■	■	■	■	■	■	■	■	■	■																
METOC Processing - global and theater scales: Unified, coupled and ensemble environmental numerical prediction, modeling and data assimilation: ESPC 4 :Next Generation Model NEPTUNE -- NRL-MRY	■	■	■	■	■	■	■	■	■	■	■	■																

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 2342 / *METOC Data Assimilation and Mod*

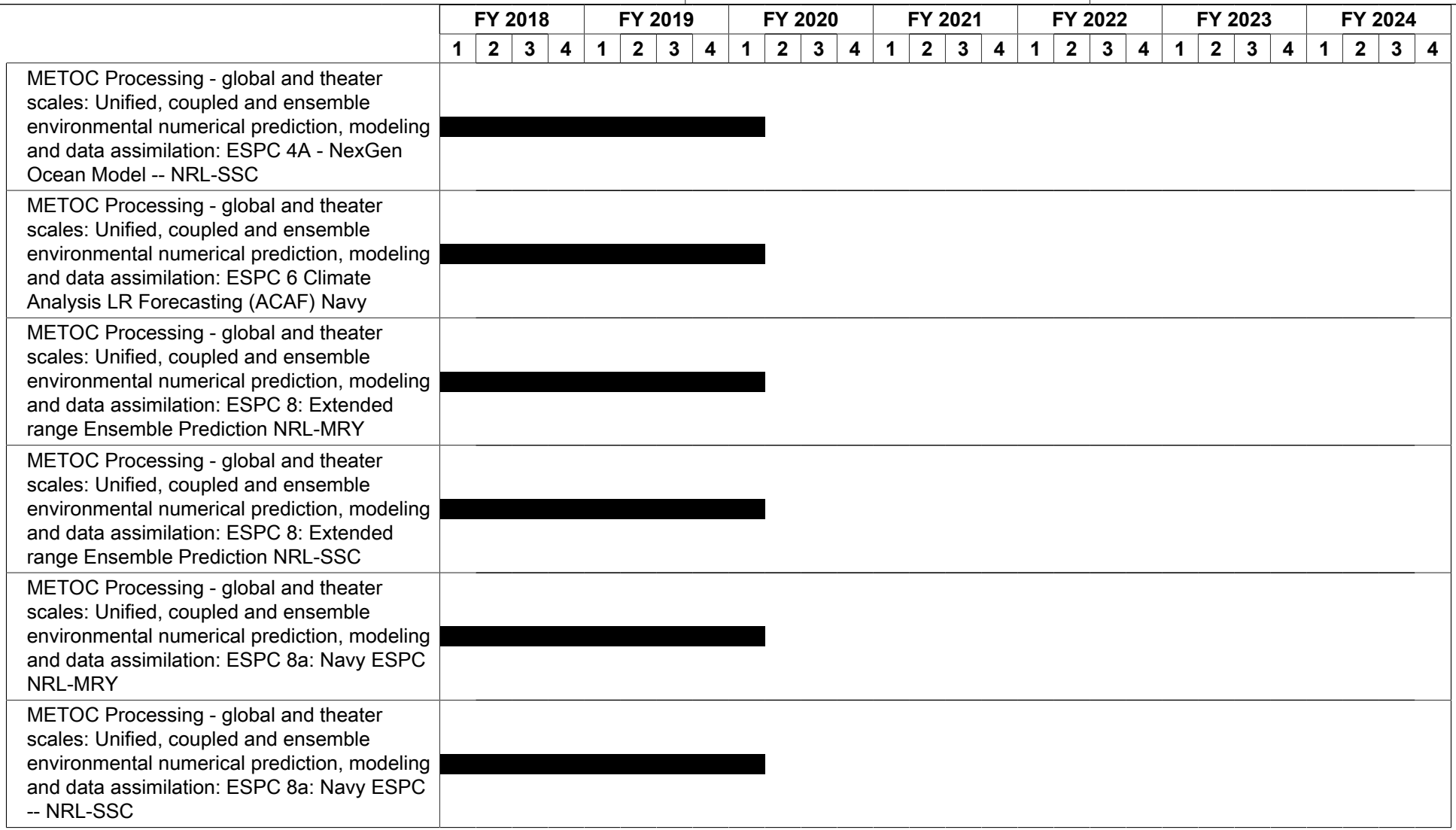


Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 2342 / *METOC Data Assimilation and Mod*

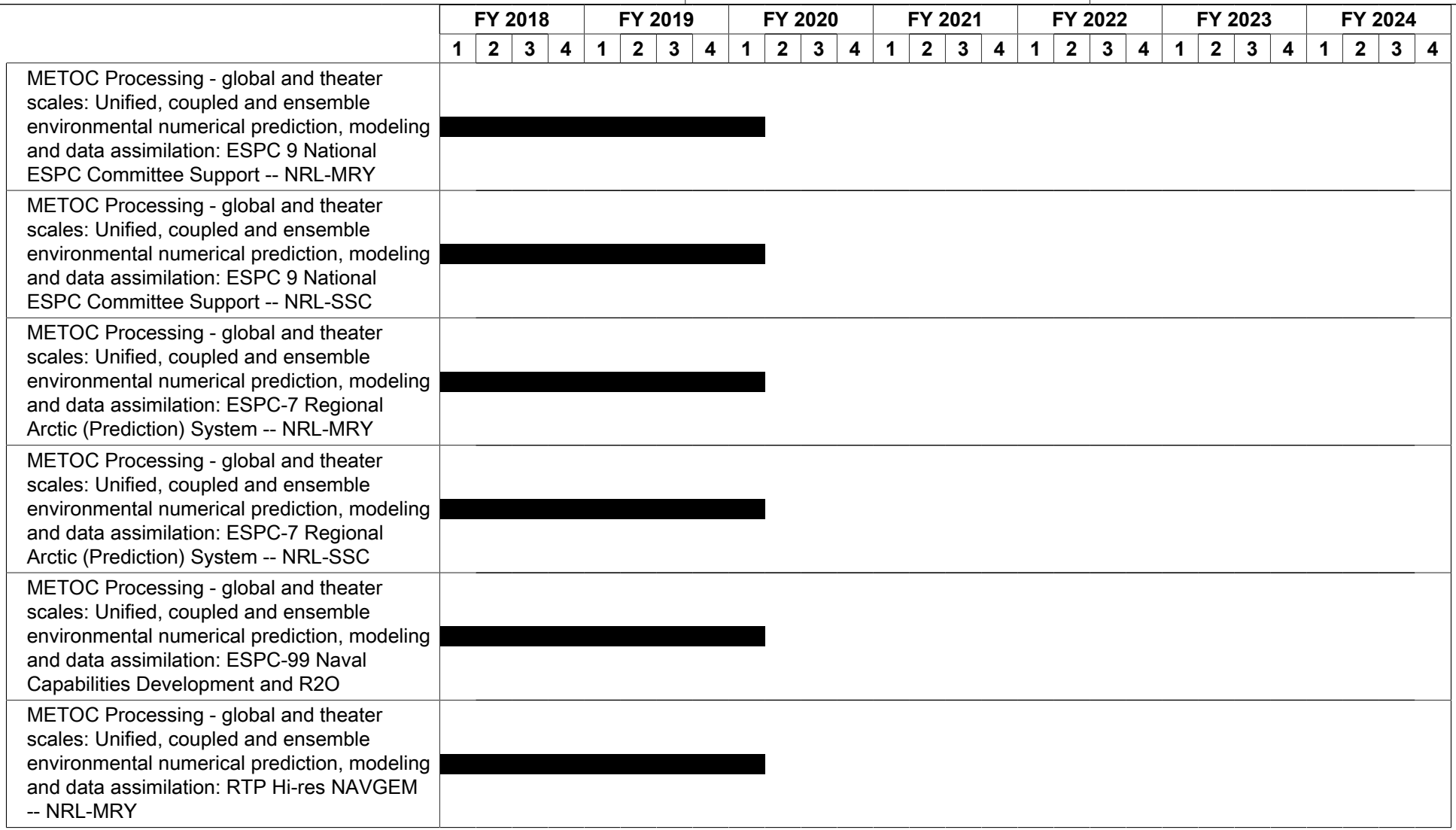


Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 2342 / *METOC Data Assimilation and Mod*

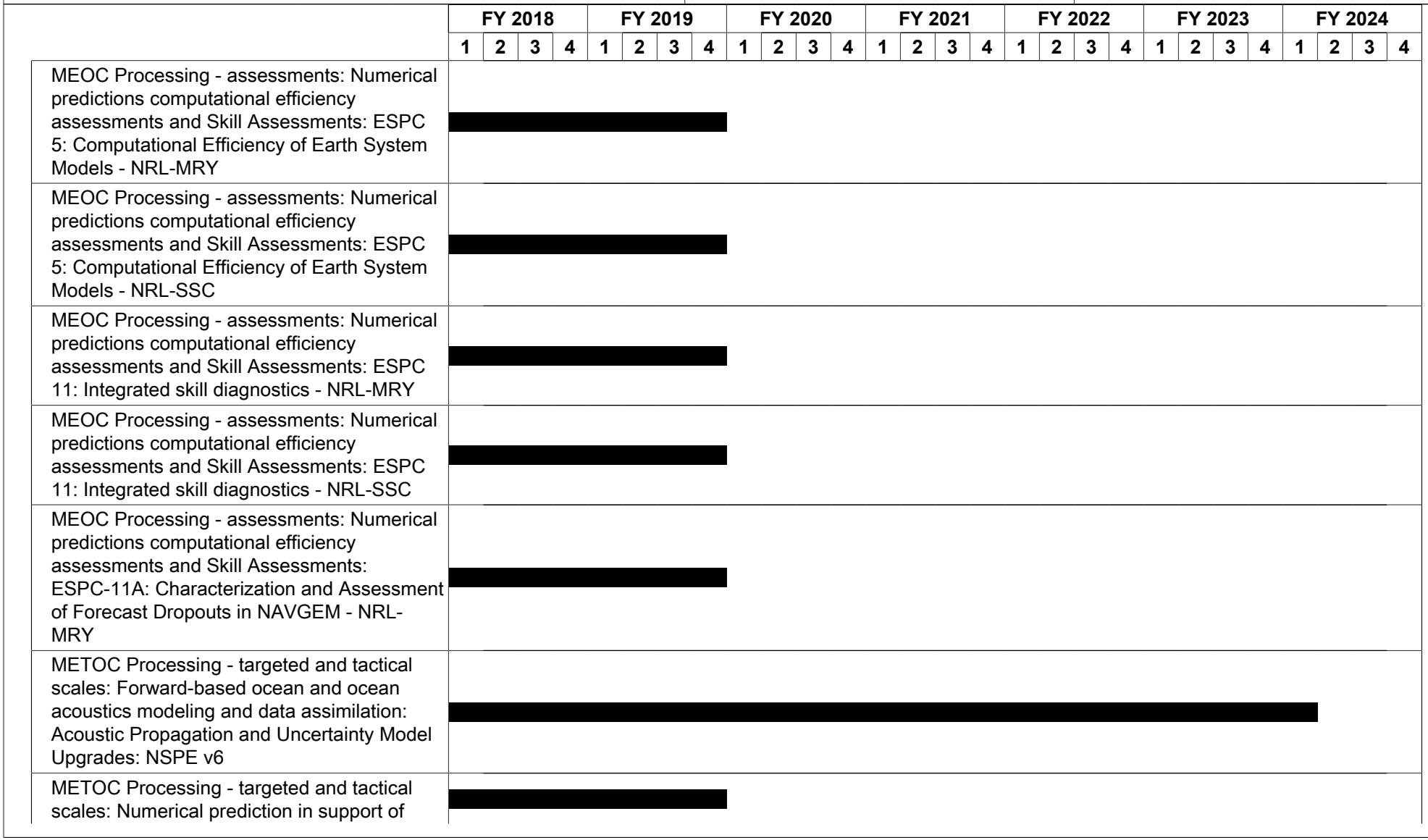


Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 2342 / *METOC Data Assimilation and Mod*

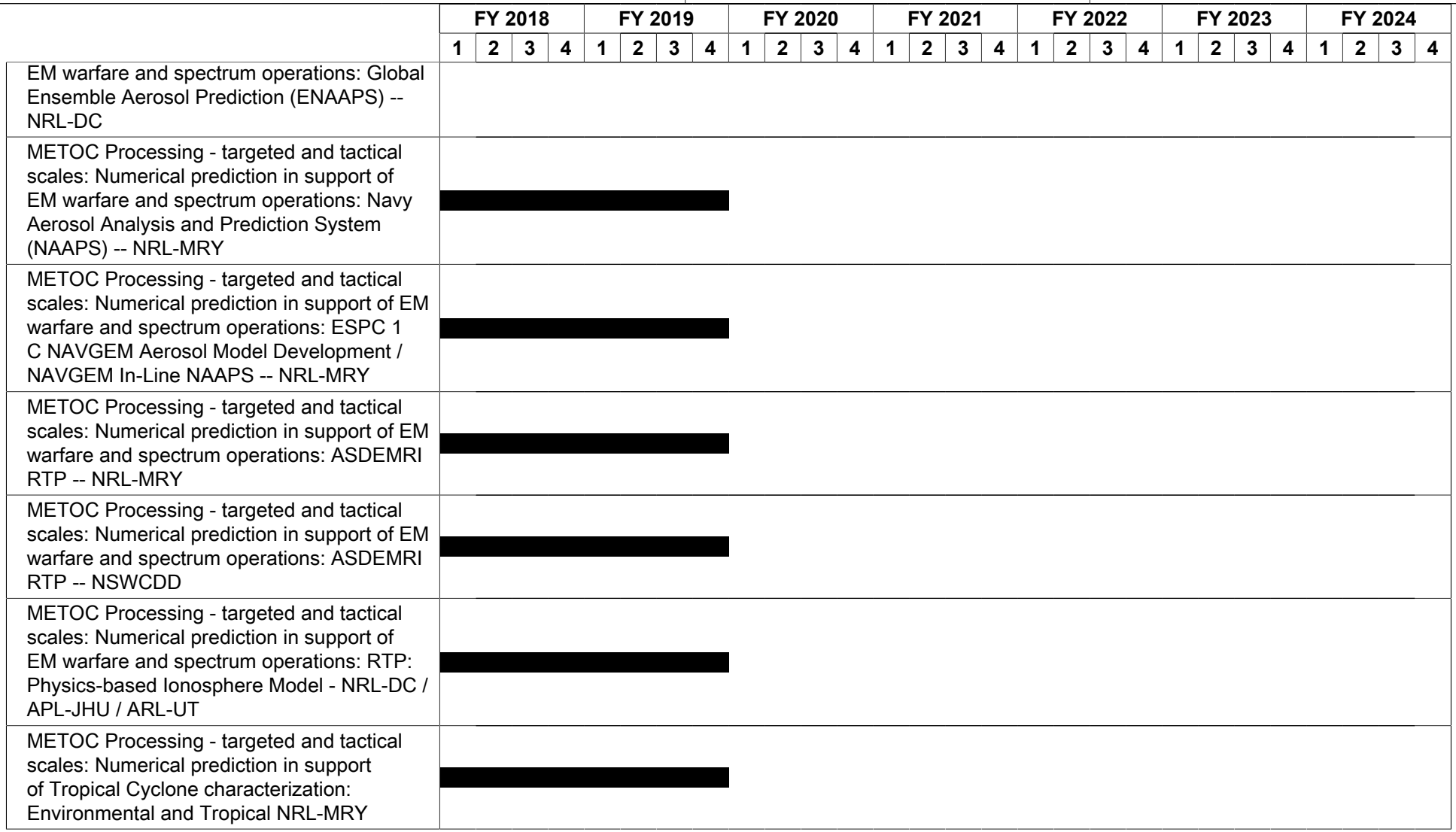


Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 2342 / *METOC Data Assimilation and Mod*

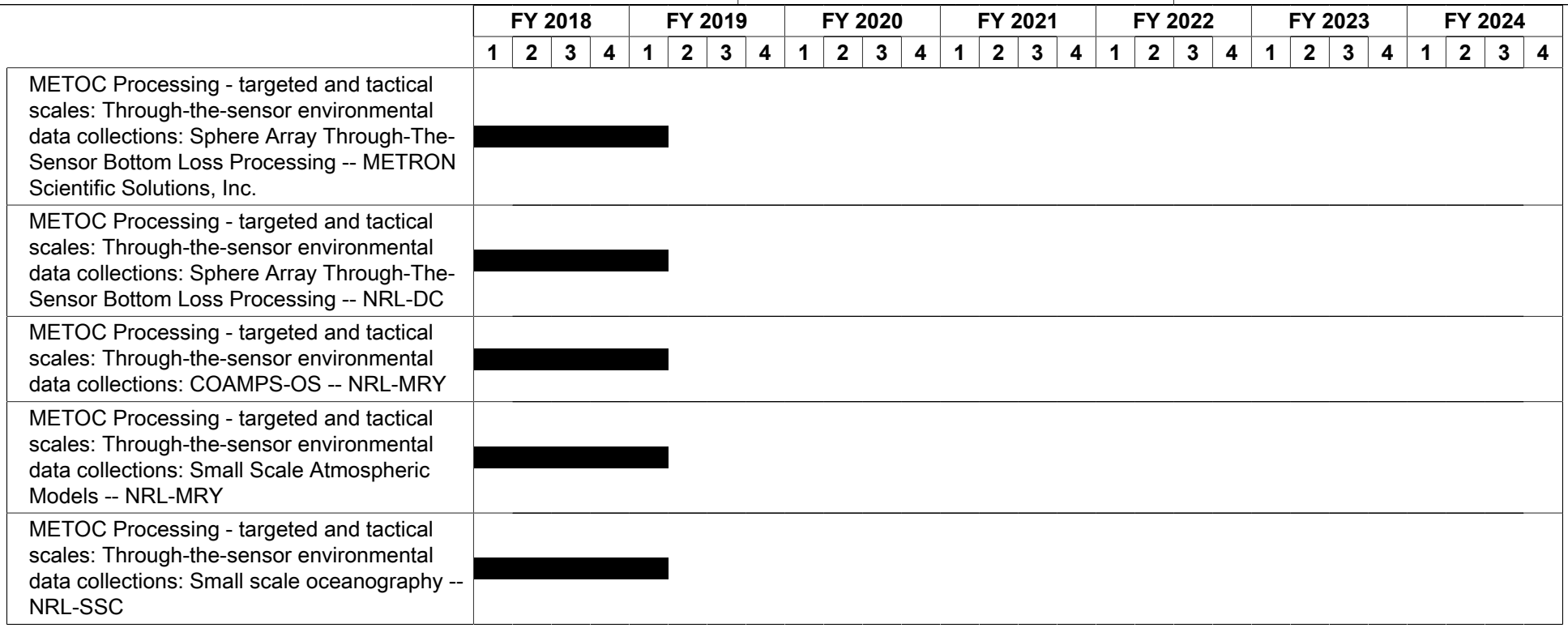


Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 2342 / *METOC Data Assimilation and Mod*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 2342				
METOC Processing - global and theater scales: Numerical prediction in support of Precise Time and Astrometry: NAVGEM Upgrade for Improved Earth Orientation Parameters -- NRL-MRY	1	2018	1	2020
METOC Processing - global and theater scales: Oceanographic and Ocean Acoustics Database Development: Biological scattering and attenuation at tactical frequencies -- APL-JHU	1	2018	1	2020
METOC Processing - global and theater scales: Oceanographic and Ocean Acoustics Database Development: Boundary Interactions - TOTLOS Improvements -- APL-UW	1	2018	1	2020
METOC Processing - global and theater scales: Oceanographic and Ocean Acoustics Database Development: Cloud Enablement of Ocean and Atmospheric Master Library -- NRL-SSC	1	2018	1	2020
METOC Processing - global and theater scales: Oceanographic and Ocean Acoustics Database Development: "OAML Models and Database Verification, Validation and Enhancement	1	2018	1	2020
METOC Processing - global and theater scales: Oceanographic and Ocean Acoustics Database Development: The Improved Synthetic Ocean Profiles (ISOP), Version 2 -- NRL-SSC	1	2018	1	2020
METOC Processing - global and theater scales: Satellite-based environmental monitoring for, analysis, assimilation and modeling: Advanced Satellite Data Assimilation -- NRL-MRY	1	2018	4	2019
METOC Processing - global and theater scales: Satellite-based environmental monitoring for, analysis, assimilation and modeling: Aerosol observations for NAAPS validation -- NRL-MRY	1	2018	4	2019

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 2342 / *METOC Data Assimilation and Mod*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
METOC Processing - global and theater scales: Satellite-based environmental monitoring for, analysis, assimilation and modeling: Mean sea surface height for Sentinel -3A/B x -- NRL-SSC	1	2018	4	2019
METOC Processing - global and theater scales: Satellite-based environmental monitoring for, analysis, assimilation and modeling: Modeling, Sensing and Forecasting Ocean Optical Products	1	2018	4	2019
METOC Processing - global and theater scales: Satellite-based environmental monitoring for, analysis, assimilation and modeling: NFLUX: Ocean Surface Bias Detection and Correction Using Satellites	1	2018	4	2019
METOC Processing - global and theater scales: Satellite-based environmental monitoring for, analysis, assimilation and modeling: Operationally implementing sat-derived ice products	1	2018	4	2019
METOC Processing - global and theater scales: Satellite-based environmental monitoring for, analysis, assimilation and modeling: Radio occultations from commercial data providers -- NRL-MRY	1	2018	4	2019
METOC Processing - global and theater scales: Satellite-based environmental monitoring for, analysis, assimilation and modeling: Satellite Aerosol Data Assimilation -- NRL-MRY	1	2018	4	2019
METOC Processing - global and theater scales: Satellite-based environmental monitoring for, analysis, assimilation and modeling: Space METOC: Sea Surface Temp (SST) -- NRL-SSC	1	2018	4	2019
METOC Processing - global and theater scales: Satellite-based environmental monitoring for, analysis, assimilation and modeling: Validating and assimilating SAR	1	2018	4	2019
METOC Processing - global and theater scales: Unified, coupled and ensemble environmental numerical prediction, modeling and data assimilation: Large Scale Prediction -- NRL-SSC	1	2018	1	2020
METOC Processing - global and theater scales: Unified, coupled and ensemble environmental numerical prediction, modeling and data assimilation: National Unified Operational Prediction Capability	1	2018	1	2020

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 2342 / *METOC Data Assimilation and Mod*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
METOC Processing - global and theater scales: Unified, coupled and ensemble environmental numerical prediction, modeling and data assimilation: NAVGEM NRL-MRY	1	2018	1	2020
METOC Processing - global and theater scales: Unified, coupled and ensemble environmental numerical prediction, modeling and data assimilation: NCOM-4DVAR NRL-SSC	1	2018	1	2020
METOC Processing - global and theater scales: Unified, coupled and ensemble environmental numerical prediction, modeling and data assimilation: ESPC 1 : Coupled Global Prediction System -- NRL-MRY	1	2018	1	2020
METOC Processing - global and theater scales: Unified, coupled and ensemble environmental numerical prediction, modeling and data assimilation: ESPC 1 : Coupled Global Prediction System -- NRL-SSC	1	2018	1	2020
METOC Processing - global and theater scales: Unified, coupled and ensemble environmental numerical prediction, modeling and data assimilation: ESPC 1 B: High Resolution NAVGEM RTP NRL-MRY	1	2018	1	2020
METOC Processing - global and theater scales: Unified, coupled and ensemble environmental numerical prediction, modeling and data assimilation: ESPC 10 Coupled Model Data Assimilation -- NRL-MRY	1	2018	1	2020
METOC Processing - global and theater scales: Unified, coupled and ensemble environmental numerical prediction, modeling and data assimilation: ESPC 10 Coupled Model Data Assimilation -- NRL-SSC	1	2018	1	2020
METOC Processing - global and theater scales: Unified, coupled and ensemble environmental numerical prediction, modeling and data assimilation: ESPC 1D Middle Atmosphere NRL-DC	1	2018	1	2020
METOC Processing - global and theater scales: Unified, coupled and ensemble environmental numerical prediction, modeling and data assimilation: ESPC 1D Middle Atmosphere NRL-MRY	1	2018	1	2020
METOC Processing - global and theater scales: Unified, coupled and ensemble environmental numerical prediction, modeling and data assimilation: ESPC 2: NRL-MRY	1	2018	1	2020

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 2342 / *METOC Data Assimilation and Mod*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
METOC Processing - global and theater scales: Unified, coupled and ensemble environmental numerical prediction, modeling and data assimilation: ESPC 2: NRL-SSC	1	2018	1	2020
METOC Processing - global and theater scales: Unified, coupled and ensemble environmental numerical prediction, modeling and data assimilation: ESPC 3: Coupled Global Ensemble Prediction System	1	2018	1	2020
METOC Processing - global and theater scales: Unified, coupled and ensemble environmental numerical prediction, modeling and data assimilation: ESPC 4 :Next Generation Model NEPTUNE -- NRL-MRY	1	2018	1	2020
METOC Processing - global and theater scales: Unified, coupled and ensemble environmental numerical prediction, modeling and data assimilation: ESPC 4A - NexGen Ocean Model -- NRL-SSC	1	2018	1	2020
METOC Processing - global and theater scales: Unified, coupled and ensemble environmental numerical prediction, modeling and data assimilation: ESPC 6 Climate Analysis LR Forecasting (ACAF) Navy	1	2018	1	2020
METOC Processing - global and theater scales: Unified, coupled and ensemble environmental numerical prediction, modeling and data assimilation: ESPC 8: Extended range Ensemble Prediction NRL-MRY	1	2018	1	2020
METOC Processing - global and theater scales: Unified, coupled and ensemble environmental numerical prediction, modeling and data assimilation: ESPC 8: Extended range Ensemble Prediction NRL-SSC	1	2018	1	2020
METOC Processing - global and theater scales: Unified, coupled and ensemble environmental numerical prediction, modeling and data assimilation: ESPC 8a: Navy ESPC NRL-MRY	1	2018	1	2020
METOC Processing - global and theater scales: Unified, coupled and ensemble environmental numerical prediction, modeling and data assimilation: ESPC 8a: Navy ESPC -- NRL-SSC	1	2018	1	2020
METOC Processing - global and theater scales: Unified, coupled and ensemble environmental numerical prediction, modeling and data assimilation: ESPC 9 National ESPC Committee Support -- NRL-MRY	1	2018	1	2020

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 2342 / *METOC Data Assimilation and Mod*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
METOC Processing - global and theater scales: Unified, coupled and ensemble environmental numerical prediction, modeling and data assimilation: ESPC 9 National ESPC Committee Support -- NRL-SSC	1	2018	1	2020
METOC Processing - global and theater scales: Unified, coupled and ensemble environmental numerical prediction, modeling and data assimilation: ESPC-7 Regional Arctic (Prediction) System -- NRL-MRY	1	2018	1	2020
METOC Processing - global and theater scales: Unified, coupled and ensemble environmental numerical prediction, modeling and data assimilation: ESPC-7 Regional Arctic (Prediction) System -- NRL-SSC	1	2018	1	2020
METOC Processing - global and theater scales: Unified, coupled and ensemble environmental numerical prediction, modeling and data assimilation: ESPC-99 Naval Capabilities Development and R2O	1	2018	1	2020
METOC Processing - global and theater scales: Unified, coupled and ensemble environmental numerical prediction, modeling and data assimilation: RTP Hi-res NAVGEM -- NRL-MRY	1	2018	1	2020
MEOC Processing - assessments: Numerical predictions computational efficiency assessments and Skill Assessments: ESPC 5: Computational Efficiency of Earth System Models - NRL-MRY	1	2018	4	2019
MEOC Processing - assessments: Numerical predictions computational efficiency assessments and Skill Assessments: ESPC 5: Computational Efficiency of Earth System Models - NRL-SSC	1	2018	4	2019
MEOC Processing - assessments: Numerical predictions computational efficiency assessments and Skill Assessments: ESPC 11: Integrated skill diagnostics - NRL-MRY	1	2018	4	2019
MEOC Processing - assessments: Numerical predictions computational efficiency assessments and Skill Assessments: ESPC 11: Integrated skill diagnostics - NRL-SSC	1	2018	4	2019
MEOC Processing - assessments: Numerical predictions computational efficiency assessments and Skill Assessments: ESPC-11A: Characterization and Assessment of Forecast Dropouts in NAVGEM - NRL-MRY	1	2018	4	2019

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 2342 / *METOC Data Assimilation and Mod*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
METOC Processing - targeted and tactical scales: Forward-based ocean and ocean acoustics modeling and data assimilation: Acoustic Propagation and Uncertainty Model Upgrades: NSPE v6	1	2018	1	2024
METOC Processing - targeted and tactical scales: Numerical prediction in support of EM warfare and spectrum operations: Global Ensemble Aerosol Prediction (ENAAPS) -- NRL-DC	1	2018	4	2019
METOC Processing - targeted and tactical scales: Numerical prediction in support of EM warfare and spectrum operations: Navy Aerosol Analysis and Prediction System (NAAPS) -- NRL-MRY	1	2018	4	2019
METOC Processing - targeted and tactical scales: Numerical prediction in support of EM warfare and spectrum operations: ESPC 1 C NAVGEM Aerosol Model Development / NAVGEM In-Line NAAPS -- NRL-MRY	1	2018	4	2019
METOC Processing - targeted and tactical scales: Numerical prediction in support of EM warfare and spectrum operations: ASDEMRI RTP -- NRL-MRY	1	2018	4	2019
METOC Processing - targeted and tactical scales: Numerical prediction in support of EM warfare and spectrum operations: ASDEMRI RTP -- NSWCDD	1	2018	4	2019
METOC Processing - targeted and tactical scales: Numerical prediction in support of EM warfare and spectrum operations: RTP: Physics-based Ionosphere Model - NRL-DC / APL-JHU / ARL-UT	1	2018	4	2019
METOC Processing - targeted and tactical scales: Numerical prediction in support of Tropical Cyclone characterization: Environmental and Tropical NRL-MRY	1	2018	4	2019
METOC Processing - targeted and tactical scales: Through-the-sensor environmental data collections: Sphere Array Through-The-Sensor Bottom Loss Processing -- METRON Scientific Solutions, Inc.	1	2018	1	2019
METOC Processing - targeted and tactical scales: Through-the-sensor environmental data collections: Sphere Array Through-The-Sensor Bottom Loss Processing -- NRL-DC	1	2018	1	2019
METOC Processing - targeted and tactical scales: Through-the-sensor environmental data collections: COAMPS-OS -- NRL-MRY	1	2018	1	2019

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 2342 / *METOC Data Assimilation and Mod*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
METOC Processing - targeted and tactical scales: Through-the-sensor environmental data collections: Small Scale Atmospheric Models -- NRL-MRY	1	2018	1	2019
METOC Processing - targeted and tactical scales: Through-the-sensor environmental data collections: Small scale oceanography -- NRL-SSC	1	2018	1	2019

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603207N / *Air/Ocean Tactical Applications*	Project (Number/Name) 2343 / *Tactical METOC Applications*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
2343: *Tactical METOC Applications*	163.724	11.448	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	175.172
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Note

Total funding control for Fleet Meteorology & Oceanography (METOC) Equipment (2343) in FY 2019 and beyond was moved from Program Element (PE) 0603207N into PE 0604218N Air Ocean Equipment Engineering Projects as a result of a Budget Activity (BA) reclassification.

A. Mission Description and Budget Item Justification

The Tactical Meteorology and Oceanography (METOC) Applications Project provides cyber secure operational effects decision aid capabilities for Navy and Marine Corps warfighters in the context of Joint Operations in a net-centric environment. This project funds the agile software development of the Naval Integrated Tactical Environmental System Next Generation (NITES-Next) program of record. NITES-Next program identifies and transitions state-of-the-art decision support software technologies from the government and commercial industry's technology base, and then demonstrates and validates these capabilities before fielding. These software decision support tools provide platform, sensor, communications, and weapon systems performance assessments for warfighters in terms of their littoral and deep-strike battlespace environments. These assessments allow mission planners and warfighters, from Unit to Theater level, to optimize their sensor employment on airborne, surface, and subsurface platforms in support of Naval Composite Warfare mission areas including Undersea Warfare (USW), Anti-Submarine Warfare (ASW), Mine Warfare (MIW), Amphibious Warfare (AMW), Anti-Surface Warfare (ASUW), Anti-Air Warfare (AAW), Strike Warfare (STW), Expeditionary Warfare (EXW), Electronic Warfare (EW), Information Operations (IO), Intelligence Operations (INT), Non-Combat Operations (NCO), Command, Control, Communication (CCC), and Naval Special Warfare (NSW). Performance assessments leading to improvements in operational and tactical control are conducted through a two-tiered approach: 1) Meteorological and Oceanographic (METOC) Decision Aids and, 2) Operational Effects Decision Aids (OEDAs). METOC Decision Aides consist of a series of analysis tools which characterize the physical environment conditions of the battlespace based on the best set of physical environment data available at the time (i.e., some combination of historical and/or real-time (or near real-time) in-situ, and numerically modeled forecast data). OEDAs use the METOC Decision Aide information by fusing it with relevant, often-classified, sensor and target data to predict how weapons and sensor systems will perform. Performance results are displayed in tabular and graphic formats integrated into net-centric visualization tools for use by mission planners, and combat/weapon system operators to develop localization plans, USW/AAW/ASUW screens, STW profiles, and AMW ingress and egress points. METOC Decision Aides and OEDAs typically use data derived from sensors developed in Project 2341 (METOC Data Acquisition) and assimilated by software produced by Project 2342 (METOC Data Assimilation and Modeling). METOC Decision Aides and OEDAs also use data obtained through direct interfaces to Navy combat systems. Cyber secure capabilities are a current emphasis required to characterize and/or predict sensor and weapons system performance in the highly complex littoral environments in support of regional conflict scenarios. It addresses multi-warfare areas, particularly shallow water ASW, NSW, and missile and air defense/strike capabilities.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 2343 / *Tactical METOC Applications*

Funding supports development and integration efforts for Meteorological and Oceanographic (METOC) systems to generate and collect METOC data and fuse multiple intelligence inputs to more robustly characterize and predict tactical atmospheric and oceanographic conditions. This integrated METOC picture will support real-time battlespace awareness of propagation conditions affecting signals across the electromagnetic spectrum. METOC data will be fused with other intelligence data and automatically provided to shipboard combat systems to inform kinetic and non-kinetic fires.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Naval Integrated Tactical Environmental System Next Generation (NITES-Next)	11.448	0.000	0.000	0.000	0.000
Articles:	-	-	-	-	-
FY 2019 Plans: N/A					
FY 2020 Base Plans: N/A					
FY 2020 OCO Plans: N/A					
Accomplishments/Planned Programs Subtotals	11.448	0.000	0.000	0.000	0.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

The NITES-Next program acquisition, management and contracting strategies are to support the Tactical Meteorology & Oceanography (METOC) Applications project to continue the development of state-of-the-art software capabilities that provide sensor, communication, and weapon system performance assessment capabilities for open ocean and littoral operating environments. The Department of the Navy (DoN) maintains management oversight of the Naval Integrated Tactical Environmental System Next Generation (NITES-Next) program's acquisition and contracting strategies. The Department of the Navy (DoN) requirements for the Naval Integrated Tactical Environmental System Next Generation (NITES-Next) program's acquisition and contracting strategies are based on approved Joint Capabilities Integration and Development System (JCIDS) documentation.

E. Performance Metrics

Goal: Field software decision aid capabilities for Navy and Marine Corps war fighters in order to facilitate the characterization and prediction of the physical environment in the battlespace.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 2343 / *Tactical METOC Applications*

Metric: Meet the performance metrics identified in approved NITES-Next Program's requirements documents (e.g., Concept Definition Document (CDD) and individual Requirements Definition Packages (RDPs)).

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603207N / *Air/Ocean Tactical Applications*	Project (Number/Name) 2343 / *Tactical METOC Applications*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Product Development Prior Year	Various	Various : Various	117.115	0.000		0.000		0.000		-		0.000	0.000	117.115	-
NITES-Next	WR	SSC Pacific : San Diego, CA	23.946	3.491	Dec 2017	0.000		0.000		-		0.000	0.000	27.437	-
NITES-Next	C/FP	SAIC : Virginia	9.916	2.051	Dec 2017	0.000		0.000		-		0.000	0.000	11.967	-
NITES-Next	WR	SSC Atlantic : South Carolina	0.376	0.087	Oct 2017	0.000		0.000		-		0.000	0.000	0.463	-
NITES-Next / Engineering	C/IDIQ	NAVSUP : Pennsylvania	1.300	0.000		0.000		0.000		-		0.000	0.000	1.300	-
NITES-Next / Engineering	C/IDIQ	SSC Pacific : Various	0.225	3.791	May 2018	0.000		0.000		-		0.000	0.000	4.016	-
		Subtotal	152.878	9.420		0.000		0.000		-		0.000	0.000	162.298	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Support Prior Year	Various	Various : Various	0.720	0.000		0.000		0.000		-		0.000	0.000	0.720	-
NITES-Next	C/FP	SAIC : Virginia	6.415	1.232	Dec 2017	0.000		0.000		-		0.000	0.000	7.647	-
		Subtotal	7.135	1.232		0.000		0.000		-		0.000	0.000	8.367	N/A

Management Services ($ in Millions)

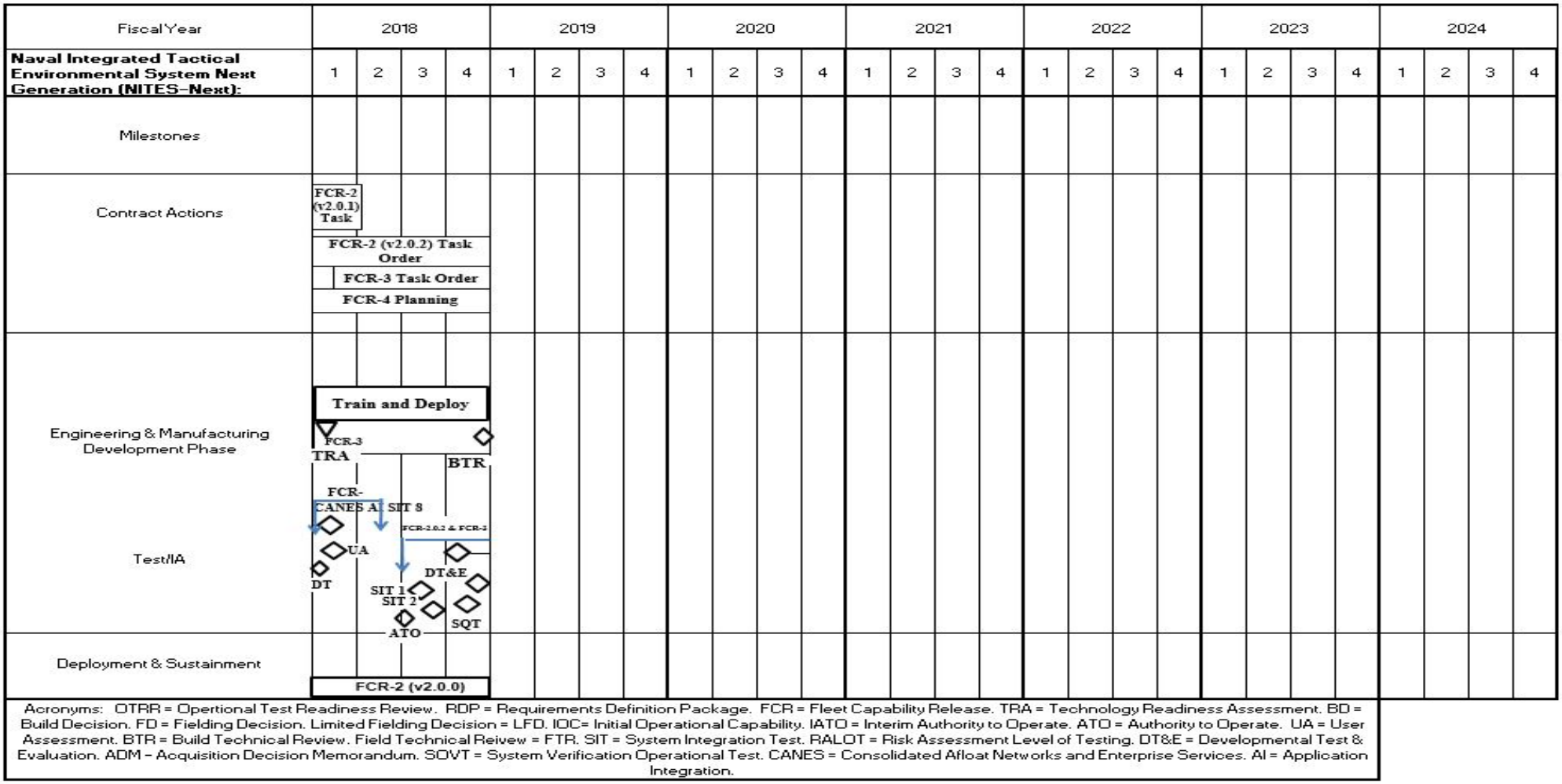
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Management Services Prior Year	Various	Various : Various	0.031	0.000		0.000		0.000		-		0.000	0.000	0.031	-
NITES-Next	WR	SSC Pacific : San Diego, CA	1.433	0.303	Dec 2017	0.000		0.000		-		0.000	0.000	1.736	-
NITES-Next	C/FP	BAH : San Diego, CA	2.247	0.493	Dec 2017	0.000		0.000		-		0.000	0.000	2.740	-
		Subtotal	3.711	0.796		0.000		0.000		-		0.000	0.000	4.507	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603207N / *Air/Ocean Tactical Applications*	Project (Number/Name) 2343 / *Tactical METOC Applications*	

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	163.724	11.448		0.000		0.000		-		0.000	0.000	175.172	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 2343 / *Tactical METOC Applications*



Acronyms: OTRR = Opertional Test Readiness Review. RDP = Requirements Definition Package. FCR = Fleet Capability Release. TRA = Technology Readiness Assessment. BD = Build Decision. FD = Fielding Decision. Limited Fielding Decision = LFD. IOC= Initial Operational Capability. IATO = Interim Authority to Operate. ATO = Authority to Operate. UA = User Assessment. BTR = Build Technical Review. Field Technical Reivew = FTR. SIT = System Integration Test. RALOT = Risk Assessment Level of Testing. DT&E = Developmental Test & Evaluation. ADM – Acquisition Decision Memorandum. SOVT = System Verification Operational Test. CANES = Consolidated Afloat Networks and Enterprise Services. AI = Application Integration.

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 2343 / *Tactical METOC Applications*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Naval Integrated Tactical Environmental System Next Generation (NITES-Next)				
Milestones: Build Decision (BD) Fleet Capability Release - 3	2	2018	2	2018
Contract Actions: FCR-2 Task Order (v2.0.1)	1	2018	2	2018
Contract Actions: FCR-2 Task Order (v2.0.2)	1	2018	4	2018
Contract Actions: FCR-3 Task Order	1	2018	4	2018
Contract Actions: FCR-4 Planning	1	2018	4	2018
Engineering & Manufacturing Development Phase: Fleet Capability Release - 2 / Train Deploy	1	2018	4	2018
Engineering & Manufacturing Development Phase: Fleet Capability Release - 3 / Train Deploy	1	2018	4	2018
Engineering & Manufacturing Development Phase: Technology Readiness Assessment - 3	1	2018	1	2018
Engineering & Manufacturing Development Phase: Build Technical Review FCR-3	4	2018	4	2018
Test/IA: Fleet Capability Release - 2	1	2018	2	2018
Test/IA: Fleet Capability Release - 3	3	2018	4	2018
Test/IA: System Integration Test - 1 (FCR-3)	3	2018	3	2018
Test/IA: System Integration Test - 2 (FCR-3)	3	2018	3	2018
Test/IA: Authority to Operate FCR-2.0.2	3	2018	3	2018
Test/IA: System Qualification Test FCR-3	4	2018	4	2018
Test/IA: Developmental Test Fleet Capability Release - FCR-2	1	2018	1	2018
Test/IA: Developmental Test Fleet Capability Release - FCR-3	4	2018	4	2018
Test/IA: User Assessment FCR-2	1	2018	1	2018
Test/IA: CANES AI SIT FCR-2	1	2018	1	2018

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 2343 / *Tactical METOC Applications*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Test/IA: CANES AI SIT FCR-3	4	2018	4	2018
Test/IA: Deployment and Sustainment: Deployment, fielding and Sustainment (OMN)	1	2018	4	2018

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603207N / *Air/Ocean Tactical Applications*	Project (Number/Name) 2344 / *Precise Time and Astrometry*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
2344: *Precise Time and Astrometry*	15.533	4.992	4.556	2.467	-	2.467	3.293	3.209	3.079	3.141	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Precise Timing and Astrometry (PTA) project funds research and development of improvements for the U.S. Master Clock (MC) System, the DoD Time Transfer capability, the Earth Orientation System, and the Astrometric Observation System. The MC System and Time Transfer provides precise time for use in modern military and National Technical Means (NTM) navigation, guidance, positioning, and tracking systems. The Earth Orientation System provides precise Earth Orientation Parameters for use by the DoD and the national civilian infrastructure to establish the specific orientation of the Earth and to provide input to the terrestrial reference frame. The Astrometric Observation System provides the basic data needed to generate the Celestial Reference Frame (CRF) which is the standard for calibrating all inertial navigation systems, satellite orbits, and earth rotation determinations. Improvement to the MC System, Time Transfer, Earth Orientation, and Astrometric Observation Systems are needed to ensure that new and upgraded DoD and NTM capabilities meet their performance requirements. By DoD Directive 4650.06 and OPNAV9420.1B, the U.S. Naval Observatory (USNO), is responsible for coordinating Precise Time and Time Interval (PTTI) requirements and for maintaining a PTTI reference standard (astronomical and atomic) for use by all DoD, federal agencies, and related scientific laboratories. The Navy is also responsible for providing CRF data for military and NTM navigation, positioning, and guidance capabilities to all DoD via DODI 4650.06 and OPNAV9420.1B.

The PTA research and development efforts are focused on several areas relating to timing and time transfer: (1) Fielding of Rubidium Fountain Atomic Clocks and development of improved Global Positioning System (GPS) Timing Receivers in order to meet the precise timing requirements for the GPS III system; (2) Research & development of the capability of distributing timing signals via Optical fiber lines, as an alternative and backup to GPS time distribution; and (3) Research & development into Optical Clock technology, which is expected to be required for future DoD systems. The PTA research and development effort is also focused on the following areas related to Earth Orientation Parameter (EOP) determination: (1) Upgrade of the Very Long Baseline Interferometry (VBLI) data acquisition system / radio telescope at Kokee Park HI; (2) Development of a Software (SW) Correlator for processing of VLBI data, necessary for the generation of Earth Orientation Parameter (EOP) data; (3) Development of the capability for electronic transmission of the VLBI data from remote VLBI sites to the USNO correlator. The new SW Correlator and the eVLBI infrastructure upgrades are necessary in order to support daily updates of EOP data required by GPS III; (4) Development of an automated end-to-end EOP processing system, which combines input from multiple data sets (e.g. VLBI data, GPS orbit data, and laser ranging data, etc.). Automation is necessary to meet future DoD and GPS requirements; and (5) Modifications to the EOP system for compatibility with the new international standard -'VLBI2010'. The PTA research and development for astrometry focuses on 1) 1.8 meter telescope deployment, 2) research into the development of a GPS-denied reference frame as a navigation solution, 3) visible and infrared (IR) instrumentation development. These activities are necessary for producing CRF products for DoD customers in an era of new surveillance, targeting, intelligence, and reconnaissance technologies and instrumentation.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Precise Timing and Astronomy	4.992	4.556	2.467	0.000	2.467

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 2344 / *Precise Time and Astrometry*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Articles:	-	-	-	-	-

Description: Research and development of improvements for the U.S. Master Clock (MC) System, the DoD Time Transfer capability, the Earth Orientation System, and the Astrometric Observation System.

FY 2019 Plans:
- Critical Design Review (CDR) for transceiver for next generation time transfer
- Development of time transfer modem
- Two Way Satellite Time Transfer (TWSTT) enhancements
- Optical Time Transfer: Fiber and Free Space optical time transfer capability development
- Optical Clock Development: characterization of capabilities of thermal calcium beam, frequency comb performance, higher performance development
- Transition Earth Orientation Parameters (EOP) automation products to operations (Initial Operating Capability, IOC)
- Test GPS-denied reference frame data pipeline
- Solar Lunar Almanac Core (SLAC) Shapiro illuminance model study/upgrade
- System Requirements Review (SRR) for next generation infrared astrometric camera
- Initiate development of prototype optical lattice clock (begin materials study)
- Complete 1.8 meter enclosure

FY 2020 Base Plans:
- Continue Critical Design Review (CDR) for transceiver for next generation time transfer
- Continue Two Way Satellite Time Transfer (TWSTT) enhancements
- Continue Optical Time Transfer: Fiber and Free Space optical time transfer capability development
- Optical Clock Development: Assess calcium thermal-beam clock stability,develop spectroscopy on laser-cooled beam
- Transition Earth Orientation Parameters (EOP) automation products to operations (Final Operating Capability FOC)
- Transition GPS-denied reference frame data pipeline to operations
- Continue Solar Lunar Almanac Core (SLAC) Shapiro illuminance model study/upgrade
- Continue development of next generation infrared astrometric camera

FY 2020 OCO Plans:

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 2344 / *Precise Time and Astrometry*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Decrease between FY19 and FY20 due to Time Frequency Distribution System, Assured Timing Services, Kokee Park telescope, Celestial Reference Frame Observations and Earth Orientation Parameters Continuity of Operations, Next generation commercial clock, and STELLA/MICA life cycle support requirement adjustments/ changes. The FY2020 funding request for project 2344 was reduced by $0.479 million to account for the availability of prior year execution balances.					
Accomplishments/Planned Programs Subtotals	4.992	4.556	2.467	0.000	2.467

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

The included technology developments are primarily in-house with selected contractor participation.

E. Performance Metrics

(1) Automated Earth Orientation Parameters reach Initial Operational Capability (IOC).
(2) System Requirements Review for next generation infrared astrometric camera
(3) Demonstrate Free Space Time Transfer Capability
(4) Delivery of first Next Generation Time Transfer transceiver--transition to operations.
(5) 1.8 meter Enclosure Fabrication Completion

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603207N / *Air/Ocean Tactical Applications*	Project (Number/Name) 2344 / *Precise Time and Astrometry*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Primary Hardware Development (NPOI) 1.8m Telescope Project (1)	SS/FFP	Lowell Observatory : Flagstaff, AZ	0.200	0.000		0.000		0.000		-		0.000	0.000	0.200	-
Primary Hardware Development (NPOI) 1.8m Telescope (2)	SS/FFP	AZ Embeded System : Not Specified	0.500	0.000		0.000		0.000		-		0.000	0.000	0.500	-
Ancillary Hardware Development 1	Various	U.S. Naval Observatory : Washington, DC	0.155	0.018	Dec 2017	0.060	Dec 2018	0.075	Dec 2019	-		0.075	0.000	0.308	-
Ancillary Hardware Development 2	Various	U.S. Naval Observatory : Washington, DC	0.154	0.018	Jan 2018	0.060	Jan 2019	0.075	Jan 2020	-		0.075	0.000	0.307	-
Ancillary Hardware Development 3	Various	U.S. Naval Observatory : Washington, DC	0.192	0.018	Apr 2018	0.060	Apr 2019	0.075	Apr 2020	-		0.075	0.000	0.345	-
Ancillary Hardware Development 4	Various	U.S. Naval Observatory : Washington, DC	0.097	0.018	Jul 2018	0.060	Jul 2019	0.075	Jul 2020	-		0.075	0.000	0.250	-
Primary Hardware Development for CTD (System Integration)	C/FP	Classified : Not Specified	0.000	0.000		0.000		0.000		-		0.000	0.000	0.000	-
Primary Hardware Development for CTD (RF Interface)	MIPR	Classified : Not Specified	4.980	0.660	Mar 2018	0.000		0.000		-		0.000	0.000	5.640	-
Primary Hardware Development for CTD (Line Interface)	MIPR	Classified : Not Specified	2.219	0.830	Jun 2018	0.000		0.000		-		0.000	0.000	3.049	-
Primary Hardware Development for CTD (Reference Upgrade)	C/FFP	Symmetricom : San Jose, CA	0.400	0.150	Jul 2018	0.000		0.000		-		0.000	0.000	0.550	-
Next Generation Secure Time Transfer	C/FFP	Classified : Not Specified	0.934	0.273	Jul 2018	0.500	Mar 2019	0.158	Mar 2020	-		0.158	0.565	2.430	-
1.8 meter infrared camera development	C/FFP	Classified : Not Specified	0.000	0.000		0.931	Jan 2019	0.414	Jan 2020	-		0.414	4.249	5.594	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603207N / *Air/Ocean Tactical Applications*	Project (Number/Name) 2344 / *Precise Time and Astrometry*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Primary Hardware Development (Site Prep)	SS/FFP	NASA/GSFC : HI	0.000	0.100	Jan 2018	0.000		0.000		-		0.000	0.000	0.100	-
Primary Hardware Development (Antenna Receiver Electronics)	C/FFP	NASA : GSFC	1.000	0.000		0.000		0.000		-		0.000	0.000	1.000	-
1.8 meter Telescope Enclosure	C/FFP	NAVFAC SW : Not Specified	0.000	2.153	Mar 2018	0.000		0.000		-		0.000	0.000	2.153	-
Advanced Time and Frequency Tranfer Upgrade	C/FFP	Classified : Not Specified	0.000	0.000		0.500	Jul 2019	0.150	Jul 2020	-		0.150	0.600	1.250	-
Optical Lattice Clocks	C/FFP	Classified : Not Specified	0.000	0.000		0.500	Jul 2019	0.150	Jul 2020	-		0.150	0.600	1.250	-
		Subtotal	10.831	4.238		2.671		1.172		-		1.172	6.014	24.926	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Development Support (All PTA - Labor) 1	Allot	U.S. Naval Observatory (Civilian Labor) : Washington, DC	0.450	0.078	Dec 2017	0.115	Dec 2018	0.118	Dec 2019	-		0.118	Continuing	Continuing	Continuing
Development Support (All PTA - Labor) 2	Allot	U.S. Naval Observatory (Civilian Labor) : Washington, DC	0.450	0.078	Mar 2018	0.115	Mar 2019	0.118	Mar 2020	-		0.118	Continuing	Continuing	Continuing
Development Support (All PTA - Labor) 3	Allot	U.S. Naval Observatory (Civilian Labor) : Washington, DC	0.450	0.078	Jun 2018	0.115	Jun 2019	0.118	Jun 2020	-		0.118	Continuing	Continuing	Continuing
Development Support (All PTA - Labor) 4	Allot	U.S. Naval Observatory (Civilian	0.450	0.078	Jul 2018	0.115	Jul 2019	0.118	Jul 2020	-		0.118	Continuing	Continuing	Continuing

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603207N / *Air/Ocean Tactical Applications*	Project (Number/Name) 2344 / *Precise Time and Astrometry*	

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
		Labor) : Washington, DC													
Software Development (EOP Automation)	C/FFP	U.S. Naval Observatory (Civilian Labor) : Washington, DC	1.380	0.056	Jun 2018	0.537	Jun 2019	0.250	Jun 2020	-		0.250	0.000	2.223	-
Travel 1	Allot	U.S. Naval Observatory (Civilian Travel) : Varies	0.032	0.011	Oct 2017	0.000		0.000		-		0.000	0.000	0.043	-
Travel 2	Allot	U.S. Naval Observatory (Civilian Travel) : Varies	0.032	0.011	Jan 2018	0.000		0.000		-		0.000	0.000	0.043	-
Travel 3	Allot	U.S. Naval Observatory (Civilian Travel) : Varies	0.033	0.011	Apr 2018	0.000		0.000		-		0.000	0.000	0.044	-
Travel 4	Allot	U.S. Naval Observatory (Civilian Travel) : Varies	0.033	0.011	Jul 2018	0.000		0.000		-		0.000	0.000	0.044	-
VLBI2010 Testing and Integration	MIPR	NASA : GSFC	0.905	0.000		0.000		0.000		-		0.000	0.000	0.905	-
Software Development (SW Correlator GUI)	C/FFP	U.S. Naval Observatory : Washington, DC	0.000	0.000		0.000		0.000		-		0.000	0.000	0.000	-
Astrometric Development	C/FFP	U.S. Naval Observatory : Washington, DC	0.487	0.000		0.261	Mar 2019	0.000		-		0.000	0.000	0.748	-
EOP Optimal Estimation	C/FFP	NASA : GSFC	0.000	0.000		0.125	Feb 2019	0.125	Feb 2020	-		0.125	0.500	0.750	-
Foreign GNSS	C/FFP	Classified : Not Specified	0.000	0.000		0.125	Feb 2019	0.125	Feb 2020	-		0.125	0.500	0.750	-
SLAC Software Upgrade	C/FFP	Classified : Not Specified	0.000	0.000		0.377	Mar 2019	0.323	Mar 2020	-		0.323	0.690	1.390	-
Primary Hardware Development (NPOI) 1.8m Telescope Project (2)	SS/FFP	NASA : Varies	0.000	0.342	Feb 2018	0.000		0.000		-		0.000	0.000	0.342	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 2344 / *Precise Time and Astrometry*

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
		Subtotal	4.702	0.754		1.885		1.295		-		1.295	Continuing	Continuing	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	15.533	4.992		4.556		2.467		-		2.467	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 2344 / *Precise Time and Astrometry*

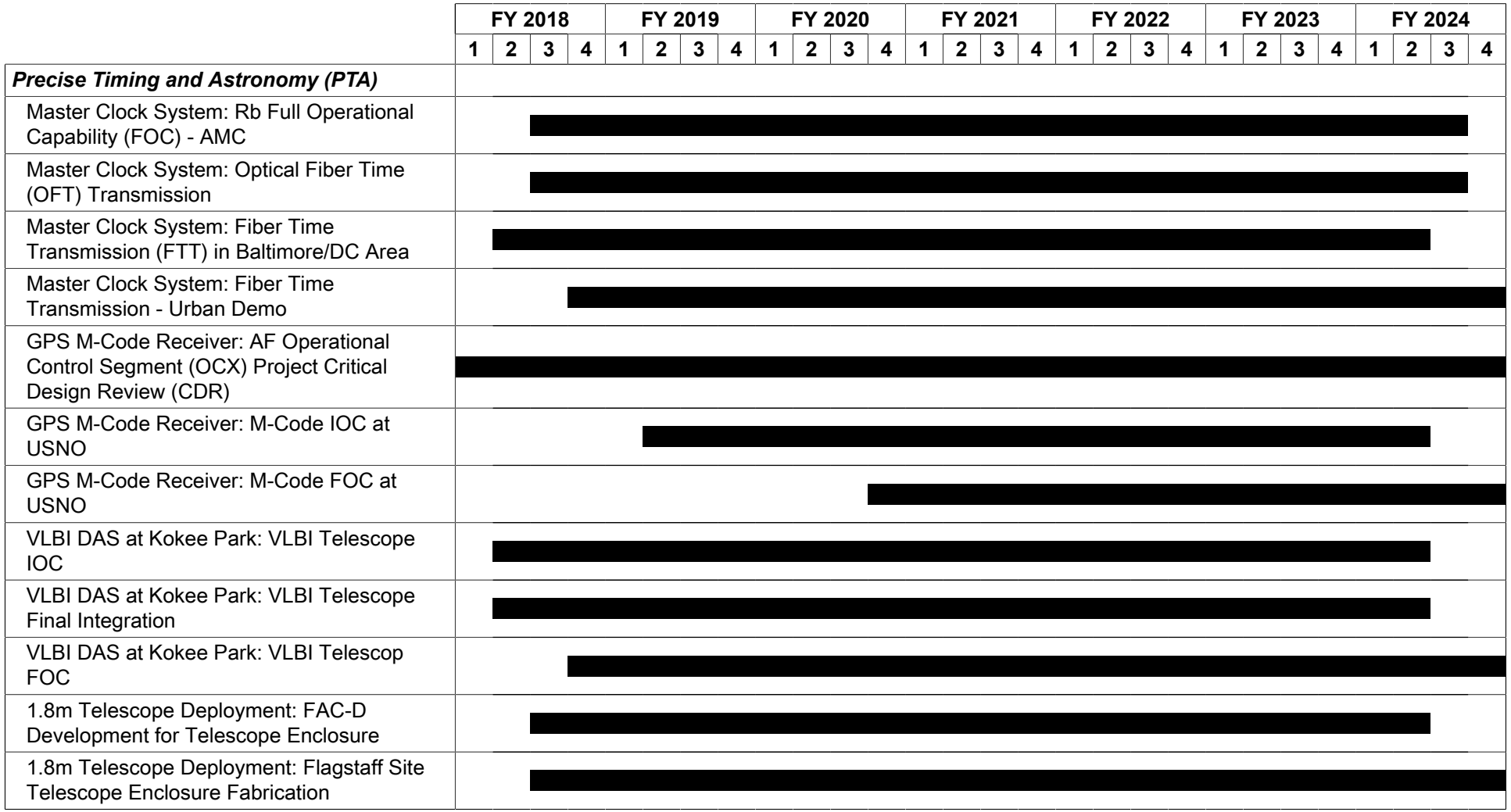


Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 2344 / *Precise Time and Astrometry*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Precise Timing and Astronomy (PTA)				
Master Clock System: Rb Full Operational Capability (FOC) - AMC	3	2018	3	2024
Master Clock System: Optical Fiber Time (OFT) Transmission	3	2018	3	2024
Master Clock System: Fiber Time Transmission (FTT) in Baltimore/DC Area	2	2018	2	2024
Master Clock System: Fiber Time Transmission - Urban Demo	4	2018	4	2024
GPS M-Code Receiver: AF Operational Control Segment (OCX) Project Critical Design Review (CDR)	1	2018	4	2024
GPS M-Code Receiver: M-Code IOC at USNO	2	2019	2	2024
GPS M-Code Receiver: M-Code FOC at USNO	4	2020	4	2024
VLBI DAS at Kokee Park: VLBI Telescope IOC	2	2018	2	2024
VLBI DAS at Kokee Park: VLBI Telescope Final Integration	2	2018	2	2024
VLBI DAS at Kokee Park: VLBI Telescop FOC	4	2018	4	2024
1.8m Telescope Deployment: FAC-D Development for Telescope Enclosure	3	2018	2	2024
1.8m Telescope Deployment: Flagstaff Site Telescope Enclosure Fabrication	3	2018	4	2024

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603207N / *Air/Ocean Tactical Applications*	Project (Number/Name) 2363 / *Remote Sensing Capability Development*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
2363: *Remote Sensing Capability Development*	11.128	3.874	0.324	0.327	-	0.327	0.328	0.328	0.000	0.000	0.000	16.309
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Note

Total funding control for Fleet Meteorology & Oceanography (METOC) Equipment (2363) in FY19 and beyond was moved from Program Element (PE) 0603207N into PE 0604218N Air Ocean Equipment Engineering Projects as a result of a Budget Activity (BA) reclassification.

A. Mission Description and Budget Item Justification

Remote Sensing Capability Development characterizes the ocean environment using a variety of remote sensing techniques that provide that capability to discriminate atypical oceanographic phenomena from the natural environment that will greatly improve undersea dominance capabilities. The Naval Oceanographic Office will employ oceanographic data to refine and extend environmental characterization of the phenomena and disseminate data to the Fleet.

Remote Sensing Capability Development characterizes ocean environment using a variety of remote sensing techniques that provide that capability to discriminate atypical oceanographic phenomena from the natural environment that will greatly improve undersea dominance capabilities. The Naval Oceanographic Office will employ oceanographic data to refine and extend environmental characterization of the phenomena and disseminate data to the Fleet.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Remote Sensing Capability Development	3.816	0.000	0.000	0.000	0.000
Articles:	-	-	-	-	-
FY 2019 Plans: N/A					
FY 2020 Base Plans: N/A					
FY 2020 OCO Plans: N/A					
Title: Remote Sensing Capability Dev.	0.058	0.324	0.327	0.000	0.327
Articles:	-	-	-	-	-
Description: Collect remote sensing and ground truth data in various weather and sea states to broaden the range of environmental conditions and reduce uncertainty in environmental prediction. Develop and enhance software algorithms to automatically detect oceanographic phenomena. Integrate algorithms for access over the					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 2363 / *Remote Sensing Capability Development*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
network. Enhance existing toolsets to provide users robust applications to assist in their daily tasks. Develop training to provide the user community education on using the different tools and applications. (Details held at a higher classification) ***FY 2019 Plans:*** Increase investment in new technology that allows for an accelerated pace to detect oceanographic phenomena of ocean science transitions in the interest of national security for Task Force Ocean. ***FY 2020 Base Plans:*** Invest in new technology that allows for an accelerated pace to detect oceanographic phenomena of ocean science transitions in the interest of national security for Task Force Ocean. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** There is no significant change from FY2019 to FY2020					
Accomplishments/Planned Programs Subtotals	3.874	0.324	0.327	0.000	0.327

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Remote Sensing Capability Development is being managed as a Program Executive Office (PEO) Project, via a Project Definition Document (PDD) construct for acquisition rigor and oversight.
Remote Sensing Capability Development is being managed as a PEO Project leveraging the Rapid Development and Deployment (RDD) construct for rigor and discipline.

E. Performance Metrics

Available in the Project's Requirements Definition Package (RDP).
Classified performance metrics are available in the Project's Requirements Definition Package (RDP) approved 14 July 2015

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 2363 / *Remote Sensing Capability Development*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Remote Sensing Capability Development Data Collection	C/FFP	SAIC : Virginia	1.781	0.521	Feb 2018	0.000		0.000		-		0.000	0.000	2.302	-
Remote Sensing Capability Development Data Collection	WR	NRL : Washington, DC	1.942	0.944	Nov 2017	0.000		0.000		-		0.000	0.000	2.886	-
Remote Sensing Capability Development Data Collection	C/FFP	Raytheon : MA	1.070	0.000		0.000		0.000		-		0.000	0.000	1.070	-
Remote Sensing Capability Development Data Collection	WR	NUWC : Keyport, WA	0.232	0.000		0.000		0.000		-		0.000	0.000	0.232	-
Remote Sensing Capability Development Data Collection	C/FFP	Cubic : San Diego, CA	1.041	1.068	Apr 2018	0.000		0.000		-		0.000	0.000	2.109	-
REMOTE SENSING CAPABILITY DEVELOPMENT DATA COLLECTION	Various	VARIOUS : VARIOUS	0.210	0.058	Jan 2018	0.324	Jan 2019	0.327	Nov 2019	-		0.327	5.176	6.095	-
		Subtotal	6.276	2.591		0.324		0.327		-		0.327	5.176	14.694	N/A

Remarks

Due to a change in contract strategy funds were sent to Cubic vice Raytheon beginning in FY17.

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Remote Sensing Capability Development Data Collection	WR	SSC PAC : San Diego, CA	0.967	0.453	Mar 2018	0.000		0.000		-		0.000	0.000	1.420	-
		Subtotal	0.967	0.453		0.000		0.000		-		0.000	0.000	1.420	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603207N / *Air/Ocean Tactical Applications*	Project (Number/Name) 2363 / *Remote Sensing Capability Development*	

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Remote Sensing Capability Development Data Collection	WR	SSC PAC : San Diego, CA	1.922	0.830	Mar 2018	0.000		0.000		-		0.000	0.000	2.752	-
Remote Sensing Capability Development Data Collection	WR	SSC Pacific : SAN DIEGO, CA	1.081	0.000		0.000		0.000		-		0.000	0.375	1.456	-
		Subtotal	3.003	0.830		0.000		0.000		-		0.000	0.375	4.208	N/A

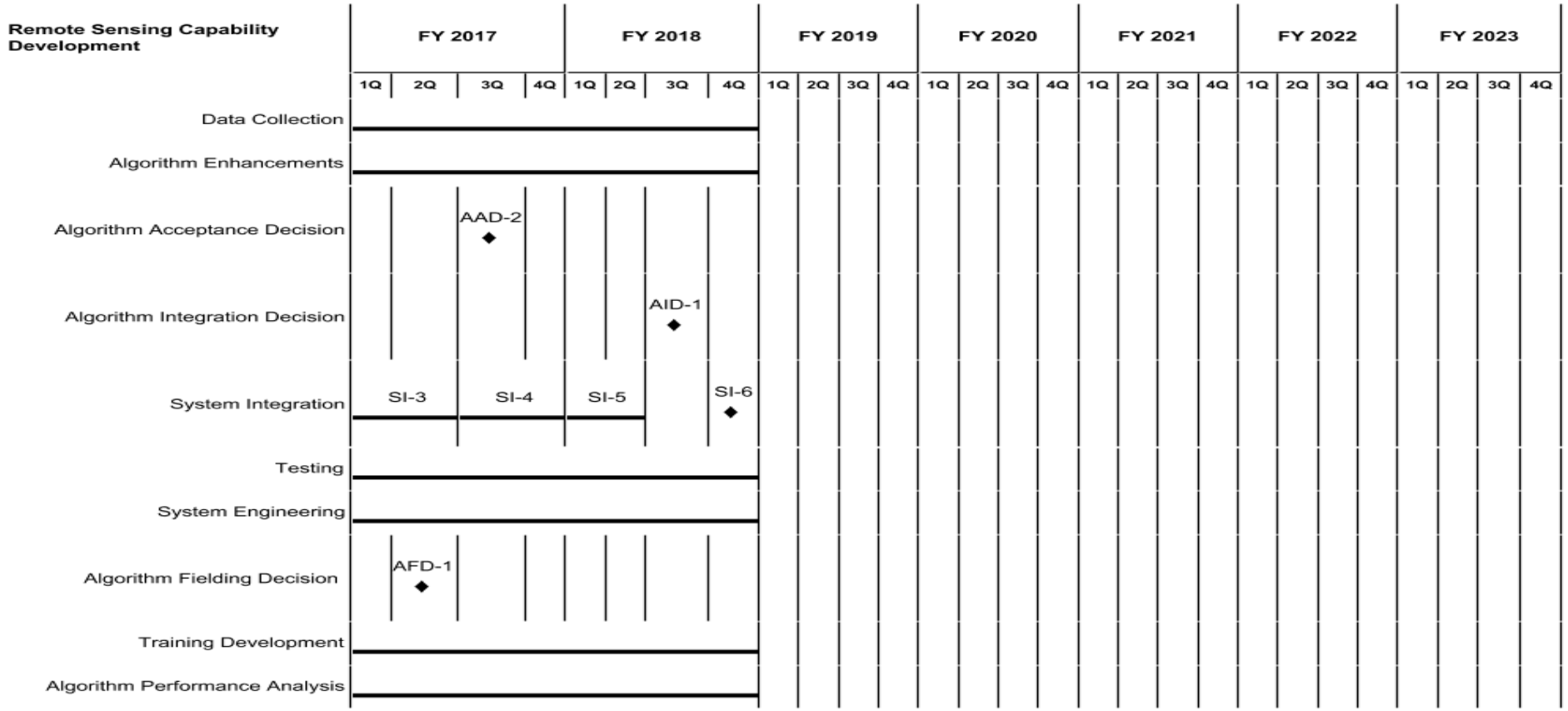
Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Remote Sensing Capability Development Data Collection	C/FP	BAH : Virginia	0.345	0.000		0.000		0.000		-		0.000	0.000	0.345	-
Remote Sensing Capability Development Data Collection	C/FP	BAH : VA	0.537	0.000		0.000		0.000		-		0.000	0.374	0.911	-
		Subtotal	0.882	0.000		0.000		0.000		-		0.000	0.374	1.256	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	11.128	3.874		0.324		0.327		-		0.327	5.925	21.578	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 2363 / *Remote Sensing Capability Development*



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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 2363 / *Remote Sensing Capability Development*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Remote Sensing Capability Development				
Data Collection:	1	2018	4	2018
Algorithm Enhancements:	1	2018	4	2018
Algorithm Integration Decision: Algorithm Integration Decision 1	3	2018	3	2018
System Integration: System Integration 5	1	2018	2	2018
System Integration: System Integration 6	4	2018	4	2018
Testing:	1	2018	4	2018
System Engineering:	1	2018	4	2018
Training Development:	1	2018	4	2018
Algorithm Performance Analysis:	1	2018	4	2018
Remote Sensing Capability Dev.				
Data Collection:: Schedule Detail	1	2019	2	2020
Algorithm Development:: Schedule Detail	1	2019	4	2020
Application Development:: Schedule Detail	1	2018	4	2018
System Integration:: Schedule Detail	3	2019	4	2019
Testing:: Schedule Detail	1	2020	4	2020
System Engineering:: Schedule Detail	1	2020	4	2020
Training Development:: Schedule Detail	1	2018	4	2018

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603207N / *Air/Ocean Tactical Applications*	Project (Number/Name) 3207 / *Fleet Synthetic Training*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
3207: *Fleet Synthetic Training*	2.399	0.243	0.266	0.283	-	0.283	0.305	0.326	0.332	0.339	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Fleet Synthetic Training (FST) provides Naval Forces with an enhanced in-port training capability. Integrating embedded shipboard training devices, aircraft and submarine simulators into an interoperable network with joint, coalition and interagency partners will provide more effective training for our deploying naval forces.

A key factor in achieving this new way of training our Naval Forces is to ensure that the required training is based on realistic characterizations of the physical environment. This project develops and delivers software that characterizes the ocean and atmospheric environments; adjusts to meet fleet-required training scenarios; allows synthetic training to be conducted in areas of planned and contingency operations and provides sufficient detail to simulate the real-world conditions of the physical environment in those areas of interest.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Fleet Synthetic Training	0.243	0.266	0.283	0.000	0.283
Articles:	-	-	-	-	-
Description: Ballistic Missile Defense (BMD) Fleet Synthetic Training (FST) at sea effort will provide the capability to conduct integrated Live, Virtual, and Constructive (LVC) single or multi-ship exercises with ships at sea using the Navy Continuous Training Environment (NCTE). This capability will support BMD mission area Fleet training and mission rehearsal in theater, allow ships to participate in Combatant Command (CCMD) mandated BMD exercises while pier-side or underway, as well as enhance BMD training objective accomplishment in current Optimized Fleet Response Plan (O-FRP) underway training events such as Composite Training Unit Exercises (COMPTUEX) and Joint Task Force Exercises (JTFEX). The NCTE and FST directly support Fleet training readiness, strike group and BMD platform deployment certifications.					
FY 2019 Plans: - Implement On-Demand Cloud-Hosting to dynamically scale to workloads, thus making it more efficient, able to scale up for large jobs, and ultimately saving future operating costs. - Develop a service around advanced propagation model which can be called by any simulation in the Navy Continuous Training Environment (NCTE).					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 3207 / *Fleet Synthetic Training*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
- Devise Ensemble Model extensions to enable registration and cataloging of ensemble members and subsequent generation of products from individual members as well as cross-member analysis products (e.g., probability and/or range and mean products). ***FY 2020 Base Plans:*** - Complete On-Demand Cloud-Hosting to dynamically scale to workloads, thus making it more efficient, able to scale up for large jobs, and ultimately saving future operating costs. - Further develop SensorSim to provide increased simulated sensor effects as an external service to provide standard and consistent sensor effect modeling across the NCTE and offer ease of extension and modification. - Research a Search and Rescue (SAR) capability to provide the necessary environmental data in an executable format with existing capabilities or as an interactive tool to allow an end-user to provide inputs such as the location of the incident and entity in the water, then model the drift path of the object or person. - Implement and execute a service around advanced propagation model which can be called by any simulation in the Navy Continuous Training Environment (NCTE). - Develop Fleet Synthetic Training which provides integrated live, virtual, and constructive single or multi-ship exercises in support of Ballistic Missile Defense (BMD). ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increase between FY19 and FY20 enhances advance technology to support Ballistic Missile Defense Fleet Synthetic Training which provides integrated live, virtual, and constructive single or multi-ship exercises.					
Accomplishments/Planned Programs Subtotals	0.243	0.266	0.283	0.000	0.283

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

The included technology developments are primarily in-house with contractor participation through existing vehicles.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 3207 / *Fleet Synthetic Training*

E. Performance Metrics

1) The Navy will produce meteorological and oceanographic environmental databases for all NCTE exercise areas. Will implement, test, and integrate with Joint Semi Automated Forces (JSAF) and other federates in accordance with requirements.

2) The Navy will complete data and architecture integration, including information assurance compliance for provision of synthetic meteorological and oceanographic data to the NCTE. Data and products will be available via Naval Oceanography Command Portal (NEP-Oc), DVD and/or Machine-to-Machine (M2M) during planning and execution of FST events.

3) The Navy will produce products based on synthetic ocean environment and synthetic satellite/radar imagery based on meteorological environmental data for all NCTE exercise areas. Products are utilized in planning and execution of FST events.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603207N / *Air/Ocean Tactical Applications*	Project (Number/Name) 3207 / *Fleet Synthetic Training*	

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Development Support	WR	AER : VA	0.558	0.083	Jan 2018	0.000		0.106	Jan 2020	-		0.106	Continuing	Continuing	Continuing
Software Development	WR	AER : VA	0.212	0.031	Jan 2018	0.000		0.053	Jan 2020	-		0.053	Continuing	Continuing	Continuing
Configuration Management	WR	AER : VA	0.369	0.039	Jan 2018	0.000		0.043	Apr 2020	-		0.043	0.000	0.451	-
Studies and Analysis	WR	AER : VA	0.469	0.039	Apr 2018	0.000		0.043	Jan 2020	-		0.043	0.000	0.551	-
Award Fees	WR	NAWC TSD (Orlando, FL) : FL	0.093	0.012	Jan 2018	0.000		0.017	Jan 2020	-		0.017	0.000	0.122	-
Technical Data	WR	N/A : N/A	0.119	0.000		0.000		0.000		-		0.000	0.000	0.119	-
		Subtotal	1.820	0.204		0.000		0.262		-		0.262	Continuing	Continuing	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Operational Test & Evaluation	WR	AER : VA	0.321	0.000		0.000		0.000		-		0.000	0.000	0.321	-
Development Test and Evaluation	WR	AER : VA	0.258	0.039	Jan 2018	0.266	Jan 2019	0.021	Jan 2020	-		0.021	0.000	0.584	-
		Subtotal	0.579	0.039		0.266		0.021		-		0.021	0.000	0.905	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	2.399	0.243		0.266		0.283		-		0.283	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 3207 / *Fleet Synthetic Training*

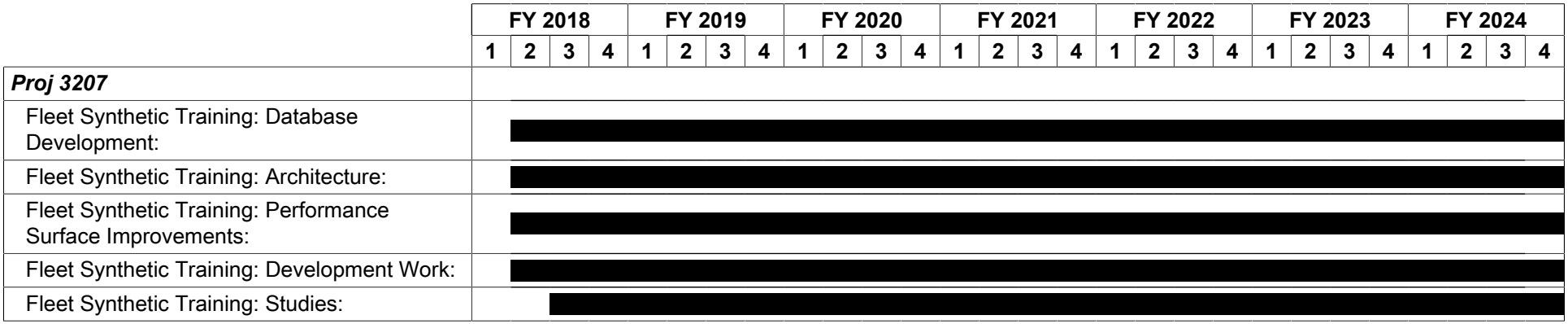


Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 3207 / *Fleet Synthetic Training*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 3207				
Fleet Synthetic Training: Database Development:	2	2018	4	2024
Fleet Synthetic Training: Architecture:	2	2018	4	2024
Fleet Synthetic Training: Performance Surface Improvements:	2	2018	4	2024
Fleet Synthetic Training: Development Work:	2	2018	4	2024
Fleet Synthetic Training: Studies:	3	2018	4	2024

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603207N / *Air/Ocean Tactical Applications*	Project (Number/Name) 3404 / *Tactical Environmental Support*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
3404: *Tactical Environmental Support*	0.000	0.315	2.595	2.619	-	2.619	2.643	2.672	2.684	2.738	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Tactical Environmental Support Project (3404) enables the future warfighter to leverage environmental data gathered, assimilated and predicted under Projects 2341 (METOC Collections) and 2342 (METOC processing) by incorporating them into warfighting technological, net-centric applications that shape the way in which commanders engage the enemy, take full advantage of environmental conditions (and their impacts on systems and sensors) and complete the mission in the most efficient manner feasible. These software decision support tools complement the capabilities found in the Naval Integrated Tactical Environmental System Next Generation (NITES-Next) Program of Record, and provide platform, sensor, communications, and weapon systems performance assessments for littoral and deep-strike warfighters. The following warfighting disciplines benefit directly from these METOC Exploitation capabilities: (1) Undersea Warfare (USW), Anti-Submarine Warfare (ASW), Mine Warfare (MIW), Amphibious Warfare (AMW), Anti-Surface Warfare (ASUW), Anti-Air Warfare, (AAW), Strike Warfare (STW), Expeditionary Warfare (EXW), Electronic Warfare (EW), Information Operations (IO), Intelligence Operations (INT), Non-Combat Operations (NCO), Command, Control, Communication (CCC), and Naval Special Warfare (NSW).

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Tactical Environmental Support	0.315	2.595	2.619	0.000	2.619
Articles:	-	-	-	-	-
Description: The Tactical Environmental Support Project (3404) enables the future warfighter to leverage environmental data gathered, assimilated and predicted under Projects 2341 (METOC Collections) and 2342 (METOC processing) by incorporating them into warfighting technological, net-centric applications that shape the way in which commanders engage the enemy, take full advantage of environmental conditions (and their impacts on systems and sensors) and complete the mission in the most efficient manner feasible. These software decision support tools complement the capabilities found in the Naval Integrated Tactical Environmental System Next Generation (NITES-Next) POR, and provide platform, sensor, communications, and weapon systems performance assessments for littoral and deep-strike warfighters. The following warfighting disciplines benefit directly from these METOC Exploitation capabilities (1) Undersea Warfare (USW), Anti-Submarine Warfare (ASW), Mine Warfare (MIW), Amphibious Warfare (AMW), Anti-Surface Warfare (ASUW), Anti-Air Warfare, (AAW), Strike Warfare (STW), Expeditionary Warfare (EXW), Electronic Warfare (EW), Information Operations (IO), Intelligence Operations (INT), Non-Combat Operations					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 3404 / *Tactical Environmental Support*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
(NCO), Command, Control, Communication (CCC), and Naval Special Warfare (NSW). Accomplishments and plans described below are examples for each effort category. ***FY 2019 Plans:*** - Complete: Provide a new ashore (reach back) radar/radio frequency (RF) and electro-optical (EO) performance products system that is modular, extensible, and high fidelity environmental model-driven that can serve as a replacement for the current tactical decision aids (TDAs) for RF: AREPS (Advanced Refractive Effects Prediction System), and EO: TAWS (Target Acquisition Weapons Software). - Continue: Improve Builder software to include Bragg Line analysis, upgrades to the Ionospheric model and upgrades to output metadata. - Complete: Enhance TrueView/Builder to maximize impact on and relevance to Navy and Marine Corps operations; make it fully compatible with Navy and Marine Corps operational computer systems and networks. - Complete: Leverage The Scalable Tactical Acoustic Propagation Loss Engine (STAPLE) Transitions project to support on-going transition of OAML model and database improvements into STAPLE in order to provide a common core element to a large number of Fleet ASW tactical and high fidelity training systems. - Complete: Improve Parabolic Equation (PE) modeling of passive sonar performance modeling within the TOPSIDE mission planner for regional ASW modeling; improve the physics and utility of the RAM/Seahawk model to extend to higher frequencies. - Complete: Evaluate and develop algorithms that leverage optical remote sensing data from Sentinel-3A, JPSS-1 VIIRS, Sentinel-3B and work toward transition of algorithms. - Complete: Improve the Naval Research Laboratory Atmospheric Acoustic Propagation (NRLAAP) system by developing new multi-vehicle simulation capabilities, incorporating the effects of propagation and ambient noise uncertainty/variability into probability of detection calculations, and improving the efficiency of the model calculations by incorporating advances from the NRL base program "Atmospheric environmental acoustic features for reduction of performance prediction time". - Complete: Work toward EPMA improvements, including: (1) New services to modernize MIW databases for imagery; (2) Refresh of environmental workflows for Bathymetry, Salinity, Temperature, Optics, and Currents; (3) Integration with new Mine Contact Database; (4) Define requirements for integration with Net-Centric Sensor Analysis for Mine Warfare (NSAM), PMS-495, NSWC-PCD; (5) Demonstrate interoperability with latest NSAM service architecture. - Complete: Provide automated mission-relevant water sampling plans with joint optimization of varied observing systems: gliders, profiling floats, shipboard, satellite, buoy, air-deployed, etc.					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 3404 / *Tactical Environmental Support*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
- Complete: Improvement and validation of the Navy Surface Layer Atmospheric Model (NAVSLaM), based on evaluation of recent applied research results and the availability of experimental datasets and produce a sample near-surface Cn2 (turbulence) climatology database for evaluation purposes. - Initiate: Leverage lessons learned from NAVSLaM to create a holistic approach to atmospheric boundary larger turbulence observation, data-basing and modeling, as they pertains to Navy tactical problems. - Initiate: Enhancements to newly fielded RF and EO capability that incorporates Fleet user feedback and tactical lessons learned. - Initiate: Explore synergies with other DoD ocean observation system initiatives in order to rapidly advance and scale-up Navy ocean observation systems, data exfiltration, data assimilation and forward modeling capabilities. - Initiate: Fully explore artificial intelligence (AI) and machine learning aspects of EPMA, to include optimization within private cloud and "big data analytics" architectures. Incorporate "mirrored" test and evaluation computational environments when fielding new EPMA capabilities. - Initiate: Develop technologies that will improve NAVAIR's ability to quickly integrate newly developed NRLAAP capabilities. - Initiate: Explore options in terms of long-term, state-of-the-art maintenance of and improvements to PE and ASW modeling. - Initiate: Explore means of integrating STAPLE with newly developed cloud-based OAML software distribution capability. - Initiate: Make additional modifications to TrueView/Builder in order to meet new Fleet operational and Cyber requirements in an agile manner. - Initiate: Leverage lessons learned from remote sensing data algorithms for use in SmallSats and other newly emerging remote sensing technologies. ***FY 2020 Base Plans:*** In FY 2020 Tactical Environment Support will focus on the Improving the Builder software to include Bragg Line analysis, upgrades to the Ionospheric model and upgrades to output metadata. Leverage lessons learned from NAVSLaM to create a holistic approach to atmospheric boundary larger turbulence observation, data-basing and modeling, as they pertain to Navy tactical problems. Enhancements to newly fielded RF and EO capability that incorporates Fleet user feedback and tactical lessons learned. Explore synergies with other DoD ocean observation system initiatives in order to rapidly advance and scale-up Navy ocean observation systems, data exfiltration, data assimilation and forward modeling capabilities. Fully explore artificial intelligence (AI) and machine learning aspects of EPMA, to include optimization within private cloud and "big data analytics"					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 3404 / *Tactical Environmental Support*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
architectures. Incorporate "mirrored" test and evaluation computational environments when fielding new EPMA capabilities. Develop technologies that will improve NAVAIR's ability to quickly integrate newly developed NRLAAP capabilities. Explore options in terms of long-term, state-of-the-art maintenance of and improvements to PE and ASW modeling. Explore means of integrating STAPLE with newly developed cloud-based OAML software distribution capability. Make additional modifications to TrueView/Builder in order to meet new Fleet operational and Cyber requirements in an agile manner. Leverage lessons learned from remote sensing data algorithms for use in SmallSats and other newly emerging remote sensing technologies. Develop and transition 4D performance surfaces and optimized suite of analyses and forecasts to identify hazardous weather and EM propagation forecasts along Triton UAS flight paths. Sensible weather variables that affect Triton and will be developed include cloud-free line-of-sight, improved turbulence probability, convection and lightning hazard probability, improved flight level winds, and cross-winds at the air base for both takeoff and landing. Algorithms for more physically-based turbulence diagnosis will be developed, along with improve cloud microphysics capable of representing convection and lightning hazards. EM propagation routines will be developed to forecast probability of red detection areas (Priority T-1a, E-1c, and RTP Topic 5). Routines to forecast cloud-free line-of-sight will be developed to forecast EO/IR sensor effectiveness. Integrate Oceanographic and Atmospheric Model Library (OAML) model and database updates into the Scalable Tactical Acoustic Propagation Loss Engine (STAPLE) baseline. Work with the Sensor Optimization Working Group (SOWG) on suitability of OAML updates for Fleet implementation. Provide STAPLE update coordination. Maintain STAPLE configuration management and documentation Incorporate the latest in 6.1/6.2 research into the Navy's operational low-frequency passive acoustic models, Navy Standard Parabolic Equation (NSPE) and Uncertainty Band (uBand). Upgrades to NSPE include ice-					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 3404 / *Tactical Environmental Support*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
covered sea surface elastic effects and a new variable depth grid finite-difference algorithm. Upgrades to uBand include cumulative uncertainty effects, a new input front-end, and several new surface duct treatment algorithms. Modifications to ray path calculations of GRAB-3D for vertical wall scenarios; convert the existing mathematical model to the proposed numerical model accounting for source bearing launch versus target bearing receiving angles; compute the acoustic pressure on a wave at the current source bearing launch angles with Caustic correction; refine/validate CASS-3D with MODSS SDSNE dataset (obtained in Phase I Base); convert validated FORTRAN model to C++ and multi-thread. 6) Develop and document an OAML Submission Plan (OSP), file an ECP, and submit CASS-3D to OAML to begin the approval process Develop techniques to conduct near real-time RF channel estimation using distributed EW/IO receivers in combination with Blue Force emitters of opportunity, and an efficient operator interface and display for interpreting the complex and rapidly changing urface EW environment. PCAP will develop a system that combines previously-developed elements, namely Refractivty Data Fusion (RDF) and Refractivity from Radio (RFR), and makes the information available to an operator in real-time. implement Variable Resolution (VR) BAGs into its survey and production workflow, which will require the development of tools for the exploitation of this new structure. The goal of this effort will be to provide this capability and toolset to NAVOCEANO. The Naval Research Laboratory's (NRL) effort will include the determination of the best approach for design/development of the tools, develop the tools, coordinate appropriate demonstrations to all required parties, and to provide software documentation to the customer. Improve the accuracy of Tactical Decision Aide (TDA) acoustic performance calculations in support of surface ship operations by reconciling Fleet sonar data with the OAML models and databases. Conversely, the Fleet data will be used to validate and upgrade the OAML models and databases. The objective of the effort is to improve the predicted performance of tactical weapon systems by measuring key environmental parameters in the battle space with tactical sensors. This is to be accomplished through the development, demonstration, and transition of new Through-the-Sensor data collection, extraction, processing, and dissemination techniques. System specifications to extract environmental data from tactical warfare sensors for use in on-scene decision aids will be developed. Sensors will include acoustic, oceanographic, and atmospheric environmental sensors. Data transformation goals include environmental data acquisition using					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 3404 / *Tactical Environmental Support*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
advanced data processing techniques and rapid information dissemination capabilities. Data dissemination goals include integrating and exposing sensor data across Navy enclaves. Improve accuracy and efficacy of clutter extraction algorithms and processes utilized in the creation of Clutter databases for NAVO. Process currently utilizes AN/SQQ-89(A) recorded data. This task would also explore feasibility of future real time clutter extraction. Geospatially derived acoustic ground analysis has been shown to yield high correlation with acoustic signal excess range predictions generated from physics-based Transmission-Loss (TL) models. We propose to provide a high-performance tool implementing a promising method by which the integration of empirical geospatial acoustic high/low ground analysis may be used to optimized traditional physics-based sensor performance predictions. These optimizations range from narrowing choices on frequency performance, sensor performance, and range within which TL is computed. The goal of this proposed effort is to improve the accuracy and expand the capabilities of models, algorithms and databases that characterize atmospheric impacts on electromagnetic and electro-optical (EM/EO) sensors, weapons, EW/ES and communications systems. Ultimately, this effort will directly help in providing U.S. warfighters with enhanced battlespace awareness to optimize Electromagnetic Maneuver Warfare (EMW) decision making and planning for the current or predicted environmental conditions. These NPS-developed models, algorithms and databases (including NAVSLaM, EDC, UADC, VRPBA, RSMA-ED, Upper-Air Cn2 models, Cn2 climatology and others) will be submitted to the CNMOC Oceanic and Atmospheric Master Library (OAML) in order to make fully tested, validated, documented and accredited products available "off the shelf" to U.S. DoD researchers and developers of EM/EO prediction TDAs and systems when and as needed. These NPS products are also disseminated to a multitude of U.S. DoD agencies and researchers prior to submission to OAML for research, development, testing and evaluation purposes. Optimize placement of unmanned oceanographic sensors for assimilation into numerical forecasts using technologies such as Guidence for Heterogeneous Observing SysTems (GHOST) developed and maintained by NRL 7300. Optimally integrate the sensor/vehicle allocation, model performance optimization, situational awareness and overall mission planning tasks into capabilities that can be transitioned to the Glider Operations center at NAVOCEANO for use with GHOST guidance. In addition, couple functionality with TOPSIDE software such that the tactical analyst can receive authoritative environmental information to inform operational decisions and to visualize mission definition input as well as platform instruction output from GHOST.					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 3404 / *Tactical Environmental Support*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
work towards transitioning a new probabilistic aerosol forecasting system, ensemble Navy Aerosol Analysis Prediction System (ENAAPS), to operations. ENAAPS was previously ported to the Navy DoD Supercomputing Resource Center (DSRC) computers and developed as a near-real-time (NRT) system run using Cylc with evaluation of the ensemble mean forecast. In the proposed work, new metrics will be developed for evaluating ensemble spread and used to evaluate the NRT 5 day forecasts, bias correction code for post-processing of the ensemble mean forecast will be added to the NRT system, and new probabilistic aerosol products will be developed. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** There is not significant change from FY2019 to FY2020.					
Accomplishments/Planned Programs Subtotals	0.315	2.595	2.619	0.000	2.619

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Acquisition, management and contracting strategies are to support the Tactical Environmental Support Project to develop, demonstrate and validate products and decision aids to understand and predict the impact of the environment on military operations.

E. Performance Metrics

Goal: Develop techniques and tools to transform traditional METOC predicted variables into more directly tactially relevant variables, and allow METOC personnel and others to understand the impact of the environment on sensors, communications, and weapons. Focus areas include, but are not limited to, electromagnetic maneuver warfare, electro-optical impacts (of environment on sensors and weapons systems), and anstisubmarine warfare. Metric -- Tasks will address no less than 75% of applicable capability gaps and requirements.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 3404 / *Tactical Environmental Support*

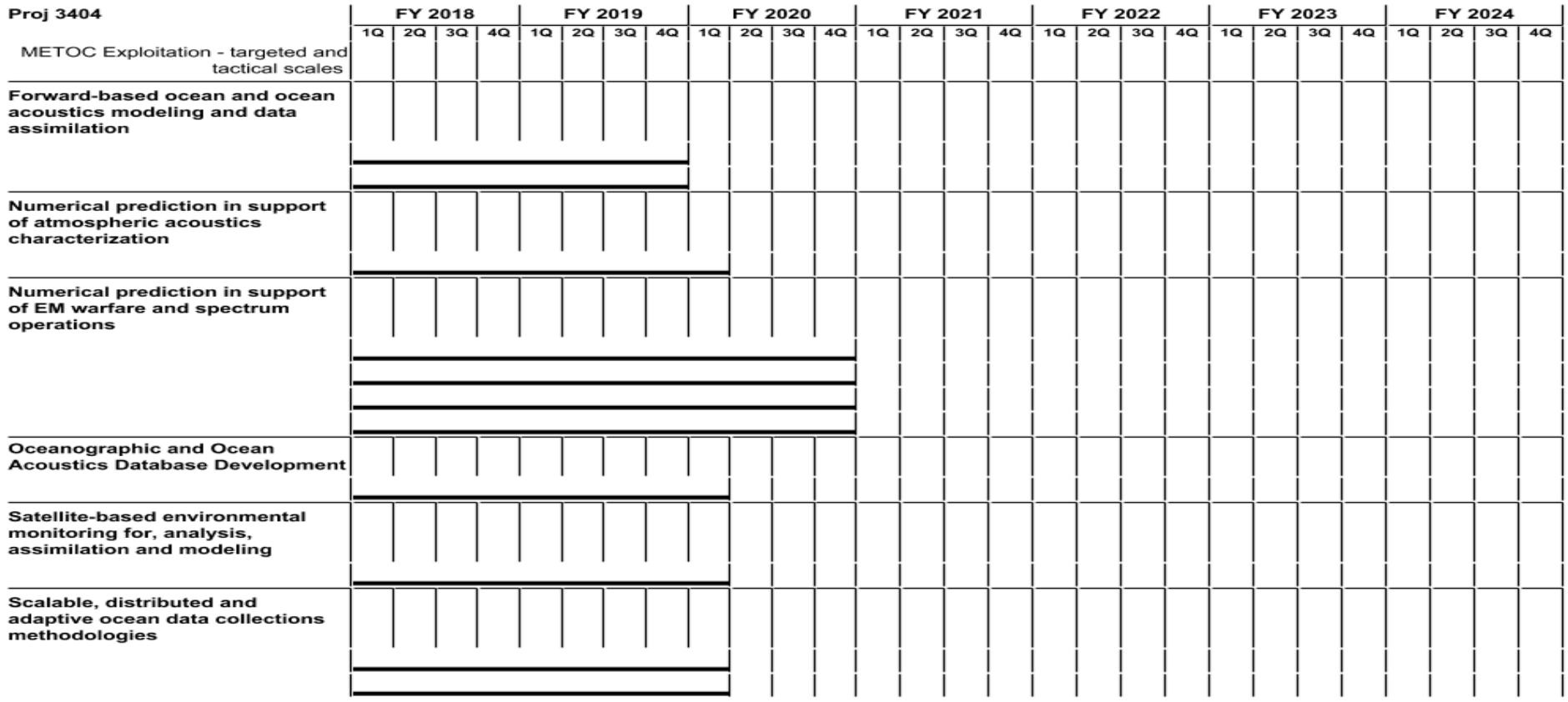
Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
METOC Tactical Environmental Support	WR	NRL : Washington, DC	0.000	0.133	Nov 2017	2.283	Nov 2018	1.319	Nov 2019	-		1.319	0.000	3.735	-
METOC Tactical Environmental Support	WR	NRL : Monterey, CD Stennis Space Center,MS	0.000	0.182	Nov 2017	0.312	Nov 2018	1.300	Nov 2019	-		1.300	Continuing	Continuing	Continuing
METOC Tactical Environmental Support-Staple Transitions	WR	NSWC Carderock : West Bethesda, MD	0.000	0.000	Nov 2017	0.000		0.000		-		0.000	2.500	2.500	-
METOC Tactical Environmental Support	C/FFP	Various : Various	0.000	0.000	Nov 2017	0.000		0.000		-		0.000	0.075	0.075	-
		Subtotal	0.000	0.315		2.595		2.619		-		2.619	Continuing	Continuing	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	0.315		2.595		2.619		-		2.619	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 3404 / *Tactical Environmental Support*



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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 3404 / *Tactical Environmental Support*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 3404				
Forward-based ocean and ocean acoustics modeling and data assimilation: STAPLE Transitions -- NSWCCD	1	2018	4	2019
Forward-based ocean and ocean acoustics modeling and data assimilation: TOPSIDE Acoustics Support / Sonar Performance Engine (SPE)/ RAM-Seahawk Upgrade 1.1 (was FY17-TES-09-N) -- OASIS, Inc.	1	2018	4	2019
Numerical prediction in support of atmospheric acoustics characterization: Atmospheric Acoustic Propagation (AAP) -- NRL-MRY	1	2018	1	2020
Numerical prediction in support of EM warfare and spectrum operations: RTP: Electromagnetic Spectrum Performance Products Ashore -- NRL-MRY / NRL-DC / SSC-PAC	1	2018	4	2020
Numerical prediction in support of EM warfare and spectrum operations: Improved Atmospheric Models for Electromagnetic Maneuver Warfare -- NPS	1	2018	4	2020
Numerical prediction in support of EM warfare and spectrum operations: Navy Electro-Optical Sensor Performance Prediction -- NRL-MRY	1	2018	4	2020
Numerical prediction in support of EM warfare and spectrum operations: NEOSPP and EMSPPA and SSCPAC Code 55280 TrueView team efforts -- SSC-PAC	1	2018	4	2020
Oceanographic and Ocean Acoustics Database Development: Environmental Post-Mission Analysis - TTS ocean and atmosphere data collection -- NRL-SSC	1	2018	1	2020
Satellite-based environmental monitoring for, analysis, assimilation and modeling: Preparing Tactical Optical Ocean Products from Satellite Sensors -- NRL-SSC	1	2018	1	2020
Scalable, distributed and adaptive ocean data collections methodologies: CAST: Cooperative Autonomous Sensing Team -- APL-UW	1	2018	1	2020
Scalable, distributed and adaptive ocean data collections methodologies: Guidance for Heterogeneous Observation Systems (GHOST) -- NRL-SSC	1	2018	1	2020

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603207N / *Air/Ocean Tactical Applications*	Project (Number/Name) 3405 / *Decision Support Products & Dissemination*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
3405: *Decision Support Products & Dissemination*	0.000	0.315	1.094	1.117	-	1.117	1.144	1.171	1.186	1.210	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Decision Support Products & Dissemination efforts enable the future warfighter to leverage environmental data gathered, assimilated, predicted and exploited by optimizing data formatting, compression, packaging, depiction, data-basing and transfer methodologies that permit the rapid dissemination of actionable battlespace environmental (METOC) information over tactical and reach-back networks. This project ensures warfighters, commanders and those who support them are fully synchronized in terms of environmental data products shared among a multitude of platforms, systems and common operating pictures (COPs). METOC information is highly dynamic. Just as time synchronization is essential to navigation principles, timely METOC knowledge and information are vital to battlespace environmental exploitation, placing the warfighter and support elements in spatial and temporal synchronization, and at a collective advantage, in terms of the current and predicted states of the ocean and atmosphere.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Decision Support Products & Dissemination	0.315	1.094	1.117	0.000	1.117
Articles:	-	-	-	-	-
Description: The Decision Support Products and Dissemination Project (3405) enables the future warfighter to leverage environmental data gathered, assimilated, predicted and exploited under Projects 2341 (METOC Collections), 2342 (METOC processing) and 3404 (METOC exploitation) by optimizing data formatting, compression, packaging, depiction, data-basing and transfer methodologies that permit the rapid dissemination of actionable battlespace environmental (METOC) information over tactical and reach-back networks. This project ensures warfighters, commanders and those who support them are fully synchronized in terms of environmental data products shared among a multitude of platforms, systems and common operating pictures (COPs). METOC information is highly dynamic. Just as time synchronization is essential to navigation principles, timely METOC knowledge and information synchronization is vital to battlespace environmental exploitation, placing the warfighter and all of those who support him on the "same sheet of music" and at a collective advantage, in terms of the current and predicted states of the ocean and atmosphere. Accomplishments and plans described below are examples for each effort category. ***FY 2019 Plans:***					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 3405 / *Decision Support Products & Dissemination*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
- Continue: Evaluate global ocean analyses and forecasts from different national/international centers, with respect to both hydrographic and acoustic properties. - Continue: Develop ship routing and base preparedness algorithms so that they can be employed on the following systems: the Automated Tropical Cyclone Forecast System (ATCF), the Joint METOC Viewer (JMV), and the Advanced Weather Interactive Processing System Version II (AWIPS II). - Complete: Provide acoustically consistent oceanographic confidence estimates based on current continuous ocean model/data comparisons for the Navy's operational ocean and acoustics communities. - Complete: Mature the Advanced Air ASW Planning abs Evaluation Tool (A3PET) capabilities already demonstrated in the prototype; provide an intuitive, interactive user interface, and provide a service application programming interface (API) for potential programmatic use by backend components in the future. - Initiate: Explore the use of oceanographic confidence estimates derived from model/data comparisons to improve Navy ocean and acoustic models and tactical decision aids. - Initiate: Leverage lessons learned from ocean analysis and forecast evaluations in order to improve databases, data assimilation techniques and ocean and acoustic models in a more synergistic way. - Initiate: Leverage lessons learned from A3PET to create a holistic approach to real-time ASW mission planning and re-tasking by exploring machine learning, high-performance computing, cloud computing and "big data analytics" aspects of the ASW mission planning and associated ocean environment problem.					
FY 2020 Base Plans: Evaluate global ocean analyses and forecasts from different national/international centers, with respect to both hydrographic and acoustic properties. Complete Develop ship routing and base preparedness algorithms so that they can be employed on the following systems the Automated Tropical Cyclone Forecast System (ATCF), the Joint METOC Viewer (JMV), and the Advanced Weather Interactive Processing System Version II (AWIPS II). Explore the use of oceanographic confidence estimates derived from model/data comparisons to improve Navy ocean and acoustic models and tactical decision aids. Initiate Leverage lessons learned from ocean analysis and forecast evaluations in order to improve databases, data assimilation techniques and ocean and acoustic models in a more synergistic way.					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 3405 / *Decision Support Products & Dissemination*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Leverage lessons learned from A3PET to create a holistic approach to realtime ASW mission planning and retasking by exploring machine learning, highperformance computing, cloud computing and "big data analytics" aspects of the ASW mission planning and associated ocean environment problem. Develop a divisionwide system for verification and validation that includes access to statistics for model runs by authorized external users. By leveraging community based tools, we can build a unified verification framework which is consistent across the suite of models and also consistent with our operational partners. Such a framework would allow us to make use of more modern, feature based verification metrics that can assist with identification and diagnosis of specific sources of model error. In addition, this modern framework would allow NRL to better tailor our verification products to inform data assimilation and model development, as well as the needs of the end user. Finally, a consistent model verification framework would aid in collaboration with other U.S. partners (e.g. NCEP, JEDI) who are employing the same community tools. The goal of this project is to create a framework and supporting technologies that will enable sharing and coordination of METOC data across multiple providers, enclaves, and domains. This includes creating a realtime master index of all model output products across multiple providers and domains, a grid generalization system that is able to pull and transform gridded model outputs from multiple sources, and a modular dissemination system that will support a wide variety of METOC data consumers. Each of these components can exist and operate at multiple nodes across agencies and network domains. extend the Adaptive Air ASW Planning and Evaluation Tool (A3PET) realtime ASW missionplanning tool to incorporate critical capabilities request by Fleet Users. This effort will develop additional capability to the existing tool, including modeling of Active Sonobuoys, modeling buoy drift and buoy deployment latency, as well as adding in overlay import/export functionality for more efficient MPRA mission planning. This effort extends the A3PET MPRA mission planning tool capability delivered in FY18.migrate the OAML library, administrative, and management functions to a cloud based approach. This will provide more efficient maintenance and distribution of the databases, algorithms and models. It will also provide better compatibility with future programs.Implement wind probabilities for Southern Hemisphere, SMOS winds and fixes, RI aid upgrades or consensus upgraded into ATCF; Evaluation of FNMOC version of WAVEWATCH ensemble based on JTWC forecasts.Apply and develop machine learning methods to modeling efforts to help identify model environments and scenarios that help validate the model against measured acoustics and/or reconstruct active acoustic events. ***FY 2020 OCO Plans:***					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 3405 / *Decision Support Products & Dissemination*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** There is no significant change from FY2019 to FY2020.					
Accomplishments/Planned Programs Subtotals	0.315	1.094	1.117	0.000	1.117

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Acquisition, management and contracting strategies are to support the Decision Support Products & Dissemination Project to develop, demonstrate and validate products and decision aids to provide environmentally based recommendations to commanders at the Strategic, Operational, and Tactical levels of military operations.

E. Performance Metrics

Goal: Develop techniques and tools to provide tactially relevant METOC based advice to military commanders. Focus areas include, but are not limited to, electromagnetic maneuver warfare, electro-optical impacts (of environment on sensors and weapons systems), and anstisubmarine warfare. Metric -- Tasks will address no less than 75% of applicable capability gaps and requirements.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603207N / *Air/Ocean Tactical Applications*	Project (Number/Name) 3405 / *Decision Support Products & Dissemination*	

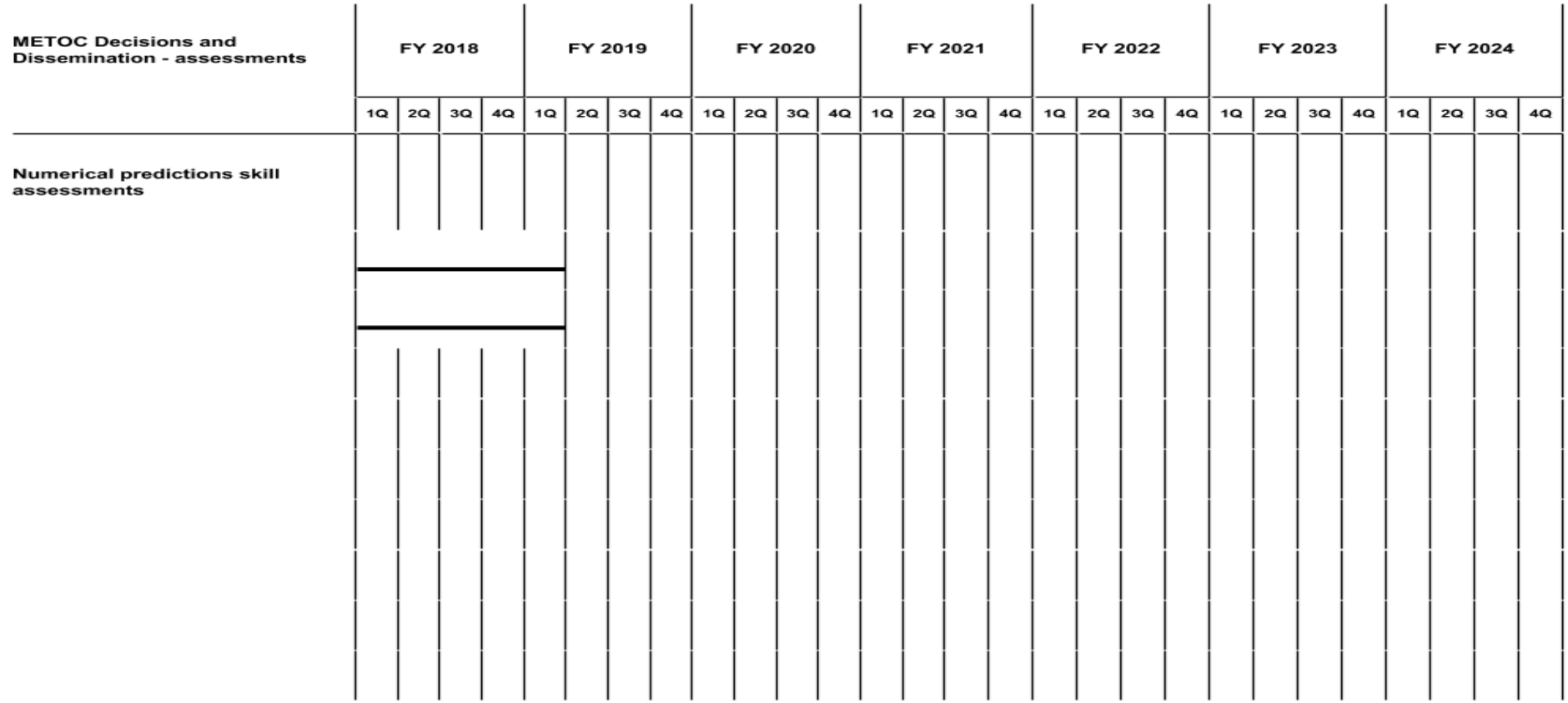
Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
METOC Tactical Environmental Support	WR	NRL : Washington DC	0.000	0.111	Nov 2017	0.232	Nov 2018	0.500	Nov 2019	-		0.500	0.000	0.843	-
METOC Tactical Environmental Support	WR	NRL : Monterey, CA; Dtennis Space Center, MS	0.000	0.100	Nov 2017	0.100	Nov 2018	0.117	Nov 2019	-		0.117	Continuing	Continuing	Continuing
METOC Tactical Environmental Support	C/FFP	Various : Various	0.000	0.104	Nov 2017	0.762	Nov 2018	0.500	Nov 2019	-		0.500	0.000	1.366	-
		Subtotal	0.000	0.315		1.094		1.117		-		1.117	Continuing	Continuing	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	0.315		1.094		1.117		-		1.117	Continuing	Continuing	N/A

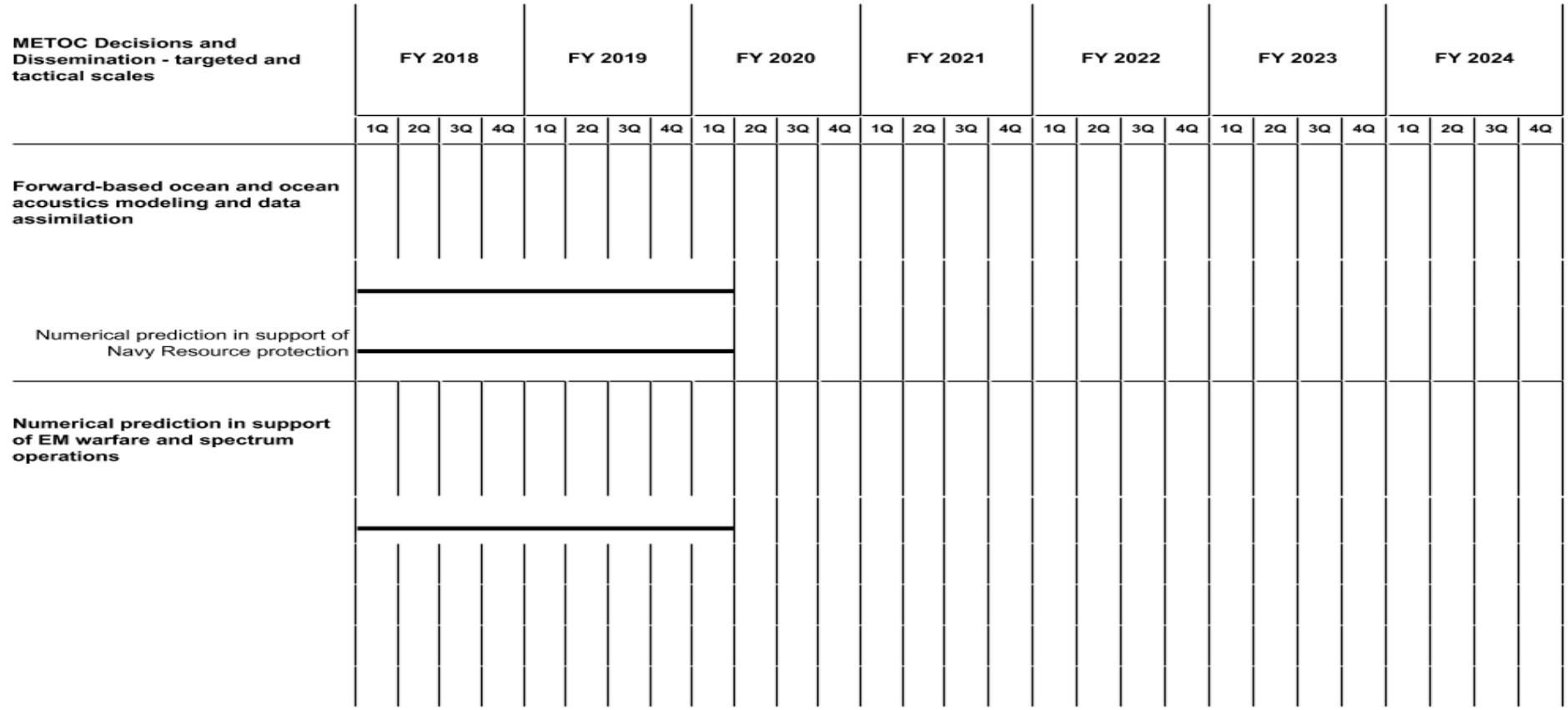
Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 3405 / *Decision Support Products & Dissemination*



2020DON - 0603207N - 3405

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 3405 / *Decision Support Products & Dissemination*



2020DON - 0603207N - 3405

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603207N / *Air/Ocean Tactical Applications*	**Project (Number/Name)** 3405 / *Decision Support Products & Dissemination*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
METOC Decisions and Dissemination - assessments				
Numerical predictions skill assessments: Global Ocean Multi-Model Comparison -- NRL-SSC	1	2018	1	2019
Numerical predictions skill assessments: Ocean model performance indicators for operational Navy ocean and acoustic model assessment -- NRL-SSC	1	2018	1	2019
METOC Decisions and Dissemination - targeted and tactical scales				
Forward-based ocean and ocean acoustics modeling and data assimilation: Adaptive Air ASW Planning and Evaluation Tool	1	2018	1	2020
Forward-based ocean and ocean acoustics modeling and data assimilation: Numerical prediction in support of Navy Resource protection: ship routing and base preparedness algorithms	1	2018	1	2020
Numerical prediction in support of EM warfare and spectrum operations: Environmental Performance Surfaces for OTH Radars and HF Communications (AKA, Pearman OTH RADAR Exploitation) -- NRL-SSC	1	2018	1	2020

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0603216N *I Aviation Survivability*

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	188.346	5.450	7.050	11.919	-	11.919	11.502	11.414	11.488	11.338	Continuing	Continuing
0584: *Acft Protective Clothing*	101.721	2.469	3.918	4.117	-	4.117	4.177	4.213	4.121	4.203	Continuing	Continuing
0591: *Acft Survivability, Vulnerability & Safety*	46.604	1.340	1.502	1.458	-	1.458	1.463	1.502	1.535	1.568	Continuing	Continuing
0592: *Acft & Ordnance Safety*	36.384	1.060	1.047	5.746	-	5.746	5.261	5.084	5.205	4.927	Continuing	Continuing
1819: *CV Acft Fire Suppress System*	3.637	0.581	0.583	0.598	-	0.598	0.601	0.615	0.627	0.640	Continuing	Continuing

A. Mission Description and Budget Item Justification

Aviation Survivability addresses the issues of aircrew and platform survivability, focusing on enhancing overall opportunity for aircrew and platform protection and enhanced performance. The capabilities addressed under this program element counter emerging threats of next generation operational weapons systems and enhance combat effectiveness in future operational mission scenarios.

JUSTIFICATION FOR BUDGET ACTIVITY: This program is funded under ADVANCED COMPONENT DEVELOPMENT AND PROTOTYPES because it includes all efforts necessary to evaluate integrated technologies, representative models or prototype systems in a high fidelity and realistic operating environment.

B. Program Change Summary ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	5.566	7.050	7.271	-	7.271
Current President's Budget	5.450	7.050	11.919	-	11.919
Total Adjustments	-0.116	0.000	4.648	-	4.648
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-0.027	0.000			
• SBIR/STTR Transfer	-0.089	0.000			
• Program Adjustments	0.000	0.000	4.700	-	4.700
• Rate/Misc Adjustments	0.000	0.000	-0.052	-	-0.052

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0603216N *I Aviation Survivability*

Change Summary Explanation

0584 - All efforts have been combined under the area of Advanced Technology Crew Station. All the current research and resultant protective devices within this project unit are designed to improve Human Performance, Protection and Sustainment in the cockpit, and therefore are combined into one overarching area.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603216N / *Aviation Survivability*	Project (Number/Name) 0584 / *Acft Protective Clothing*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
0584: *Acft Protective Clothing*	101.721	2.469	3.918	4.117	-	4.117	4.177	4.213	4.121	4.203	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Project 0584 develops, demonstrates, and validates technologies designed to enhance warfighter performance, protection, injury prevention, mission effectiveness, and survivability. The project addresses aircrew readiness; life support equipment; physiological episodes; hearing protection and communication intelligibility; advanced helmet vision systems; laser eye protection and supporting technologies; escape and crashworthy systems; active/passive restraint systems; survival and evasion; aircrew/injury modeling; crew centered cockpit design control stations and aircraft maintainer protection. Fully protected and mission ready Aircrew are a critical component of Ready Basic Aircraft. The goal is to ensure they are able to perform their mission effectively on time, safely, every time. Project 0584 responds to a number of operational requirements documents, including OR# 210-05-88 for Chemical and Biological protection, OR# 099-05-087 for Laser Eye Protection, Aircrew Laser Eye Protection (ALEP) joint operation requirements document JORD #513-88-99, and Capabilities Program Document (CPD) Night Vision Cueing and Display (NVCD).

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Advanced Technology Crew Station	1.158	1.491	4.117	0.000	4.117
Articles:	-	-	-	-	-
FY 2019 Plans: The government will be investigating the military utility of Magnetorheological (MR)-based damping systems. The goal is to investigate the capability of MR based damping systems to withstand harsh environments found onboard military vessels while continuing to perform as designed. Prototypes delivered under this agreement will be subjected to extremely harsh conditions that are more representative of the expected. These tasks are intended to begin the process of determining the robustness of the system under long periods of exposure to severe environments that exists onboard US Navy helicopters. Prototype goggles using new technology will begin field testing.					
FY 2020 Base Plans: Continue the development and testing of the military utility of Magnetorheological (MR) based vibration damping systems. Testing will investigate the capability of MR based damping systems to withstand harsh environments found onboard air and ground military vehicles where excessive impacts and vibration is causing debilitating injuries. Prototype seating systems will be subjected to longer periods of exposure to extremely harsh conditions that are more representative of the expected field conditions.					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603216N / *Aviation Survivability*	**Project (Number/Name)** 0584 / *Acft Protective Clothing*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Development of High Resolution Digital Night Vision Goggle will continue as a joint effort with the Army. Begin integration of digital night sensors into both goggle and helmet mounted displays formats. Begin human laboratory and field testing. Assess feasibility of increasing the field of view. Advanced component development of a Physiological Monitor Warning System will continue. The objective is to mature the development of the system so it will automatically resolve physiological issues. Testing will be conducted to prove component and subsystem maturity. Continue to development of a biofidelic model of the entire spinal column based on actual human data and responses to stressors ranging from fatigue to blunt force trauma to better predict and prevent incidents that increase the level of back pain and long term disabilities. Redesign head borne prototype systems to increase functionality while reducing/optimizing loading on the head and spine to reduce strain and possible injury. Continue anthropometric assessments of the head, neck, spine, and whole body to mature a digital human modeling capability for aircrew and cockpit integration. Research is ongoing to develop a simple monitor (a small dot) which is placed on the front surface of eyewear to indicate when the device has reached its maximum amount of solar radiation before eyewear protective coating degradation begins and eyes are exposed to damaging solar rays. The effort will now address whether there's an associated degradation in the impact protection of the polycarbonate protective eye wear as the solar exposure increases. Conduct environmental testing and stability over time of the dielectric protective coating. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increase from FY 2019 to FY 2020 due to development and testing to advanced Physiological Monitor Warning System component and subsystem maturity.					
Title: Advanced Integrated Life Support System	1.311	2.427	0.000	0.000	0.000
Articles:	-	-	-	-	-
FY 2019 Plans: The main emphasis will be on designing and constructing a working high resolution fully digital night vision goggle to be followed fully characterizing the subcomponents. ***FY 2020 Base Plans:***					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603216N / *Aviation Survivability*	**Project (Number/Name)** 0584 / *Acft Protective Clothing*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
N/A ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Decrease from FY 2019 to FY 2020 due to moving all efforts to the Advanced Technology Crew Station accomplishment section. All efforts have been combined under the area of Advanced Technology Crew Station. All the current research and resultant protective devices within this project unit are designed to improve Human Performance, Protection and Sustainment in the cockpit, and therefore are combined into one overarching area.					
Accomplishments/Planned Programs Subtotals	2.469	3.918	4.117	0.000	4.117

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• OPN 4268: *Aviation Support Equipment*	63.995	37.874	55.415	0.500	55.915	58.072	61.614	73.629	74.812	Continuing	Continuing

Remarks

D. Acquisition Strategy

Primary Hardware Development for the Navy Advanced Technology Crew Station efforts will be performed under a Cost Plus Fixed Fee Indefinite Delivery Indefinite Quantity contract.

E. Performance Metrics

Develop advanced crashworthy system level models, investigate improved visual search methodologies, and improve the ability to assess cockpit compatibility through new analytic approaches to anthropometry.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603216N / *Aviation Survivability*	**Project (Number/Name)** 0584 / *Acft Protective Clothing*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Systems Engineering	WR	NAWCAD : Pax River MD	34.982	0.485	Dec 2017	0.637	Dec 2018	0.663	Dec 2019	-		0.663	Continuing	Continuing	Continuing
Primary Hardware Development	C/CPFF	Intevac : San Jose CA	5.118	0.489	Jun 2018	1.500	Jun 2019	1.006	Jun 2020	-		1.006	0.000	8.113	8.113
Primary Hardware Development	MIPR	US Army CERDEC : Ft. Belvoir VA	3.515	0.000		0.000		0.050	Jun 2020	-		0.050	0.000	3.565	3.565
Primary Hardware Development	C/CPFF	Innovital : Calverton MD	0.145	0.488	Dec 2017	0.450	Dec 2018	0.150	Dec 2019	-		0.150	0.000	1.233	1.233
Prior Year Prod Dev no Longer Funded in Budget Year or Outyears	Various	Various : Various	23.340	0.000		0.000		0.000		-		0.000	0.000	23.340	23.340
Systems Engineering	WR	NAWCWD : China Lake CA	0.040	0.000		0.000		0.000		-		0.000	0.000	0.040	0.040
Physiological Monitoring	C/CPFF	TBD : TBD	0.000	0.000		0.000		1.000	Mar 2020	-		1.000	0.000	1.000	1.000
		Subtotal	67.140	1.462		2.587		2.869		-		2.869	Continuing	Continuing	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Configuration Management	WR	NAWCAD : Pax River MD	3.007	0.330	Dec 2017	0.490	Dec 2018	0.400	Dec 2019	-		0.400	Continuing	Continuing	Continuing
Prior Year Support no Longer Funded in Budget Year or Outyears	Various	Various : Various	3.232	0.000		0.000		0.000		-		0.000	0.000	3.232	3.232
		Subtotal	6.239	0.330		0.490		0.400		-		0.400	Continuing	Continuing	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603216N / *Aviation Survivability*	Project (Number/Name) 0584 / *Acft Protective Clothing*	

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Developmental Test & Evaluation	WR	NAWCAD : Pax River MD	5.516	0.320	Dec 2017	0.551	Dec 2018	0.558	Dec 2019	-		0.558	Continuing	Continuing	Continuing
Prior Year T&E no Longer Funded in Budget Year or Outyears	Various	Various : Various	18.240	0.000		0.000		0.000		-		0.000	0.000	18.240	18.240
		Subtotal	23.756	0.320		0.551		0.558		-		0.558	Continuing	Continuing	N/A

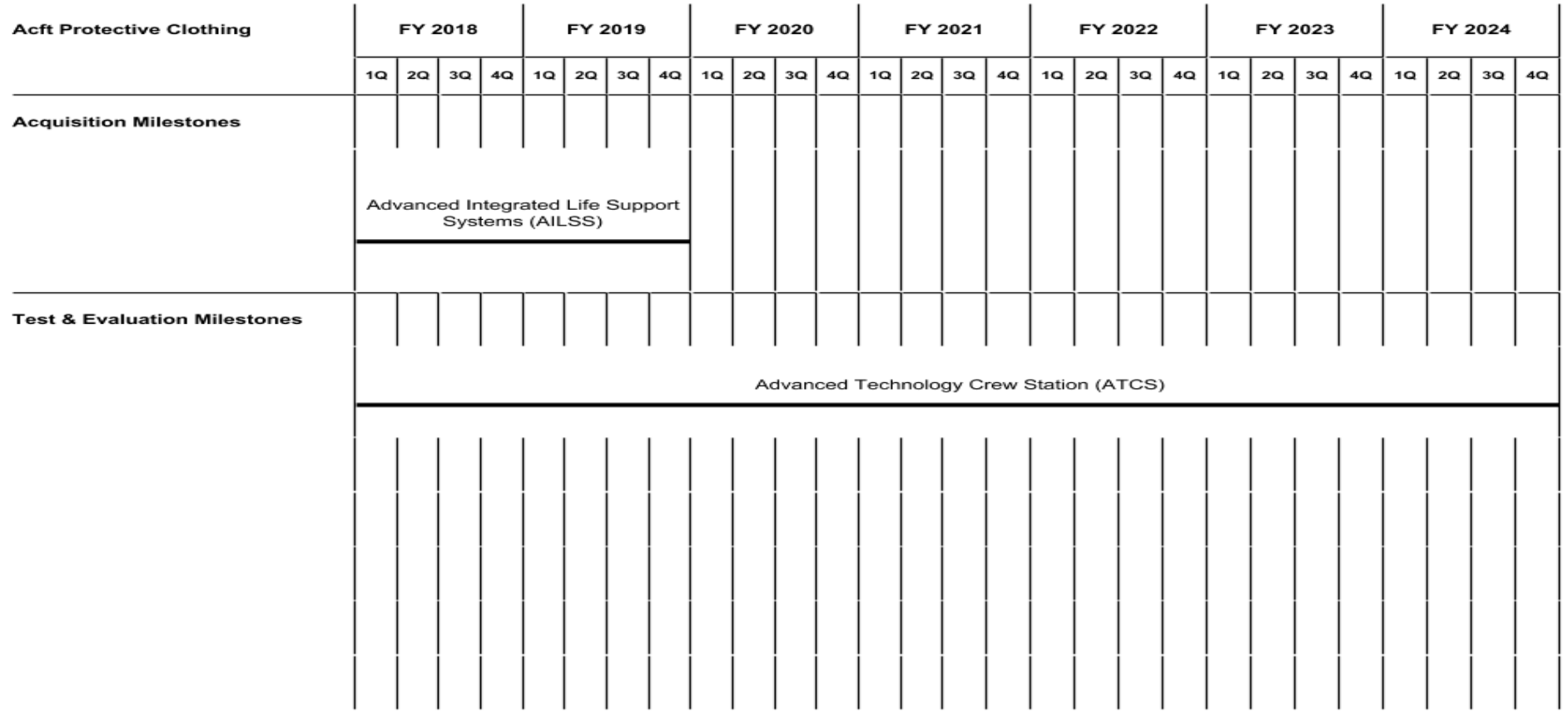
Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management Support	WR	NAWCAD : Pax River MD	4.095	0.342	Dec 2017	0.275	Dec 2018	0.275	Dec 2019	-		0.275	Continuing	Continuing	Continuing
Travel	PO	NAVAIR : Pax River MD	0.481	0.015	Oct 2017	0.015	Oct 2018	0.015	Oct 2019	-		0.015	Continuing	Continuing	Continuing
Prior Year Mgmt Svcs no Longer Funded in Budget Year or Outyears	Various	Various : Various	0.010	0.000		0.000		0.000		-		0.000	0.000	0.010	0.010
		Subtotal	4.586	0.357		0.290		0.290		-		0.290	Continuing	Continuing	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	101.721	2.469		3.918		4.117		-		4.117	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603216N / *Aviation Survivability*	**Project (Number/Name)** 0584 / *Acft Protective Clothing*



2020DON - 0603216N - 0584

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603216N / *Aviation Survivability*	**Project (Number/Name)** 0584 / *Acft Protective Clothing*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Acft Protective Clothing				
Acquisition Milestones: Advanced Integrated Life Support Systems (AILSS)	1	2018	4	2019
Test & Evaluation Milestones: Advanced Technology Crew Station	1	2018	4	2024

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603216N / *Aviation Survivability*	Project (Number/Name) 0591 / *Acft Survivability, Vulnerability & Safety*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
0591: *Acft Survivability, Vulnerability & Safety*	46.604	1.340	1.502	1.458	-	1.458	1.463	1.502	1.535	1.568	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Aircraft Survivability, Vulnerability and Safety. This project develops prototype hardware to improve the survivability of Navy and Marine Corps aircraft. This project addresses the likelihood of an aircraft being hit (susceptibility) and the probability of a kill if the aircraft is hit (vulnerability). Types of programs funded under this project include signature reduction efforts, subsystem and component hardening and development of fire and explosion suppression techniques for fuel systems.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Technology Requirements	0.028	0.045	0.040	0.000	0.040
Articles:	-	-	-	-	-
FY 2019 Plans: Planned trade studies include threats assessments, vulnerability assessments of both rotary wing and fixed wing aircraft, and updates to the Survivability Master Plan.					
FY 2020 Base Plans: Planned trade studies include: threats assessments; vulnerability assessments of both rotary wing and fixed wing aircraft; efficacy of USN/USMC simulation training systems within the updated threat system and EW environment.					
FY 2020 OCO Plans: N/A					
FY 2019 to FY 2020 Increase/Decrease Statement: Technology Requirements decreased from FY 2019 to FY 2020 because the master plan won't be updated in FY 2020					
Title: Technology Design & Development	1.260	1.437	1.218	0.000	1.218
Articles:	-	-	-	-	-
FY 2019 Plans:					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603216N / *Aviation Survivability*	**Project (Number/Name)** 0591 / *Acft Survivability, Vulnerability & Safety*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Integrate results from technology evaluation efforts to address program office survivability shortfalls with specific emphasis on iASE capability. ***FY 2020 Base Plans:*** Conduct asymmetric threats modeling and analyses based on OASIS simulation study. Integrate iASE architecture within the USN/USMC simulation and training system environment. Advance model development relating to Advanced Electronic Attack, Electro-Magnetic Maneuver Warfare, and spectrum dominance in support of air combat training and Live Virtual Constructive capabilities to improve aircraft survivability and lethality. Conduct combat situational awareness analyses to integrate existing federated capabilities. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Technology Design and Development decreased from FY 2019 to FY 2020 because it is anticipated that design and development efforts with countermeasures simulation hardware will have progressed to the point that prototype testing will begin in FY 2020.					
Title: Technology Test & Evaluation	0.052	0.020	0.200	0.000	0.200
Articles:	-	-	-	-	-
FY 2019 Plans: Implement test planning simulation solutions in a laboratory environment. ***FY 2020 Base Plans:*** Integration, laboratory, and flight testing of prototype hardware in support of the Integrated Aircraft Survivability Equipment architecture development and in support of countermeasures simulation hardware. Integrate and chamber test Live Virtual Constructive solutions. Begin testing combat situational awareness capability in a simulated environment. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Technology Test and Evaluation increased from FY 2019 to FY 2020 because it is anticipated that prototype testing of countermeasures simulation hardware will begin in FY 2020					
Accomplishments/Planned Programs Subtotals	1.340	1.502	1.458	0.000	1.458

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603216N / *Aviation Survivability*	**Project (Number/Name)** 0591 / *Acft Survivability, Vulnerability & Safety*

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Primary Hardware Development will be performed under either a Cost Plus Fixed Fee or a Firm Fixed Price contract.

E. Performance Metrics

Evaluate 100% of deployed/developmental United States Navy/United States Marine Corp aircraft platforms for survivability deficiencies using Navy gap analysis as baseline. Identify prototype hardware solutions to address 25% to 50% of deficiencies, and initiate a minimum of two new demonstration projects per year.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603216N / *Aviation Survivability*	Project (Number/Name) 0591 / *Acft Survivability, Vulnerability & Safety*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Systems Engineering	WR	NAWCAD : Pax River, MD	13.000	0.130	Oct 2017	0.207	Oct 2018	0.276	Oct 2019	-		0.276	Continuing	Continuing	Continuing
Systems Engineering	WR	NAWCWD : China Lake, CA	0.353	0.000		0.030	Oct 2018	0.150	Oct 2019	-		0.150	Continuing	Continuing	Continuing
Systems Engineering	MIPR	DTIC : Ft. Belvoir, VA	0.520	0.193	Jan 2018	0.600	Jan 2019	0.692	Jan 2020	-		0.692	0.000	2.005	2.005
System Engineering	C/CPFF	Engility : Chantilly, VA	2.608	0.968	Oct 2017	0.600	Oct 2018	0.000		-		0.000	0.000	4.176	4.176
Prior Year Prod Dev cost no longer funded in FYDP	Various	Various : Various	17.692	0.000		0.000		0.000		-		0.000	0.000	17.692	17.692
System Engineering	C/CPFF	TEKLA : Dumfries, VA	0.000	0.000		0.000		0.100	Dec 2019	-		0.100	0.000	0.100	0.100
		Subtotal	34.173	1.291		1.437		1.218		-		1.218	Continuing	Continuing	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Prior Year Support cost no longer funded in FYDP	Various	Various : Various	4.569	0.000		0.000		0.000		-		0.000	0.000	4.569	4.569
		Subtotal	4.569	0.000		0.000		0.000		-		0.000	0.000	4.569	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Developmental Test & Evaluation	WR	NAWCAD : Patuxent River, MD	2.434	0.019	Oct 2017	0.000		0.100	Oct 2019	-		0.100	Continuing	Continuing	Continuing
Developmental Test & Evaluation	WR	NAWCWD : China Lake, CA	0.000	0.000		0.020	Feb 2019	0.000		-		0.000	0.000	0.020	0.020

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603216N / *Aviation Survivability*	**Project (Number/Name)** 0591 / *Acft Survivability, Vulnerability & Safety*

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Prior Year T&E cost no longer funded in FYDP	Various	Various : Various	2.995	0.000		0.000		0.000		-		0.000	0.000	2.995	2.995
Developmental Test & Evaluation	C/CPFF	GTRI : Atlanta, GA	0.000	0.000		0.000		0.100	Jan 2020	-		0.100	0.000	0.100	0.100
		Subtotal	5.429	0.019		0.020		0.200		-		0.200	Continuing	Continuing	N/A

Remarks

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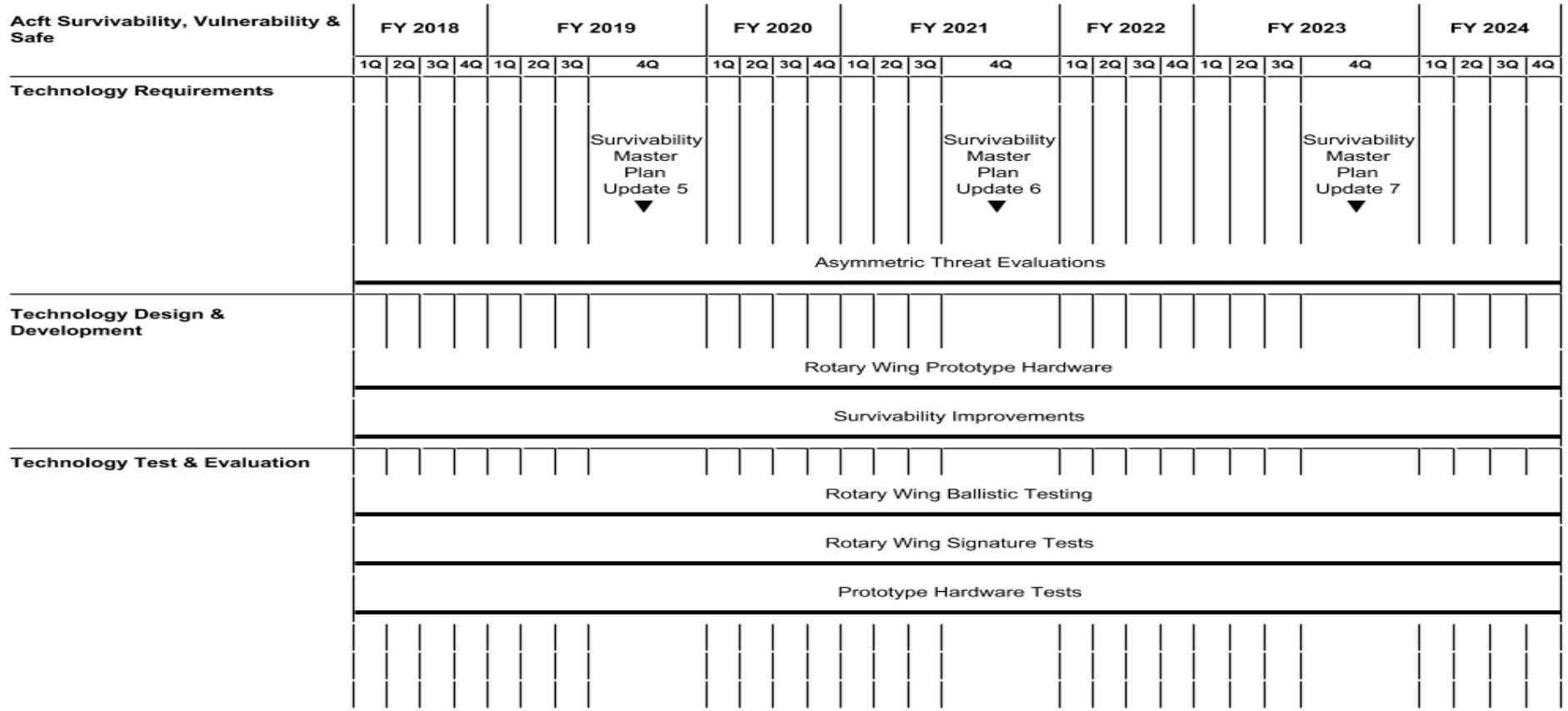
Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management Support	WR	NAWCAD : Pax River, MD	1.713	0.025	Oct 2017	0.045	Oct 2018	0.040	Oct 2019	-		0.040	Continuing	Continuing	Continuing
Travel	PO	NAVAIR : Patuxent River, MD	0.380	0.005	Oct 2017	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Prior Year Mgmt cost no longer funded in FYDP	Various	Various : Various	0.340	0.000		0.000		0.000		-		0.000	0.000	0.340	0.340
		Subtotal	2.433	0.030		0.045		0.040		-		0.040	Continuing	Continuing	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	46.604	1.340		1.502		1.458		-		1.458	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603216N / *Aviation Survivability*	**Project (Number/Name)** 0591 / *Acft Survivability, Vulnerability & Safety*



2020DON - 0603216N - 0591

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603216N / *Aviation Survivability*	**Project (Number/Name)** 0591 / *Acft Survivability, Vulnerability & Safety*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Acft Survivability, Vulnerability & Safe				
Technology Requirements: Survivability Master Plan Update 5	4	2019	4	2019
Technology Requirements: Survivability Master Plan Update 6	4	2021	4	2021
Technology Requirements: Survivability Master Plan Update 7	4	2023	4	2023
Technology Requirements: Asymmetric Threat Evaluations	1	2018	4	2024
Technology Design & Development: Rotary Wing Prototype Hardware	1	2018	4	2024
Technology Design & Development: Survivability Improvements	1	2018	4	2024
Technology Test & Evaluation: Rotary Wing Ballistic Testing	1	2018	4	2024
Technology Test & Evaluation: Rotary Wing Signature Tests	1	2018	4	2024
Technology Test & Evaluation: Prototype Hardware Tests	1	2018	4	2024

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603216N / *Aviation Survivability*	Project (Number/Name) 0592 / *Acft & Ordnance Safety*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
0592: *Acft & Ordnance Safety*	36.384	1.060	1.047	5.746	-	5.746	5.261	5.084	5.205	4.927	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Aircraft and Ordnance Safety Program transitions innovative munitions safety technology to Navy and Marine Corps air weapons, to comply with the Chief of Naval Operations direction that all munitions carried aboard Navy ships be insensitive to unplanned stimuli (thermal, impact, and shock events). The Aircraft and Ordnance Safety Program also ensures the safety and protection of personnel, aircraft, ships, and operational facilities, through improved precision targeting, fail-safe ordnance, selective effects munitions and shock/blast force protection technologies.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Insensitive Munitions (IM)	1.060	1.047	5.746	0.000	5.746
Articles:	-	-	-	-	-
FY 2019 Plans: Air-to-Air Demonstration: Continue Sidewinder warhead technology risk reduction evaluation in support of PMA-259 planned block II+ or III transition with digital detonation initiator, improved multi-layered case warhead design. Continue Sidewinder rocket motor technology risk reduction evaluation in support of PMA-259 planned block III transition with highly-loaded-grain, high-performance motor, and radio frequency cook-off sensor. Evaluation of Metal Matrix Composite structures for use with Min-Smoke propellants for use in HELLFIRE. Improve Air-Launched Weapons: Continue Insensitive Munitions (IM) and performance evaluation of a cast/cure minimum smoke composite propellant that will meet -65 degree requirement for fixed-wing platforms. Testing will be done in a Hellfire configuration to demonstrate transition ability to a system with equivalent requirements in support of PMA 242 tier III requirements. Continue evaluation of Highly-loaded-grain high performance rocket motor and application of Slow-cook-off-sensor technology in Advanced Anti-Radiation Guided Missile (AARGM) configuration for transition to PMA 242 AARGM BLK II upgrade. Advanced Containment/Case/Warhead Materials: Demonstrate IM performance of the Joint Multiple Effects Warhead System in the new revised configuration for transition to PMA 280 FY 19 planned warhead upgrade. Initiate IM and Operational performance evaluation of Eutectic Metal Composite (EMC) for Rocket Motor and Warhead components. EMC technology provides improved material strength properties and the ability to produce structures with advanced configurations that would potentially enhance both IM and operational performance.					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603216N / *Aviation Survivability*	**Project (Number/Name)** 0592 / *Acft & Ordnance Safety*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Shock/Blast Barrier Protection Modeling, Demonstration, and Testing: Continue tech-watch investigation for effective, affordable blast barrier and impact mitigation for application to Tomahawk weapon. Advanced Energetic Materials: Continue evaluation of a Joint Service Insensitive Munitions Technology Program (JIMTP) transition new explosive fill for Bomb Live Unit 111 to address Navy unique issues (i.e., irreversible growth, explosive train reliability for a very insensitive main fill, and thermal environments and ullage requirements for the fill to ensure improved IM demonstrated in JIMTP). ***FY 2020 Base Plans:*** Air-to-Air Demonstration: IM improvement through the integration of solid fuel ramjet technology with traditional solid rocket motor. Continue Sidewinder rocket motor technology risk reduction evaluation in support of PMA-259 planned block III transition with highly-loaded-grain, high-performance motor, and radio frequency cook-off sensor. Improved Air-Launched Weapons: An insensitive solid propellant tailored to Highly Loaded Grain (HLG) technology. Develop propellants that possess a high burning rate at 1500-2000PSI and high mechanical strain at cold temperatures (-650 C). Continued work with HLG in a 21" diameter motor. Continue Insensitive Munitions (IM) and performance evaluation of a cast/cure minimum smoke composite propellant that will meet -650 C requirement for fixed-wing platforms. Testing will be done in a Hellfire configuration to demonstrate transition ability to a system with equivalent requirements in support of PMA 242 tier III requirements. Continue evaluation of Highly-loaded-grain high performance rocket motor and application of Slow cook- off-sensor technology in Advanced Anti-Radiation Guided Missile (AARGM) configuration for transition to PMA-242 AARGM BLK II upgrade. Advanced Containment/Case Warhead Materials: Continue working the Metal Matrix Composite case for continued improved IM responses. Distributed Fiber Optic sensing for In-Situ Propellant Health Monitoring (DFOS). DFOS to monitor the temperature and stress/strain within a solid rocket motor. Applied to full-scale HLG motor testing as a stress-strain field characterization to supplement analytical tools. Develop a 3-D model to compare the FMU 139 D/B with previous fuzes which it is slated to replace. The integration of technology developed in the Joint Service Insensitive Munitions Technology Program program will aid in IM improvement in the fuze family. Demonstrate IM performance of the Joint Multiple Effects Warhead System in the new revised configuration for transition to PMA 280. ***FY 2020 OCO Plans:***					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603216N / *Aviation Survivability*	**Project (Number/Name)** 0592 / *Acft & Ordnance Safety*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increase supports an investment in aviation readiness enabling programs. New projects have caused the need for an increase in funding. New technologies that are finalizing in the JIMTP are transitioning to either Insensitive Munitions Advanced Development (IMAD), Insensitive Munitions Technology Transition Program (IMTTP), or a combination of the two. Ongoing conflicts have resulted in an increase in technologies needed for weapon systems.					
Accomplishments/Planned Programs Subtotals	1.060	1.047	5.746	0.000	5.746

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

All planned programs are accomplished via civilian labor and use of government testing facilities.

E. Performance Metrics

The Aircraft and Ordnance Safety program will initiate six to nine technology development/maturation efforts to improve IM signature and will work to transition those technologies to weapons programs. The weapons programs will be chosen based on PEO(U&W) weapons portfolio and will focus on the priority weapons as defined in the IM strategic plan.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603216N / *Aviation Survivability*	Project (Number/Name) 0592 / *Acft & Ordnance Safety*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Systems Engineering	WR	NAWCWD : China Lake, CA	36.376	1.060	Oct 2017	1.047	Oct 2018	5.746	Oct 2019	-		5.746	Continuing	Continuing	Continuing
		Subtotal	36.376	1.060		1.047		5.746		-		5.746	Continuing	Continuing	N/A

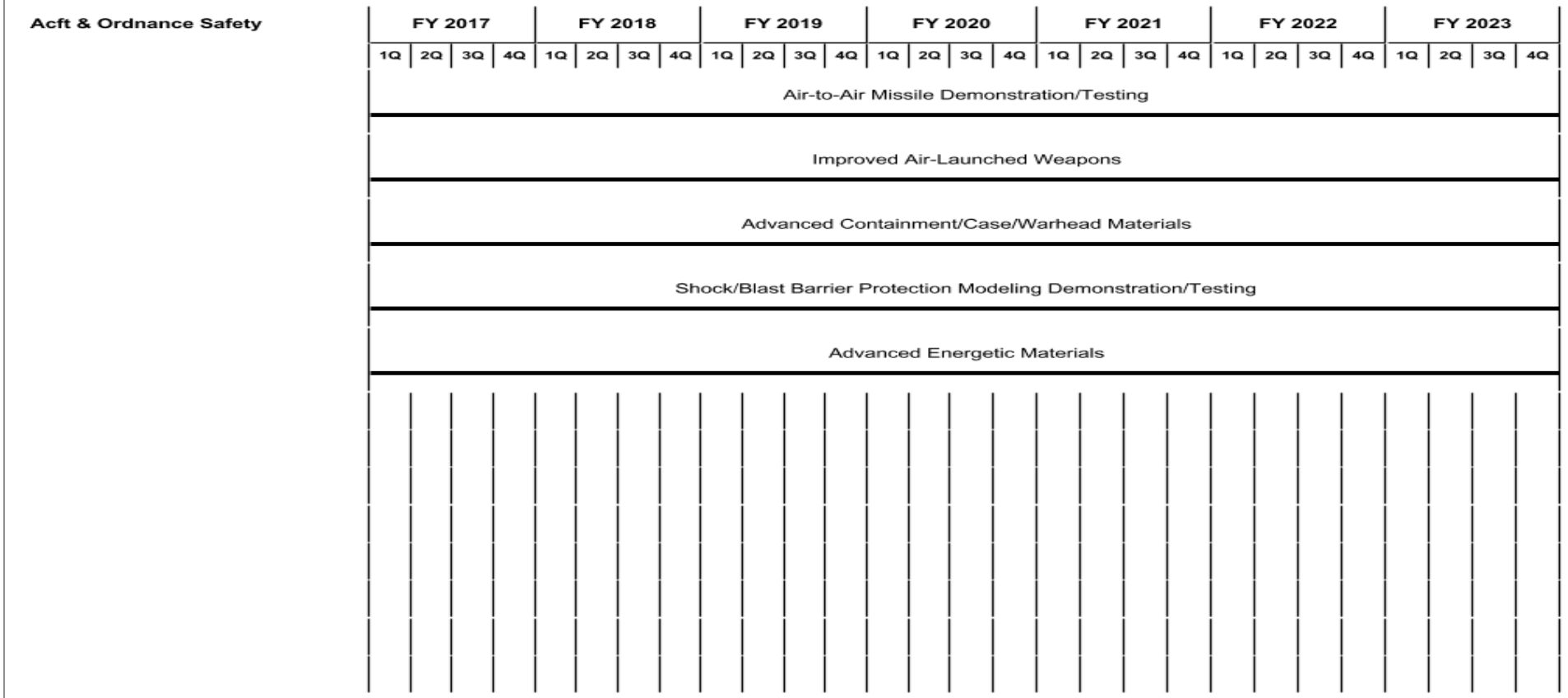
Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Prior Year Mgmt no longer funded in FYDP	Various	Various : Various	0.008	0.000		0.000		0.000		-		0.000	0.000	0.008	0.008
		Subtotal	0.008	0.000		0.000		0.000		-		0.000	0.000	0.008	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	36.384	1.060		1.047		5.746		-		5.746	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603216N / *Aviation Survivability*	**Project (Number/Name)** 0592 / *Acft & Ordnance Safety*



2019DON - 0603216N - 0592

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603216N / *Aviation Survivability*	**Project (Number/Name)** 0592 / *Acft & Ordnance Safety*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Acft & Ordnance Safety				
Air-to-Air Missile Demonstration/Testing	1	2018	4	2024
Improved Air-Launched Weapons	1	2018	4	2024
Advanced Containment/Case/Warhead Materials	1	2018	4	2024
Shock/Blast Barrier Protection Modeling Demonstration/Testing	1	2018	4	2024
Advanced Energetic Materials	1	2018	4	2024

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603216N / *Aviation Survivability*	Project (Number/Name) 1819 / *CV Acft Fire Suppress System*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
1819: *CV Acft Fire Suppress System*	3.637	0.581	0.583	0.598	-	0.598	0.601	0.615	0.627	0.640	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This project develops improved fire-fighting systems and fire protective measures for aircraft-related fires on aircraft carriers, including assessment of fire properties, definition of fire threats, improvements to fire-fighting agents and delivery systems, fire detection and suppression system performance evaluations, and fire-fighter training improvements.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Fire-Fighting	0.581	0.583	0.598	0.000	0.598
Articles:	-	-	-	-	-

FY 2019 Plans:

Continue support for Naval Air Training and Operating Procedures Standardization improvements, and modeling and simulation for fire prediction. Continue monitoring aqueous film forming foam developments and other clean agents. Continue to monitor new equipment improvements for saws, spreaders, and other improvements to reduce or discontinue the use of Motor Gasoline on ships. Finalize evaluations for flash-hood, crash-fire-rescue face shield and firefighter personnel floatation device improvements. Continue to monitor and recommend Electromagnetic Aircraft Launch Systems fire doctrine, Carrier Fixed Wing Aircraft Nuclear hangar bay conflagration management system operations, and unmanned carrier launched airborne surveillance and strike firefighting operations impacts. Finalize project looking at firefighter issues related to composites, weapons and fuels and develop procedures to be used aboard ship to rapidly and safely extinguished deep seated smoldering fires with composite materials. Continue to evaluate training and certification requirements and equipment to bring the ship up to aviation boatswains mate capabilities and readiness for Air Capable Ships, ships that rely on the ships damage control team and limited resources. Continue improved weapons cooling scenario testing. Begin project looking at options for firefighter equipment storage on CVN's and LHA/D ships.

FY 2020 Base Plans:

Continue support for Naval Air Training and Operating Procedures Standardization improvements, and modeling and simulation for fire prediction. Continue monitoring aqueous film forming foam developments and other clean agents. Continue to monitor new equipment improvements for saws, spreaders, and other improvements to reduce or discontinue the use of Motor Gasoline on ships. Continue evaluations for flash-hood, crash-fire-rescue face shield and firefighter personnel floatation device improvements. Continue to monitor and

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603216N / *Aviation Survivability*	**Project (Number/Name)** 1819 / *CV Acft Fire Suppress System*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
recommend Electromagnetic Aircraft Launch Systems fire doctrine, Carrier Fixed Wing Aircraft Nuclear hangar bay conflagration management system operations, and unmanned carrier launched airborne surveillance and strike firefighting operations impacts. Continue project looking at firefighter issues related to composites, weapons and fuels and develop procedures to be used aboard ship to rapidly and safely extinguished deep seated smoldering fires with composite materials. Continue to evaluate training and certification requirements and equipment to bring the ship up to aviation boatswains mate capabilities and readiness for Air Capable Ships, ships that rely on the ships damage control team and limited resources. Continue improved weapons cooling scenario testing. Continue project looking at options for firefighter equipment storage on CVN's and LHA/D ships. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** The increase from FY 2019 to FY 2020 is due to increased test requirements for weapons cooling and aircraft composite firefighting.					
Accomplishments/Planned Programs Subtotals	0.581	0.583	0.598	0.000	0.598

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

This is a non-ACAT program. Procurement strategy is determined by market survey and cooperative opportunities.

E. Performance Metrics

The Carrier Aircraft Fire Suppression (CAFS) program will, at a minimum, fund six to ten projects per year that investigate and evaluate tactical capability gaps and potential capability improvements regarding shipboard aircraft fire suppression doctrine and equipment. CAFS projects will have a greater than 90% success rate of insertion into Department of the Navy shipboard aircraft fire-fighting procedures and documentation.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603216N / *Aviation Survivability*	Project (Number/Name) 1819 / *CV Acft Fire Suppress System*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Systems Engineering	C/CPFF	ICI : Virginia Beach, VA	0.020	0.000		0.000		0.000		-		0.000	0.000	0.020	0.020
Systems Engineering	WR	NAWCWD : China Lake, CA	0.114	0.085	Oct 2017	0.042	Oct 2018	0.062	Oct 2019	-		0.062	Continuing	Continuing	Continuing
Systems Engineering	C/CPFF	Hughes Associates : Baltimore, MD	0.032	0.025	Nov 2017	0.000		0.000		-		0.000	0.000	0.057	0.057
Systems Engineering	C/CPFF	AVW : Chesapeake, VA	0.013	0.000		0.015	Nov 2018	0.000		-		0.000	0.000	0.028	0.028
Prior Yr Prod Dev no longer funded in the FYDP	Various	Various : Various	0.220	0.000		0.000		0.000		-		0.000	0.000	0.220	0.220
Systems Engineering	WR	NRL : Washington, DC	0.007	0.018	May 2018	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
		Subtotal	0.406	0.128		0.057		0.062		-		0.062	Continuing	Continuing	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Engineering Support	C/CPFF	ICI : Virginia Beach, VA	0.105	0.000		0.027	Nov 2018	0.030	Nov 2019	-		0.030	0.000	0.162	0.162
Engineering Support	WR	NAWCWD : China Lake, CA	0.357	0.100	Oct 2017	0.150	Oct 2018	0.176	Oct 2019	-		0.176	Continuing	Continuing	Continuing
Engineering Support	C/CPFF	Hughes Associates : Baltimore, MD	0.047	0.050	Nov 2017	0.035	Nov 2018	0.030	Nov 2019	-		0.030	0.000	0.162	0.162
Engineering Support	C/CPFF	AVW : Chesapeake, VA	0.114	0.035	Nov 2017	0.035	Nov 2018	0.000		-		0.000	0.000	0.184	0.184
Engineering Support	WR	NRL : Washington, DC	0.001	0.018	May 2018	0.005	May 2019	0.010	May 2020	-		0.010	Continuing	Continuing	Continuing
		Subtotal	0.624	0.203		0.252		0.246		-		0.246	Continuing	Continuing	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603216N / *Aviation Survivability*	Project (Number/Name) 1819 / *CV Acft Fire Suppress System*	

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Technology Test & Evaluation	WR	NAWCWD : China Lake, CA	1.436	0.150	Oct 2017	0.167	Oct 2018	0.180	Oct 2019	-		0.180	Continuing	Continuing	Continuing
Technology Test & Evaluation	C/FFP	Hughes Associates : Baltimore, MD	0.553	0.025	Nov 2017	0.050	Nov 2018	0.050	Nov 2019	-		0.050	0.000	0.678	0.678
Technology Test & Evaluation	C/CPFF	AVW : Chesapeake, VA	0.022	0.015	Nov 2017	0.000		0.000		-		0.000	0.000	0.037	0.037
Prior yr T&E no longer funded in the FYDP	Various	Various : Various	0.292	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
		Subtotal	2.303	0.190		0.217		0.230		-		0.230	Continuing	Continuing	N/A

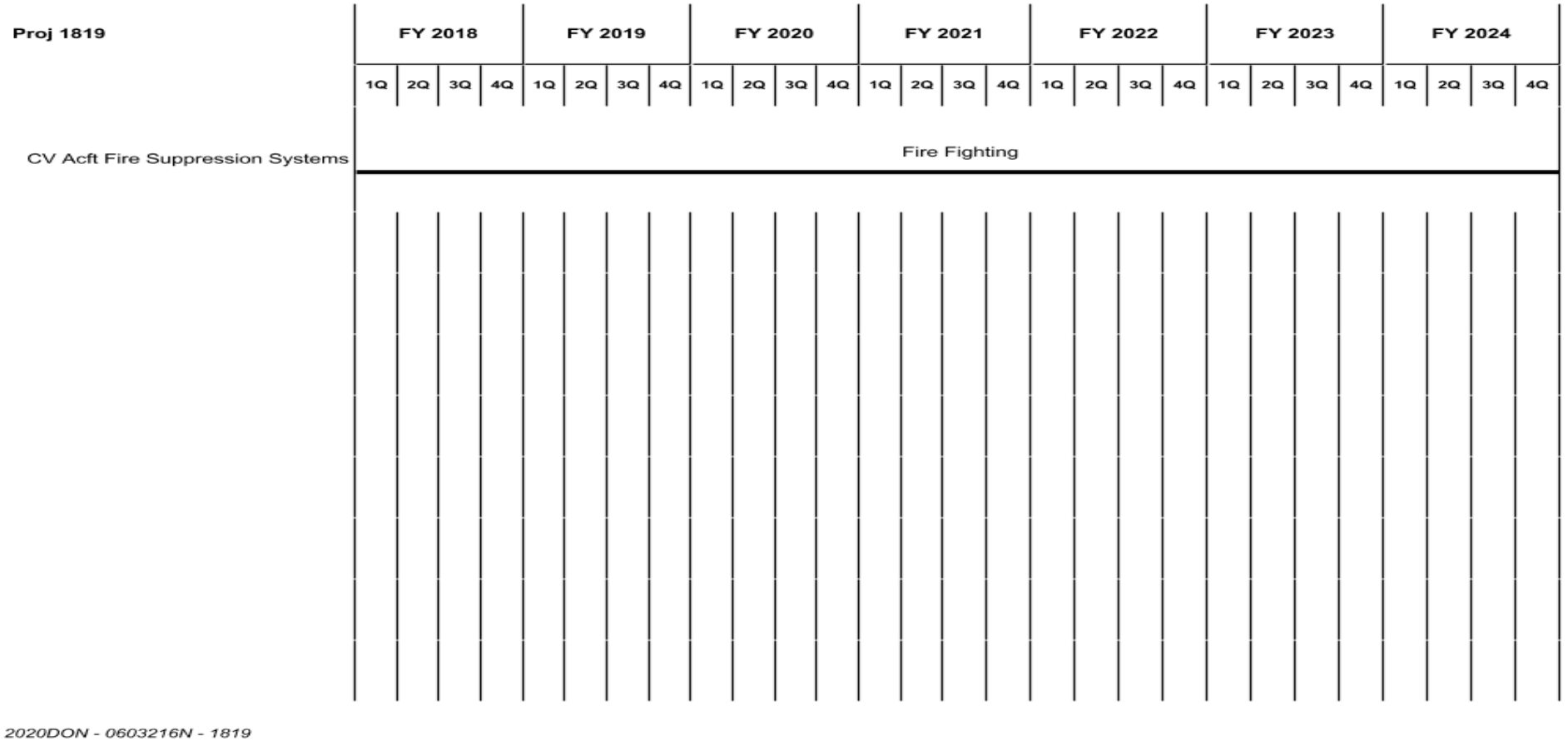
Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management	WR	NAWCWD : China Lake, CA	0.304	0.060	Oct 2017	0.057	Oct 2018	0.060	Oct 2019	-		0.060	Continuing	Continuing	Continuing
		Subtotal	0.304	0.060		0.057		0.060		-		0.060	Continuing	Continuing	N/A

	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	3.637	0.581		0.583		0.598		-		0.598	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603216N / *Aviation Survivability*	**Project (Number/Name)** 1819 / *CV Acft Fire Suppress System*



2020DON - 0603216N - 1819

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603216N / *Aviation Survivability*	**Project (Number/Name)** 1819 / *CV Acft Fire Suppress System*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 1819				
CV Acft Fire Suppression Systems: Fire Fighting	1	2018	4	2024

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy											Date: March 2019	
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0603251N *I (U)AIRCRAFT SYSTEMS*							
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
Total Program Element	20.507	0.693	0.793	1.473	-	1.473	1.522	1.542	1.566	1.598	Continuing	Continuing
3331: *C-2 System Development*	20.507	0.693	0.793	1.473	-	1.473	1.522	1.542	1.566	1.598	Continuing	Continuing

Note

The FY 2020 funding request was reduced by $0.016 million to account for the availability of prior year execution balances.

A. Mission Description and Budget Item Justification

This program element supports the study, evaluation, optimization and enhancements of fielded aircraft systems not supported by a system specific Research, Development, Test and Evaluation, Navy program element. The supported efforts will provide a basis to recommend options for improved efficiency, minimization of life cycle cost, and other affordable options. As naval aircraft systems age, and analysis of the programmatic and /or reliability enhancements options allows the Department of the Navy to more effectively understand and manage system lifecycle costs and implications in future airborne platforms.

This program is funded under ADVANCED COMPONENT DEVELOPMENT AND PROTOTYPES because it includes all efforts necessary to evaluate integrated technologies, representative models or prototype systems in a high fidelity and realistic operating environment.

B. Program Change Summary ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	0.695	0.793	1.508	-	1.508
Current President's Budget	0.693	0.793	1.473	-	1.473
Total Adjustments	-0.002	0.000	-0.035	-	-0.035
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.002	0.000			
• Program Adjustments	0.000	0.000	-0.022	-	-0.022
• Rate/Misc Adjustments	0.000	0.000	-0.013	-	-0.013

Change Summary Explanation

Technical: Not applicable.
Schedule: Not applicable.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603251N / *(U)AIRCRAFT SYSTEMS*	Project (Number/Name) 3331 / *C-2 System Development*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
3331: *C-2 System Development*	20.507	0.693	0.793	1.473	-	1.473	1.522	1.542	1.566	1.598	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The C-2A Greyhound is a high wing monoplane, twin engine turbo-prop aircraft capable of operating from both a shore base and all operational United States Navy aircraft carrier classes. The mission of the C-2A is to provide rapid response Carrier Onboard Delivery of fleet essential supplies, repair parts, and personnel to sustain at sea operations of deployed battle groups. In addition, the C-2A provides airdrop delivery and mobilization support for special operations forces from land bases and carriers, Search and Rescue, and Humanitarian Relief.

This project will fund required development and obsolescence analysis of other subsystems required to operate the C-2A to the end of its service life.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Combat Readiness	0.693	0.793	1.473	0.000	1.473
Articles:	-	-	-	-	-
Description: C-2 Combat Readiness establishes an enduring capacity to address obsolescence, safety, and readiness degrader issues for the C-2A(R) aircraft until the end of it's service life.					
FY 2019 Plans: Continuation of C-2A subsystems studies and analysis for Circuit Card Assembly & Chassis Assembly. Begin prototype assembly of three (3) Chassis Assembly.					
FY 2020 Base Plans: Continue developing prototype for Chassis Assembly (Qty 3). C-2A subsystem studies and analysis for obsolescence analysis for emergency transformer rectifier.					
FY 2020 OCO Plans: N/A					
FY 2019 to FY 2020 Increase/Decrease Statement: Funding increase from FY19 to FY20 due to revised program plan to include emergency transformer rectifier.					
Accomplishments/Planned Programs Subtotals	0.693	0.793	1.473	0.000	1.473

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603251N / *(U)AIRCRAFT SYSTEMS*	**Project (Number/Name)** 3331 / *C-2 System Development*

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• APN/0556: *C-2A Series*	18.592	8.327	15.747	-	15.747	17.491	5.395	0.000	0.000	5.578	553.866

Remarks

D. Acquisition Strategy

The C-2 Operational Ground Controllability strategy will be exercised under an Engineering Change Proposal.

E. Performance Metrics

C-2A emergency transformer rectifier studies and analysis final report is planned for 4QFY20

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603251N / *(U)AIRCRAFT SYSTEMS*	Project (Number/Name) 3331 / *C-2 System Development*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Prior year Prod Dev no longer funded in the FYDP	Various	Various : Various	11.151	0.000		0.000		0.000		-		0.000	0.000	11.151	11.151
		Subtotal	11.151	0.000		0.000		0.000		-		0.000	0.000	11.151	N/A

Remarks

Totals may not add due to rounding.

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Development Support	WR	North Island : North Island, CA	0.849	0.304	Nov 2017	0.400	Jan 2019	0.723	Nov 2019	-		0.723	Continuing	Continuing	Continuing
Development Support	WR	Department of Energy : Kansas City, MO	0.000	0.389	Feb 2018	0.393	Jan 2019	0.750	Dec 2019	-		0.750	Continuing	Continuing	Continuing
Prior year Support no longer funded in the FYDP	Various	Various : Various	5.573	0.000		0.000		0.000		-		0.000	0.000	5.573	-
		Subtotal	6.422	0.693		0.793		1.473		-		1.473	Continuing	Continuing	N/A

Remarks

Totals may not add due to rounding.

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Developmental Test & Evaluation	WR	NAWCAD : Pax River, MD	2.908	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
		Subtotal	2.908	0.000		0.000		0.000		-		0.000	Continuing	Continuing	N/A

Remarks

Totals may not add due to rounding.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603251N / *(U)AIRCRAFT SYSTEMS*	Project (Number/Name) 3331 / *C-2 System Development*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Travel	Various	Various : Various	0.026	0.000	Oct 2017	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
		Subtotal	0.026	0.000		0.000		0.000		-		0.000	Continuing	Continuing	N/A

Remarks

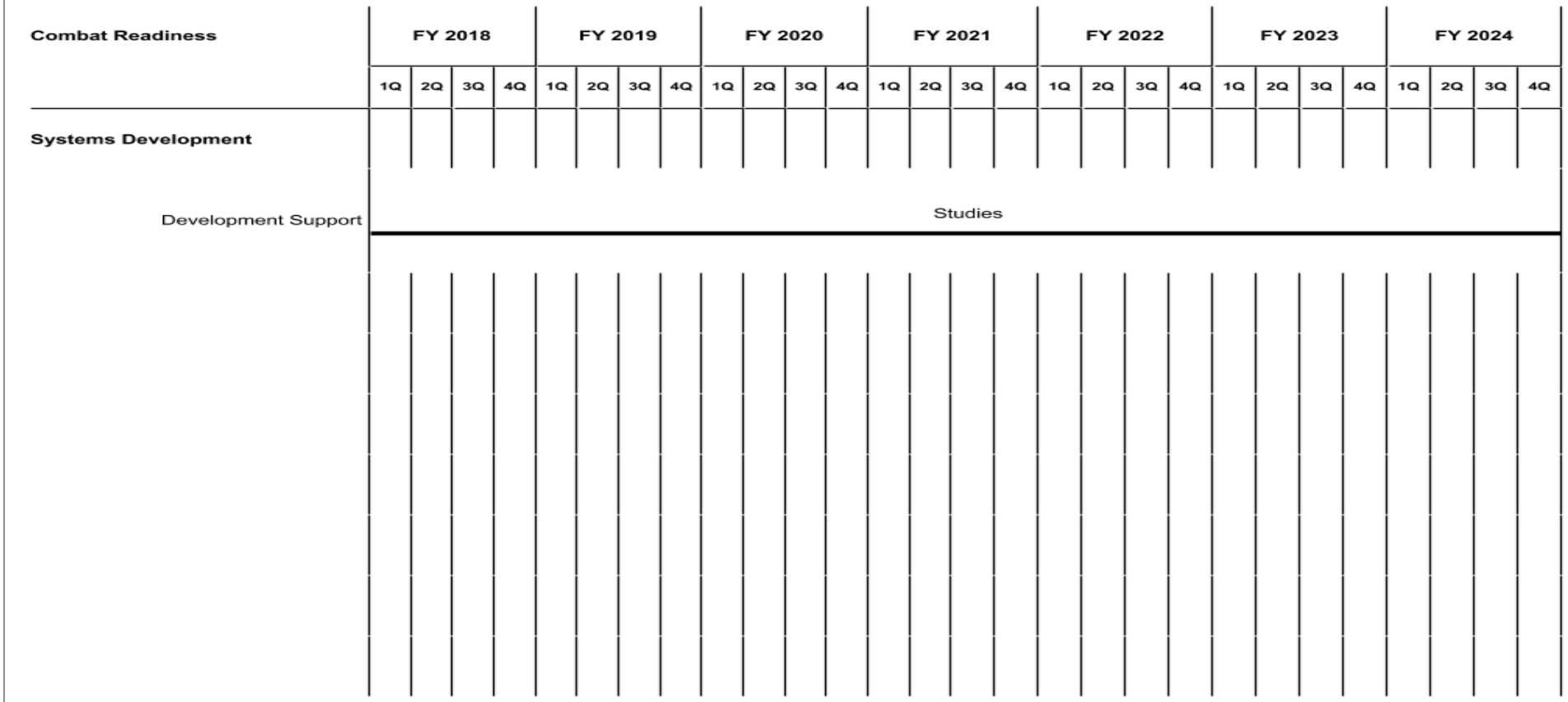
Totals may not add due to rounding.

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	20.507	0.693		0.793		1.473		-		1.473	Continuing	Continuing	N/A

Remarks

Totals may not add due to rounding.

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603251N / *(U)AIRCRAFT SYSTEMS*	**Project (Number/Name)** 3331 / *C-2 System Development*



2020PB - 0603251N - 3331

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603251N / *(U)AIRCRAFT SYSTEMS*	**Project (Number/Name)** 3331 / *C-2 System Development*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Combat Readiness				
Systems Development: Development Support: Studies	1	2018	4	2024

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy											Date: March 2019	
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0603254N *I ASW Systems Development*							
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
Total Program Element	128.772	7.466	7.044	7.172	-	7.172	7.298	7.445	7.591	7.743	Continuing	Continuing
1292: *Adv ASW Sensors & Proc*	128.772	7.466	7.044	7.172	-	7.172	7.298	7.445	7.591	7.743	Continuing	Continuing

A. Mission Description and Budget Item Justification

Includes RDT&E funds for advanced development and developmental testing of airborne anti-submarine warfare (ASW) systems, including aircraft, equipment, and devices for use against all types of submarine targets.

JUSTIFICATION FOR BUDGET ACTIVITY: This program is funded under ADVANCED COMPONENT DEVELOPMENT AND PROTOTYPES because it includes all efforts necessary to evaluate integrated technologies, representative models or prototype systems in a high fidelity and realistic operating environment.

B. Program Change Summary ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	7.661	7.058	7.184	-	7.184
Current President's Budget	7.466	7.044	7.172	-	7.172
Total Adjustments	-0.195	-0.014	-0.012	-	-0.012
• Congressional General Reductions	-	-0.014			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.187	0.000			
• Rate/Misc Adjustments	0.000	0.000	-0.012	-	-0.012
• Congressional General Reductions Adjustments	-0.008	-	-	-	-

Change Summary Explanation

Technical: Not applicable.

Schedule:
1292. Not applicable.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603254N / *ASW Systems Development*	Project (Number/Name) 1292 / *Adv ASW Sensors & Proc*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
1292: *Adv ASW Sensors & Proc*	128.772	7.466	7.044	7.172	-	7.172	7.298	7.445	7.591	7.743	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This program provides Air Anti-Submarine Warfare (ASW) effectiveness through development and maturation of advanced hardware and software associated with airborne acoustic and non-acoustic systems. This includes sensors and components, processing, post-processing, data recording and display capabilities to address regional threat scenarios against surfaced or submerged conventionally and nuclear powered submarines. Key objectives are platform accommodations of advanced active and passive sensors and components, improved detection, classification, localization, tracking, and increased capacity and flexibility to handle multi-sensor data loads. Furthermore, technologies that can be affordably implemented as payloads across fixed wing, rotary and unmanned platforms engaged in ASW, will be pursued. Programs being funded during the FYDP will evaluate technologies such as: Over the Horizon (OTH) communications, sonobuoy communication link to/from aircraft, Distributed Netted Sensors, transient signals, and source and receiver improvement technologies that will enhance passive and multi-static active sensor systems capabilities. Programs being funded during the FYDP will provide for the development and maturation of persistent tactical search technologies that will allow transition to the localization and attack phase in all operationally relevant environments. In addition, the program will provide for the development and subsequent experimentation, including data collection and engineering measurement, of Multi-static Active Coherent (MAC) sources and receivers, laser technologies, electro-optical and multi-spectral camera technologies, radar, and Magnetic Anomaly Detection (MAD) sensors. Those technologies that are deemed mature and provide increased operational capability will be approved for a production Rapid Capability Insertion (RCI) build. The test articles, which consist of passive/active sensors/components and associated processors, will support at-sea trials and experiments.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: System performance assessments	7.466	7.044	7.172	0.000	7.172
Articles:	100	100	100	-	100
FY 2019 Plans: Conduct sensor and system performance assessments and effects chains gap analyses on the next generation of Multi-Static Active Coherent (MAC) system components, advancements in passive sensing and other acoustic and non-acoustic enhancements for traditional and high altitude ASW operations. Develop and mature prototype signal processing and hardware for data collections and at-sea experimentation. Employ the related test articles, models, processors and algorithms in at-sea demonstrations and related laboratory or in-water experiments to validate technical maturity and operational performance. Conduct data analyses to evaluate and mature the prototype hardware and signal processing algorithms leveraging science and technology, research and development, and operational fleet-collected data.					
FY 2020 Base Plans:					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603254N / *ASW Systems Development*	**Project (Number/Name)** 1292 / *Adv ASW Sensors & Proc*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Design, mature, and prototype test articles, models, processors, and algorithms for laboratory and at-sea demonstrations to validate technical maturity and operational performance. Conduct sensor and system performance assessments for the next generation of airborne wide area search. Evaluate advancements in passive sensing for deep ocean ASW operations. Employ effects chain gap analysis and performance modeling to verify capability improvements for acoustic and non-acoustic technologies. Conduct data analyses to evaluate and mature the prototype hardware and signal processing algorithms leveraging science and technology, research and development, and operational fleet-collected data. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** FY20 increase funds for data analysis, maturation of hardware and algorithms.					
Accomplishments/Planned Programs Subtotals	7.466	7.044	7.172	0.000	7.172

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• RDT&E/0480: *ASW Sensors & Proc*	32.686	38.599	43.045	-	43.045	43.837	44.717	45.594	46.505	Continuing	Continuing

Remarks

D. Acquisition Strategy

Develop and mature promising acoustic and non-acoustic ASW technologies that have high potential for meeting documented capability gaps and Fleet requirements. As funding permits, transition those technologies into acquisition programs of record for eventual Fleet release on ASW platforms.

E. Performance Metrics

Potential ASW technologies are quantitatively assessed for effect on ASW kill chain in relation to cost, schedule and performance metrics.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603254N / *ASW Systems Development*	Project (Number/Name) 1292 / *Adv ASW Sensors & Proc*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Primary Hdw Development	Various	Various : Various	3.030	1.500	Dec 2017	1.134	Dec 2018	1.622	Dec 2019	-		1.622	Continuing	Continuing	Continuing
		Subtotal	3.030	1.500		1.134		1.622		-		1.622	Continuing	Continuing	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Software Development	WR	NAWCAD : PATUXENT RIVER, MD	5.225	1.082	Dec 2017	1.050	Dec 2018	1.075	Dec 2019	-		1.075	0.000	8.432	-
Studies & Analysis	WR	NAWCAD : PATUXENT RIVER, MD	7.871	1.000	Dec 2017	1.100	Dec 2018	0.880	Dec 2019	-		0.880	Continuing	Continuing	Continuing
		Subtotal	13.096	2.082		2.150		1.955		-		1.955	Continuing	Continuing	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Dev Test & Eval	Various	Various : Various	23.847	1.933	Dec 2017	2.000	Dec 2018	1.811	Dec 2019	-		1.811	Continuing	Continuing	Continuing
		Subtotal	23.847	1.933		2.000		1.811		-		1.811	Continuing	Continuing	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Contractor Eng Spt	Various	Various : Various	21.472	1.011	Dec 2017	1.000	Dec 2018	1.050	Dec 2019	-		1.050	Continuing	Continuing	Continuing
ENG & TECH SVCS (NON-FFRDC)	Various	Various : Various	2.994	0.100	Dec 2017	0.100	Dec 2018	0.100	Dec 2019	-		0.100	Continuing	Continuing	Continuing
MGT & PROF SVCS (FFRDC)	Various	Various : Various	1.473	0.084	Dec 2017	0.100	Dec 2018	0.100	Dec 2019	-		0.100	Continuing	Continuing	Continuing

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603254N / *ASW Systems Development*	Project (Number/Name) 1292 / *Adv ASW Sensors & Proc*

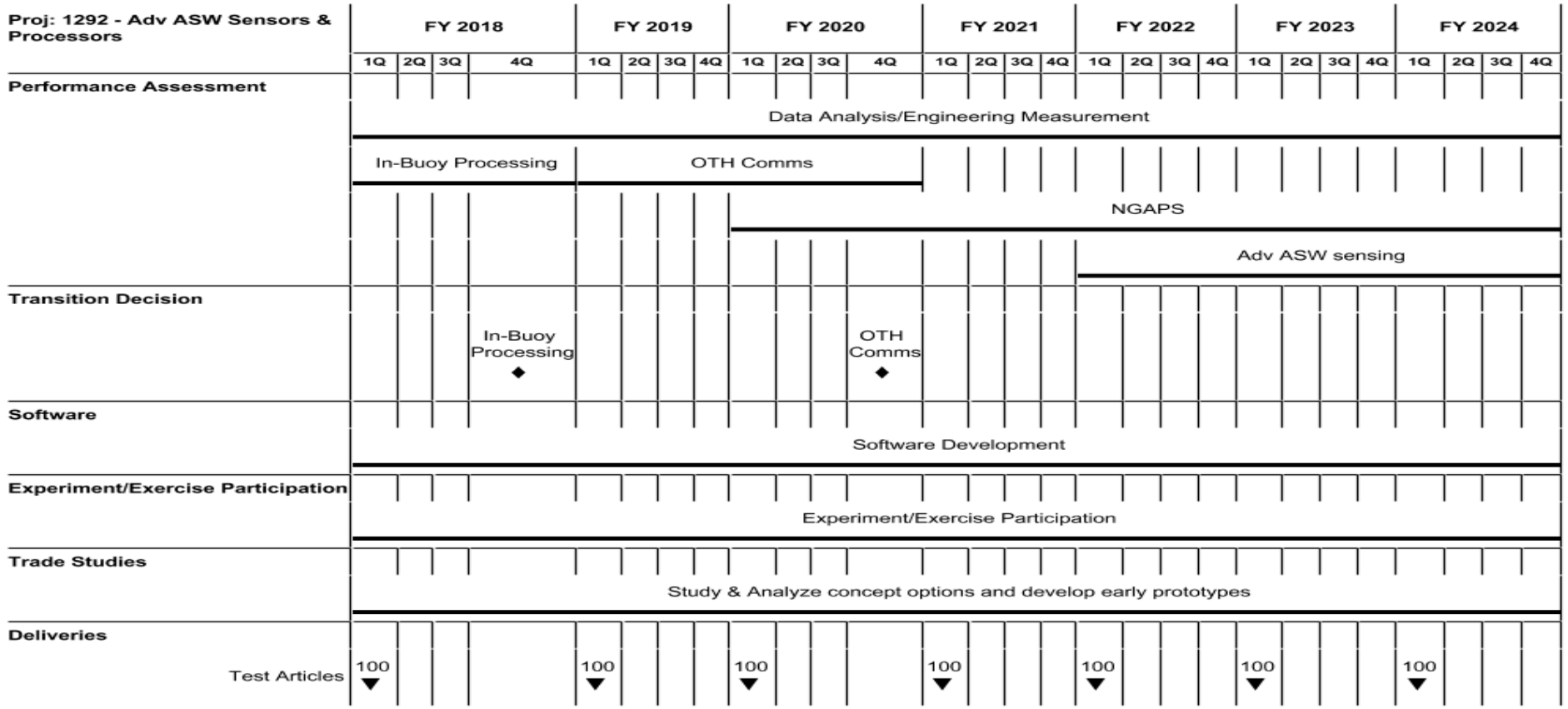
Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Government Eng Spt	WR	NAWCAD : PATUXENT RIVER, MD	62.704	0.748	Dec 2017	0.552	Dec 2018	0.526	Dec 2019	-		0.526	Continuing	Continuing	Continuing
Travel	Various	VARIOUS : VARIOUS	0.156	0.008	Dec 2017	0.008	Dec 2018	0.008	Dec 2019	-		0.008	Continuing	Continuing	Continuing
		Subtotal	88.799	1.951		1.760		1.784		-		1.784	Continuing	Continuing	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	128.772	7.466		7.044		7.172		-		7.172	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603254N / *ASW Systems Development*	**Project (Number/Name)** 1292 / *Adv ASW Sensors & Proc*



2020PB - 0603254N - 1292

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603254N / *ASW Systems Development*	**Project (Number/Name)** 1292 / *Adv ASW Sensors & Proc*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj: 1292 - Adv ASW Sensors & Processors				
Performance Assessment: Data Analysis/Engineering Measurement	1	2018	4	2024
Performance Assessment: In-Buoy Processing	1	2018	4	2018
Performance Assessment: OTH Comms	1	2019	4	2020
Performance Assessment: Next Generation Airborne Passive System	1	2020	4	2024
Performance Assessment: Advanced ASW sensing	1	2022	4	2024
Transition Decision: In-Buoy Processing	4	2018	4	2018
Transition Decision: OTH Comms	4	2020	4	2020
Software: Software Development	1	2018	4	2024
Experiment/Exercise Participation: Experiment/Exercise Participation	1	2018	4	2024
Trade Studies: Trade Studies	1	2018	4	2024
Deliveries: Test Articles: Test Article Deliveries (7)	1	2018	1	2018
Deliveries: Test Articles: Test Article Deliveries (8)	1	2019	1	2019
Deliveries: Test Articles: Test Article Deliveries (9)	1	2020	1	2020
Deliveries: Test Articles: Test Article Deliveries (10)	1	2021	1	2021
Deliveries: Test Articles: Test Article Deliveries (11)	1	2022	1	2022
Deliveries: Test Articles: Test Article Deliveries (12)	1	2023	1	2023
Deliveries: Test Articles: Test Article Deliveries (13)	1	2024	1	2024

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0603261N *I Tactical Airborne Reconnaissance*

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	76.216	3.692	3.540	3.419	-	3.419	3.430	3.520	3.589	3.662	Continuing	Continuing
2467: *UxS Common Standards, Interoperability and Integration*	76.216	3.692	3.540	3.419	-	3.419	3.430	3.520	3.589	3.662	Continuing	Continuing

A. Mission Description and Budget Item Justification

This program element funds efforts to develop common technical and interoperability standards for current and future unmanned platforms, sensors, communications, and networking capabilities to achieve the required integration and interoperability of Unmanned Systems (UxS) represented in approved Naval Concept of Operations (CONOPS).

This program is funded under ADVANCED COMPONENT DEVELOPMENT AND PROTOTYPES because it includes all efforts necessary to evaluate integrated technologies, representative models or prototype systems in a high fidelity and realistic operating environment.

B. Program Change Summary ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	3.707	3.540	3.522	-	3.522
Current President's Budget	3.692	3.540	3.419	-	3.419
Total Adjustments	-0.015	0.000	-0.103	-	-0.103
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.015	0.000			
• Rate/Misc Adjustments	0.000	0.000	-0.103	-	-0.103

Change Summary Explanation

Technical: Not applicable to baseline.
Schedule: Not applicable.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603261N / *Tactical Airborne Reconnaissance*	Project (Number/Name) 2467 / *UxS Common Standards, Interoperability and Integration*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
2467: *UxS Common Standards, Interoperability and Integration*	76.216	3.692	3.540	3.419	-	3.419	3.430	3.520	3.589	3.662	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Naval Unmanned Aircraft Systems (UAS) strategy employs a family of UAS to perform persistent Intelligence, Surveillance, and Reconnaissance (ISR) in support of naval and joint service missions from forward bases/platforms and naval ships.

In support of the Navy and Marine Corps' overall UAS strategy, this program develops common technical and interoperability standards for current and future unmanned platforms, sensors, communications, and networking capabilities to achieve the integration and interoperability of UAS systems represented in approved Naval Concept of Operations (CONOPS). Leveraging fleet input based on current operations and informed by future operational plans, these efforts ensure the desired interoperability and integration of Unmanned Systems (UxS) throughout the battlespace is achieved. This program also establishes the common architecture, including command & control, for all unmanned systems to support and inform future CONOPS development. This effort provides for a cross program view of naval unmanned systems and is the entry point for DoN and other services to address commonality and interoperability opportunities.

Specifically:
- Provides studies and demonstrations in support of naval UAS Family of Systems (FoS) CONOPS development.
- Horizontally integrates across the naval UAS FoS through the development of Naval Interoperability Profiles to achieve required unmanned capabilities and interoperability.
- Provides support for development of common and interoperable UAS standards for use throughout the Department of Defense (DoD) and the North Atlantic Treaty Organization (NATO).
- Conducts CONOPS studies, demonstrations, advanced development/prototyping, and exercises for vehicle control, targeting, and weapons, sensor and payload employment.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Studies and Demonstrations	1.589	1.920	1.960	0.000	1.960
Articles:	-	-	-	-	-
Description: Studies and demonstrations to support CONOPS development from an interoperability perspective for effective integration of UAS. Develop a UAS architecture environment to allow for effective modeling and simulation of common UAS components in representative battlespace architectures.					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603261N / *Tactical Airborne Reconnaissance*	**Project (Number/Name)** 2467 / *UxS Common Standards, Interoperability and Integration*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
FY 2019 Plans: Continue development of the Unmanned Aircraft Systems (UAS) modeling and simulation of Fleet CONOPS scenarios. Demonstrate Manned/Unmanned Interoperability. Provide technical government engineering support. ***FY 2020 Base Plans:*** Continue development of the Unmanned Aircraft Systems (UAS) modeling and simulation of Fleet CONOPS scenarios. Demonstrate Manned/Unmanned Interoperability. Provide technical government engineering support. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** There are no significant changes					
Title: Naval Interoperability & Standardization	2.103	1.620	1.459	0.000	1.459
Articles:	-	-	-	-	-
Description: Develop UAS common technical standards implementations to achieve desired capabilities and interoperability between manned/unmanned systems. ***FY 2019 Plans:*** Continue to develop Unmanned Systems Naval Interoperability Profiles in support of approved naval CONOPS. Support DoN, Joint Service and NATO coalition interoperability efforts. Provide government engineering support, program office travel, and contract services. ***FY 2020 Base Plans:*** Continue to develop Unmanned Systems Naval Interoperability Profiles in support of approved naval CONOPS. Support DoN, Joint Service and NATO coalition interoperability efforts. Provide government engineering support and contract services. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** There are no significant changes					
Accomplishments/Planned Programs Subtotals	3.692	3.540	3.419	0.000	3.419

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603261N / *Tactical Airborne Reconnaissance*	**Project (Number/Name)** 2467 / *UxS Common Standards, Interoperability and Integration*

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

The department will leverage existing government facilities and resources to develop common technical and interoperability standards for current and future unmanned sensors, communications, and networking capabilities to achieve the required interoperability and integration of unmanned systems represented in approved Naval Concept of Operations (CONOPS). Government engineering support will be used for standards development, architectural analysis, modeling and simulation efforts and testing.

E. Performance Metrics

UAS capabilities delivered to the warfighter are continually improved upon through efforts that increase the level of commonality, standardization, and interoperability between nodes depicted in existing and planned Naval CONOPS.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603261N / *Tactical Airborne Reconnaissance*	Project (Number/Name) 2467 / *UxS Common Standards, Interoperability and Integration*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Prior year Prod Dev no longer funded in the FYDP	Various	Various : Various	18.711	0.000		0.000		0.000		-		0.000	0.000	18.711	-
		Subtotal	18.711	0.000		0.000		0.000		-		0.000	0.000	18.711	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Studies & Demonstrations	WR	NAWCAD : Pax River, MD	4.912	0.241	Dec 2017	0.245	Dec 2018	0.250	Dec 2019	-		0.250	Continuing	Continuing	Continuing
Standards Development	C/CPFF	Engility : Lexington Park, MD	2.780	1.432	Jan 2018	1.400	Jan 2019	1.334	Jan 2020	-		1.334	Continuing	Continuing	Continuing
Prior year Support no longer funded in the FYDP	Various	Various : Various	29.815	0.000		0.000		0.000		-		0.000	0.000	29.815	-
		Subtotal	37.507	1.673		1.645		1.584		-		1.584	Continuing	Continuing	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Prior year Test & Eval no longer funded in the FYDP	Various	Various : Various	2.627	0.000		0.000		0.000		-		0.000	0.000	2.627	-
		Subtotal	2.627	0.000		0.000		0.000		-		0.000	0.000	2.627	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management Support	Various	Various : Various	4.580	0.671	Jan 2018	0.218	Jan 2019	0.125	Jan 2020	-		0.125	Continuing	Continuing	Continuing

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603261N / *Tactical Airborne Reconnaissance*	Project (Number/Name) 2467 / *UxS Common Standards, Interoperability and Integration*	

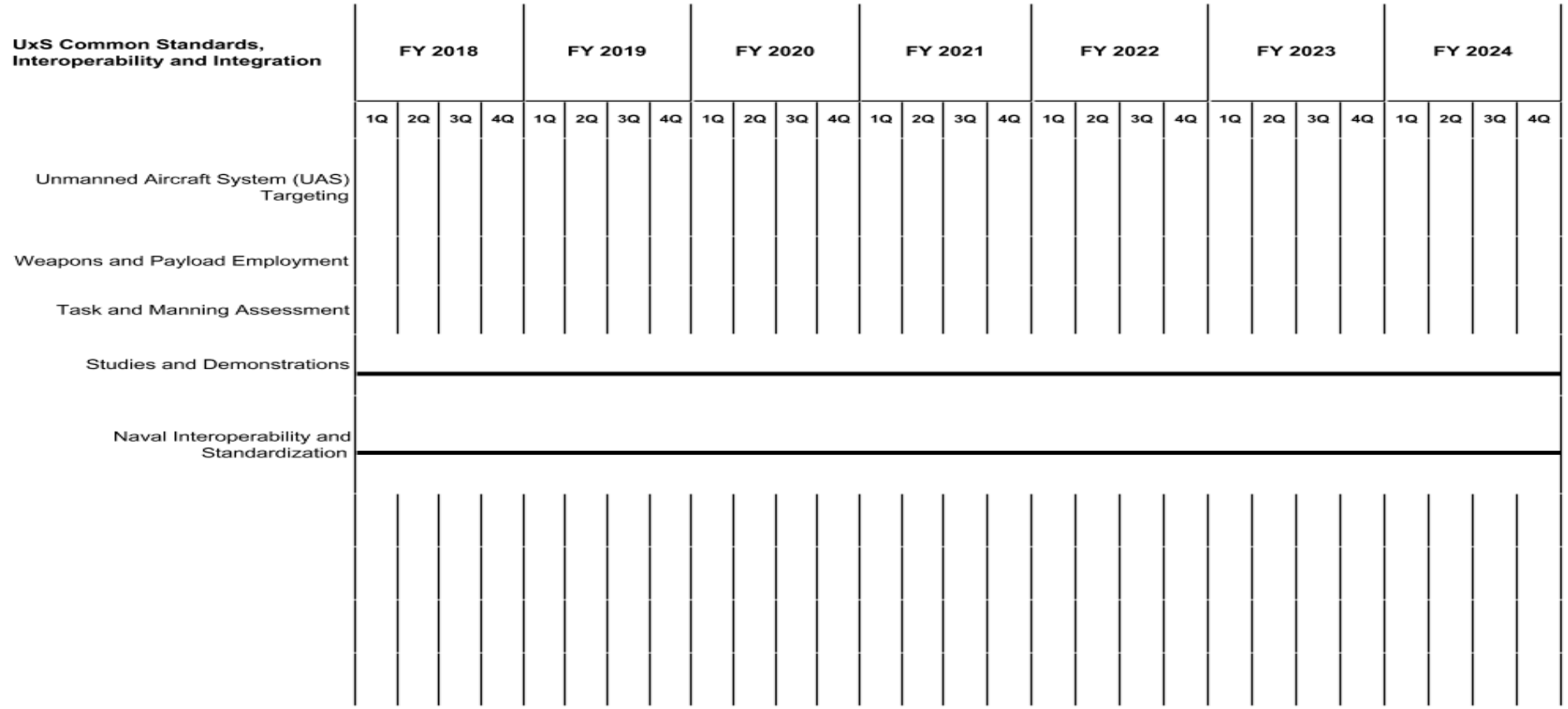
Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Government Engineering Support	WR	NAWCAD : Pax River, MD	11.183	1.348	Dec 2017	1.675	Dec 2018	1.710	Dec 2019	-		1.710	Continuing	Continuing	Continuing
Travel	WR	NAVAIR HQ : Pax River, MD	0.558	0.000		0.002	Oct 2018	0.000		-		0.000	Continuing	Continuing	Continuing
Prior year Mgmt Services no longer funded in the FYDP	Various	Various : Various	1.050	0.000		0.000		0.000		-		0.000	0.000	1.050	-
		Subtotal	17.371	2.019		1.895		1.835		-		1.835	Continuing	Continuing	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	76.216	3.692		3.540		3.419		-		3.419	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603261N / *Tactical Airborne Reconnaissance*	**Project (Number/Name)** 2467 / *UxS Common Standards, Interoperability and Integration*



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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603261N / *Tactical Airborne Reconnaissance*	**Project (Number/Name)** 2467 / *UxS Common Standards, Interoperability and Integration*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
UxS Common Standards, Interoperability and Integration				
Studies and Demonstrations:	1	2018	4	2024
Naval Interoperability and Standardization:	1	2018	4	2024

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy											Date: March 2019	
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0603382N *I Advanced Combat Systems Tech*							
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
Total Program Element	68.820	4.450	39.240	64.694	-	64.694	76.309	47.098	50.712	51.723	Continuing	Continuing
0324: *Adv Combat System Technology*	68.820	1.798	1.813	1.797	-	1.797	1.835	1.875	1.912	1.950	Continuing	Continuing
2480: *SSL-TM*	0.000	0.000	0.000	3.922	-	3.922	11.918	5.442	4.000	0.000	0.000	25.282
3422: *SHARC Surface Platform*	0.000	2.627	7.025	9.281	-	9.281	14.757	3.834	0.000	0.000	0.000	37.524
3423: *LOCUST*	0.000	0.013	1.954	2.960	-	2.960	5.948	7.940	8.103	8.265	Continuing	Continuing
3424: *Heterogeneous Collaborative Unmanned Systems (HCUS)*	0.000	0.012	1.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	1.012
3437: *EMW/SEWIP/SSEE Accelerator*	0.000	0.000	14.389	23.630	-	23.630	23.636	0.000	0.000	0.000	0.000	61.655
3438: *Innovative Naval Prototype (INP) Transition (6.4)*	0.000	0.000	13.059	23.104	-	23.104	18.215	28.007	36.697	41.508	Continuing	Continuing

Note

In FY 2020, Project Unit 2480 was created and includes Solid State Laser Technology Maturation (SSL-TM) resources and associated plans for better coordination and justification of this high priority research area within the Navy's research portfolio. These funds were realigned internally in the PE out of Project Unit 3438.

In FY 2019, plans and resources in Program Element (PE) 0603382N Advanced Combat System Tech, Project Unit (PU) 0385 Rapid Prototype Development was realigned to PE 0604030N Rapid Prototyping, Experimentation and Demonstration, PU 0385 Rapid Prototype Development. Additionally, PE 0603382N Advanced Combat System Tech, PU 0399 Unmanned Rapid Prototype Development was realigned within PU 3438 Innovative Naval Prototype (INP) Transition (6.4).

A. Mission Description and Budget Item Justification

The Advanced Combat System Technology line is to evolve the technical and business practices for programs to change to an open architecture construct. The program was constructed to mature both technical and business model integration for C5I systems programs of record in an open architecture environment. The priority was incorporating the principles of modular design and design disclosure, reusable application software, interoperability and secure information exchange, lifecycle affordability and encouraging competition and collaboration.

Project Unit 0324: Funding is to fully implement the Naval Open (Systems) Architecture (OSA) strategy. The implementation of this strategy provides the tools and leadership for assisting programs and the Naval Research and Development Establishment through the technical, business and cultural transition to OSA. The primary tools and assistance is established through a limited set of technical reference frameworks, consistent contract language guidance, Intellectual Property strategies and

improvements in transparency of design disclosure and information exchange on past and current investments to support portfolio management and cross-program reuse. The OSA transformation effort will be applied to programs of record and coupled with rapid prototyping efforts being realized as management efficiencies both within programs and in accelerated acquisition efforts. Those elements include ensuring that all naval systems, families of systems, programs and prototypes move to modular OSA in accordance with Department of Defense (DoD) Instruction 5000.01 of 7 January 2015 which mandates that all DoD programs utilize Modular OSA to rapidly field affordable and interoperable systems. This project facilitates a strategic shift in the technical and business methods to establish cooperation and cross-domain/COI business relationships. This improves innovation and economies of scale throughout the Navy and Marine Corps. This leadership effort has identified the business case and potential return on investment for moving the Navy towards an open systems approach, supported the development of open systems technologies, and integrated best business and technical practices for open systems development within Naval acquisition. Naval OSA ensures Navy-wide system architectures become extensible and scalable in function, capacity, and workload to meet Joint warfighting requirements. This also includes the identification and development of common software components, functions, reuse methodologies, and extensible product lines.

Project Unit 2480: The efforts described in this mission area address the advanced component development and prototype demonstration associated with the Navy's Solid State Laser Technology Maturation (SSL-TM) Innovative Naval Prototypes (INP) Program and the Leap Ahead Technology (LA-Tech) investments. The SSL-TM program is developing an integrated Laser Weapons System Demonstrator (LWSD). SSL-TM will provide a new capability to the Fleet to address known capability gaps against asymmetric threats (UAS, small boats, and ISR sensors) and will inform future acquisition strategies, system designs, integration architectures, and fielding plans for laser weapon systems.

Project Unit 3422: The SHARC Surface Platforms demonstration project is part of the Department of Defense Third Offset Strategy as one element in the Sensor Grid category for 24/7 autonomy infused Situational Awareness (SA). This project will purchase Commercial-off-the-Shelf SHARC Platforms (wave gliders) and integrate four (4) unique Government-owned classified mission payloads focused on the detection of threats. These capabilities will enable CONOPS development in an operationally relevant environment to demonstrate how these technologies can improve the SA to the battlespace Commanders.

Project Unit 3423: The LOCUST demonstration is part of the Department of Defense Third Offset Strategy as one element in the Effector Grid category for small autonomous systems. LOCUST leverages the BA-3 Innovative Naval Prototype program developing and demonstrating swarming technology. The BA-3 effort is developing both the air vehicle, UAS swarming behaviors, and miniaturized sensor systems. ONR has demonstrated an autonomous system capable of launching 33 UASs in 40 seconds and flying them in a coordinated swarm. This BA-4 effort is trailing the BA-3 demonstration of technologies by a fiscal quarter and then demonstrating the technology in operationally relevant environments with military mission applications.

Project Unit 3424: The Heterogeneous Collaborative Unmanned Systems (HCUS) demonstration is part of the Department of Defense Third Offset Strategy as one element in the Effector Grid category for small autonomous systems. HCUS provides autonomous, tactical monitoring of an adversary's port-sized littoral area for an extended period of time with capability to apply limited offensive effects on-demand. Vehicles and sensors are intended to be used in contested environments - employing local communications nets, autonomous vehicle behavior, low bandwidth command links and local navigation with no requirement for GPS input.

HCUS systems can be encapsulated and deployed as a single payload, or a small number of payload packages designed for specific missions. The payloads can be carried into theater by various manned or unmanned platforms depending on the degree of stealth required. A week-long project demonstration will simulate covert

deployment, operations of autonomous UAVs over the area of interest, data exfiltration to a remote operator, autonomous UAV recharging via USVs and/or UUVs, deployment of unmanned ground sensors for persistent sensing, and remote operator on-demand offensive attack on a simulated target.

Project 3437: The EMW/SEWIP/SSEE Accelerator is part of the Department of Defense Third Offset Strategy to improve real time Electro-Magnetic Maneuver Warfare operations. This effort will develop integrated cross platform active and passive sensing solutions, next generation network and real time spectrum operations.

Project 3438: This activity addresses the advanced component development and prototype demonstration associated with ONR's Innovative Naval Prototypes (INP) Program and the Leap Ahead Technology (LA-Tech) investments. INP and LA-Tech investments represent game changing technologies with the potential to revolutionize operational concepts. They are disruptive in nature as they would dramatically change the way naval forces fight. INPs and LA-Techs push the imagination of our nation's technical talent to deliver transformational warfighting capabilities. Investments may include such mission areas as Unmanned and Autonomous Systems, Directed Energy / Electric Weapons, Electromagnetic Maneuver Warfare, Cyber Warfare, and Undersea Warfare. Funding to be realigned from the Unmanned Rapid Prototype Development project (Project Number 0399) in FY 2019.

B. Program Change Summary ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	61.381	59.741	67.098	-	67.098
Current President's Budget	4.450	39.240	64.694	-	64.694
Total Adjustments	-56.931	-20.501	-2.404	-	-2.404
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-20.501			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.253	0.000			
• Program Adjustments	0.000	0.000	-2.164	-	-2.164
• Rate/Misc Adjustments	0.001	0.000	-0.240	-	-0.240
• Congressional Directed Reductions Adjustments	-56.679	-	-	-	-

Change Summary Explanation

The FY 2020 request was reduced by $2.164 million to reflect the availability of prior year execution balances.

The funding increase from FY 2019 to FY 2020 reflects increased procurement of SHARC platforms in PU 3422, and increased investment in HIJENKS Operational Acceleration effort in Project 3438.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603382N / *Advanced Combat Systems Tech*	Project (Number/Name) 0324 / *Adv Combat System Technology*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
0324: *Adv Combat System Technology*	68.820	1.798	1.813	1.797	-	1.797	1.835	1.875	1.912	1.950	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Project Unit 0324: Funding is to fully implement the Naval Open (Systems) Architecture (OSA) strategy. The implementation of this strategy provides the tools and leadership for assisting programs and the Naval Research and Development Establishment (NR&DE) through technical, business and policy transition to OSA. The primary tools and assistance are provided through a limited set of technical reference frameworks, consistent contract language guidance, Intellectual Property strategies and improvements in transparency of design disclosure and information exchange on past and current investments to support portfolio management and cross-program reuse. The OSA transformation effort will be applied to programs of record and coupled with rapid prototyping efforts being realized as management efficiencies both within programs and in accelerated acquisition efforts. Those elements include ensuring that all naval systems, families of systems, programs and prototypes move to modular OSA in accordance with Department of Defense (DoD) Instruction 5000.01 of 7 January 2015 which mandates that all DoD programs utilize Modular Open Systems Architecture to rapidly field affordable and interoperable systems. This project facilitates a strategic shift in the technical and business methods to establish cooperation, cross-domain, and community of interest business relationships. This improves innovation and economies of scale throughout the Navy and Marine Corps. This leadership effort has identified the business case and potential return on investment for moving the Navy towards an open systems approach, supported the development of open systems technologies, and integrated best business and technical practices for open systems development within Naval acquisition. Naval OSA ensures Navy-wide system architectures become extensible and scalable in function, capacity, and workload to meet Joint warfighting requirements. This also includes the identification and development of common software components, functions, reuse methodologies, and extensible product lines.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Align the Naval Enterprise Across All Domains to Implement OA	0.560	0.562	0.560	0.000	0.560
Articles:	-	-	-	-	-
FY 2019 Plans: The FY 2019 budget plan is to continue to execute the FY 2018 plan in addition to support program Modular Open Architecture development in coordination with accelerated acquisition projects and POR and define where Modular Open Systems Architecture is needed based on technology growth areas and Threats.					
FY 2020 Base Plans: The FY 2020 budget will be utilized to continue to execute the FY 2019 plan supporting the initiated Modular Open Systems Architecture projects associated with rapid prototyping. These will be incorporated in conjunction with platform/system block upgrades. Additionally, it will promote policy changes and standards development					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603382N / *Advanced Combat Systems Tech*	**Project (Number/Name)** 0324 / *Adv Combat System Technology*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
that support the implementation and standardization of Modular Open Systems Architecture for POR interoperability efforts. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** There is no significant change from FY 2019 to FY 2020.					
Title: Change the Naval and Marine Corps policy and guidance to Institutionalize OA Principle ***Articles:*** ***FY 2019 Plans:*** The FY 2019 budget will be utilized to continue to execute the FY 2018 plan in addition to support the initiation of Modular Open Systems Architecture for rapid prototyping projects to be incorporated in conjunction with platform system block upgrades and promote policy changes that support the implementation and standardization of Modular Open Systems Architecture for POR interoperability efforts. ***FY 2020 Base Plans:*** The FY 2020 budget will be utilized to continue to execute the FY 2019 plan supporting the initiated Modular Open Systems Architecture projects associated with rapid prototyping. These will be incorporated in conjunction with platform/system block upgrades. Additionally, it will promote policy changes and standards development that support the implementation and standardization of Modular Open Systems Architecture for POR interoperability efforts. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** There is no significant change from FY 2019 to FY 2020.	0.624 -	0.619 -	0.610 -	0.000 -	0.610 -
Title: OA Systems Engineering Leadership ***Articles:*** ***FY 2019 Plans:*** The FY 2019 budget will be utilized to continue to execute the FY 2018 plan in addition to coordinate the development and maintenance of Modular Open Systems Architecture interfaces and standards, promote	0.225 -	0.232 -	0.217 -	0.000 -	0.217 -

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603382N / *Advanced Combat Systems Tech*	**Project (Number/Name)** 0324 / *Adv Combat System Technology*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
projects that have successfully implemented OA in its systems, and to delegate authority as appropriate to enable speed and agility. ***FY 2020 Base Plans:*** The FY 2020 budget will be utilized to continue to execute the FY 2019 plan supporting the initiated Modular Open Systems Architecture projects associated with rapid prototyping. These will be incorporated in conjunction with platform/system block upgrades. Additionally, it will promote policy changes and standards development that support the implementation and standardization of Modular Open Systems Architecture for POR interoperability efforts. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** There is no significant change from FY 2019 to FY 2020.					
Title: Knowledge Products for Implementing OSA	0.389	0.400	0.410	0.000	0.410
Articles:	-	-	-	-	-
FY 2019 Plans: The FY 2019 budget will continue to execute the FY 2018 plan and to provide Scientists and Engineers within NR&DE common products that can be used across the enterprise and identify test assets that can be leveraged between programs to implement OSA and accelerate acquisition. ***FY 2020 Base Plans:*** The FY 2020 budget will be utilized to continue to execute the FY 2019 plan supporting the initiated Modular Open Systems Architecture projects associated with rapid prototyping. These will be incorporated in conjunction with platform/system block upgrades. Additionally, it will promote policy changes and standards development that support the implementation and standardization of Modular Open Systems Architecture for POR interoperability efforts. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** There is no significant change from FY 2019 to FY 2020.					
Accomplishments/Planned Programs Subtotals	1.798	1.813	1.797	0.000	1.797

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603382N / *Advanced Combat Systems Tech*	**Project (Number/Name)** 0324 / *Adv Combat System Technology*

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

This has been a Navy Acquisition Executive directed effort to fundamentally alter the business, technical and policy for warfare systems acquisition to result in improved cost, increased access to innovation, a reduction in time to field, and promote cultural environment change. The Navy's OSA Enterprise effort built off past successes such as the Acoustic Rapid Commercial-off-the-Shelf Insertion started program and established this core OA Budget line (policy statement dated 5 August 2004). The strategy was further refined in the Deputy Chief of Naval Operations (DCNO)requirement of 23 December 2005 (N6/7), the Naval OSA Strategy of 2011 and extended for applicability to the other Defense Services under the DoD Better Buying Power initiative. This effort continues to expand into and support the related strategic shift to Rapid Prototyping, Experimentation and Demonstration.

E. Performance Metrics

Change Naval Processes and business practices to cost-effectively innovate and rapidly deploy improved warfighting capability based on fleet requirements. Provide OSA to field common, interoperable capabilities; Change Navy and Marine Corps Business processes to Institutionalize OSA Principles.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603382N / *Advanced Combat Systems Tech*	Project (Number/Name) 0324 / *Adv Combat System Technology*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
SE/OA Domain Support	C/FP	APL/ IET Contract : VARIOUS	2.576	0.000		0.000		0.000		-		0.000	0.000	2.576	Continuing
Systems Engineering	MIPR	NSWC / Dahlgren : Dahlgren, VA	13.307	0.000		0.000		0.000		-		0.000	0.000	13.307	Continuing
Systems Engineering	WR	NSWC/CRANE, Carderock, DISA : VARIOUS	3.119	0.000		0.000		0.000		-		0.000	0.000	3.119	Continuing
Systems Engineering	C/CPAF	ASSETT; Lockheed Martin, NJ; Gartner, VA : Washington DC	5.114	0.000		0.000		0.000		-		0.000	0.000	5.114	Continuing
OA DOMAIN SUPPORT	WR	NUWC/Newport, Spawar, Navair : VARIOUS	11.931	0.000		0.000		0.000		-		0.000	0.000	11.931	Continuing
SE/Signal Processor	C/CPAF	Lockheed Martin : VARIOUS	6.000	0.000		0.000		0.000		-		0.000	0.000	6.000	Continuing
SE/Signal Processor	C/CPAF	BAE : VARIOUS	0.300	0.000		0.000		0.000		-		0.000	0.000	0.300	Continuing
SE/Signal Processor	C/CPAF	Raytheon : VARIOUS	0.100	0.000		0.000		0.000		-		0.000	0.000	0.100	Continuing
SE/Signal Processor	WR	NSWC/DD, NRL, PHD : VARIOUS	0.600	0.000		0.000		0.000		-		0.000	0.000	0.600	Continuing
Align the Naval Enterprise Across All Domains to Implement OA	WR	NSWCDD : VARIOUS	1.988	0.631	Oct 2017	0.562	Oct 2018	0.560	Oct 2019	-		0.560	0.000	3.741	-
Change the Naval and Marine Corps policy and guidance to Institutionalize OA Principle	WR	NSWC, NRL, NUWC, NAWC : VARIOUS	0.400	0.553	Oct 2017	0.619	Oct 2018	0.610	Oct 2019	-		0.610	0.000	2.182	-
OA Systems Engineering Leadership	WR	NSWC, NRL, NUWC, NAWC : VARIOUS	0.320	0.225	Oct 2017	0.232	Oct 2018	0.217	Oct 2019	-		0.217	0.000	0.994	-
Knowledge Products for Implementing OSA	WR	NSWC, NRL, NUWC, NAWC NUW, NEWPORT,	0.447	0.389	Oct 2017	0.400	Oct 2018	0.410	Oct 2019	-		0.410	0.000	1.646	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
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Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
		NSWC CRANE : VARIOUS													
		Subtotal	46.202	1.798		1.813		1.797		-		1.797	0.000	51.610	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Industry Development	C/FP	IBM, ANGLE, TBD (New IET Contract) : VARIOUS	9.805	0.000		0.000		0.000		-		0.000	0.000	9.805	Continuing
Technical Data-Academia	WR	NPS-Monterey/DAU : MONTEREY, CA	2.348	0.000		0.000		0.000		-		0.000	0.000	2.348	Continuing
Software Development	C/FP	TRIDENT, ASSET : VARIOUS	0.309	0.000		0.000		0.000		-		0.000	0.000	0.309	Continuing
		Subtotal	12.462	0.000		0.000		0.000		-		0.000	0.000	12.462	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Operational Test & Evaluation	WR	NSWC/DD : DAHLGREN, VA	2.216	0.000		0.000		0.000		-		0.000	0.000	2.216	Continuing
OA Asset Repository (SBIR Account)	WR	Miscellaneous : VARIOUS	0.150	0.000		0.000		0.000		-		0.000	0.000	0.150	Continuing
		Subtotal	2.366	0.000		0.000		0.000		-		0.000	0.000	2.366	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
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Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management Support	C/CPAF	Miscellaneous : VARIOUS	3.021	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
SBIR Assessment (Cong Add)	WR	NSWC/DD : DAHLGREN, VA	4.748	0.000		0.000		0.000		-		0.000	0.000	4.748	Continuing
DAWDF	TBD	TBD : TBD	0.021	0.000		0.000		0.000		-		0.000	0.000	0.021	Continuing
		Subtotal	7.790	0.000		0.000		0.000		-		0.000	Continuing	Continuing	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	68.820	1.798		1.813		1.797		-		1.797	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603382N / *Advanced Combat Systems Tech*	**Project (Number/Name)** 0324 / *Adv Combat System Technology*

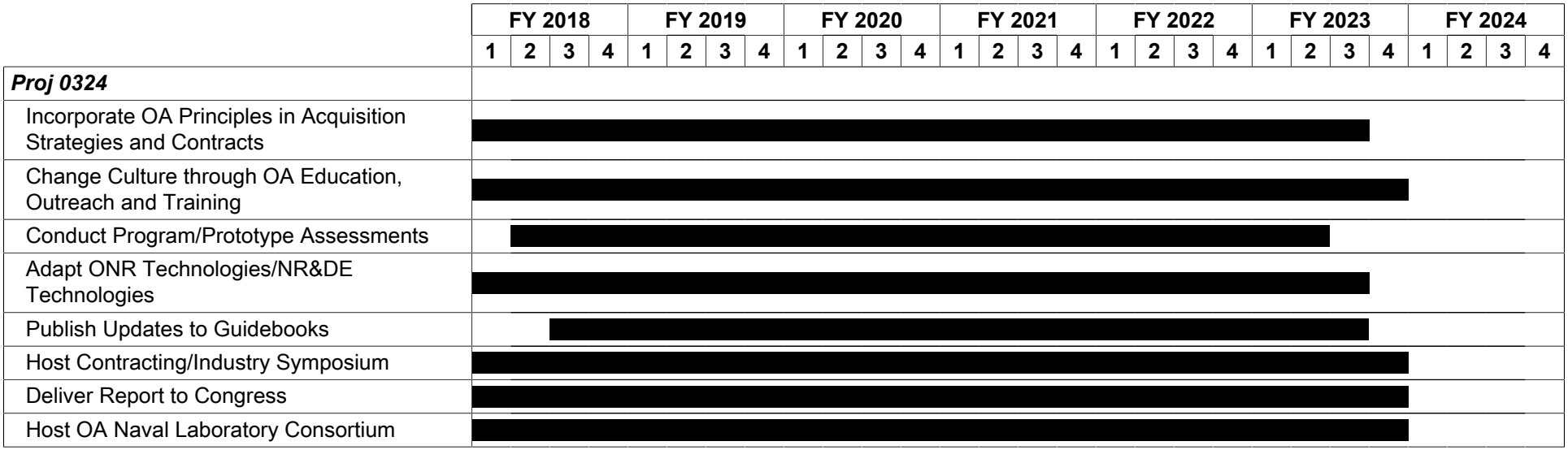


Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
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Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 0324				
Incorporate OA Principles in Acquisition Strategies and Contracts	1	2018	3	2023
Change Culture through OA Education, Outreach and Training	1	2018	4	2023
Conduct Program/Prototype Assessments	2	2018	2	2023
Adapt ONR Technologies/NR&DE Technologies	1	2018	3	2023
Publish Updates to Guidebooks	3	2018	3	2023
Host Contracting/Industry Symposium	1	2018	4	2023
Deliver Report to Congress	1	2018	4	2023
Host OA Naval Laboratory Consortium	1	2018	4	2023

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603382N / *Advanced Combat Systems Tech*	Project (Number/Name) 2480 / *SSL-TM*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
2480: *SSL-TM*	0.000	0.000	0.000	3.922	-	3.922	11.918	5.442	4.000	0.000	0.000	25.282
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Note

This project unit (PU) was established in FY 2020 from funding internally realigned in the PE out of Project Unit 3438. This is not a new start. This PU 2480 includes Solid State Laser Technology Maturation (SSL-TM) resources and associated plans intended to provide advanced component development and prototyping for selected SSL-TM technologies maturing out of ONR's supporting Leap Ahead Technology (LA-Tech) and Innovative Naval Prototype (INP) BA3 portfolio.

A. Mission Description and Budget Item Justification

The efforts described in this mission area address the advanced component development and prototype demonstration associated with the Navy's Solid State Laser Technology Maturation (SSL-TM) Innovative Naval Prototypes (INP) Program and the Leap Ahead Technology (LA-Tech) investments. The SSL-TM program is developing an integrated Laser Weapons System Demonstrator (LWSD). SSL-TM will provide a new capability to the Fleet to address known capability gaps against asymmetric threats (UAS, small boats, and ISR sensors) and will inform future acquisition strategies, system designs, integration architectures, and fielding plans for laser weapon systems.

INP and LA-Tech investments represent game changing technologies with the potential to revolutionize operational concepts. They are disruptive in nature as they would dramatically change the way naval forces fight. INPs and LA-Techs push the imagination of our nation's technical talent to deliver transformational warfighting capabilities. Successful demonstrations are intended to present the Department of the Navy with a programmatic challenge as these new capabilities can lead to the obsolescence of existing capabilities and significant decisions as to the path forward for integrating the new technological capabilities into the warfighting systems of the future.

ONR manages a continuum of INP and LA-Tech development from BA2 to BA3 to BA4. The goal of these BA4 investments is to further mature development and expend efforts necessary to evaluate integrated technologies, representative modes or prototype systems in high fidelity and realistic operating environments. This BA4 investment includes system specific efforts that help expedite technology transition from the laboratory to operational use. Emphasis is on proving component and subsystem maturity prior to integration in major and complex systems and may involve risk reduction initiatives. Projects in this category involve efforts prior to Milestone B and are referred to as advanced component development activities and include technology demonstrations. It is the goal of these projects to achieve Technology Readiness Levels 6 or 7. Successful experimentation and demonstration highlights the viability of new technological capabilities that could be implemented if an acquisition program were to be established to support further development. The portfolio is periodically refreshed through the selection of new INPs and LA-Tech investments as existing ones are completed.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Solid State Laser Technology Maturation (SSL-TM)	0.000	0.000	3.922	0.000	3.922

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603382N / *Advanced Combat Systems Tech*	**Project (Number/Name)** 2480 / *SSL-TM*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Articles:	-	-	-	-	-
Description: The Solid State Laser Technology Maturation (SSL-TM) Program is developing an integrated Laser Weapons System Demonstrator (LWSD) that will be installed on USS Portland (LPD-27) during FY 2019 with investments funded in the BA3 Innovative Naval Prototypes Program Element 0603801N. The investment programmed in Program Element 0603382N, Advanced Combat Systems Technology, funds costs for extended at-sea experimentation, operations, and support of the installed system on LPD-27 in the Pacific operating areas. SSL-TM will provide a new capability to the Fleet to address known capability gaps against asymmetric threats (UAS, small boats, and ISR sensors) and will inform future acquisition strategies, system designs, integration architectures, and fielding plans for laser weapon systems. ***FY 2019 Plans:*** N/A ***FY 2020 Base Plans:*** Conduct extended experimentation and laser weapons systems capabilities demonstration on USS Portland during fleet operations and experiments. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** The increase in FY 2020 is due to establishment of the project for fiscal transparency into investments in SSL-TM technology experimentation and demonstration activity. Prior work was conducted under Project 3438.					
Accomplishments/Planned Programs Subtotals	0.000	0.000	3.922	0.000	3.922

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

The projects identified for execution are non-acquisition programs. The Office of Naval Research will provide Government oversight to the projects. Each project will develop a project plan to support execution. Project plans will include a schedule and the necessary technical requirements and objectives to measure and evaluate performance. Additionally, each project will be subjected to experimentation then demonstrated in operationally relevant environments to assess their ability to meet warfighter requirements. Project deliverables will include the actual integrated hardware/software prototype systems, test reports, and technical data, necessary to

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603382N / *Advanced Combat Systems Tech*	**Project (Number/Name)** 2480 / *SSL-TM*

support decision making. These decisions include the transition of technologies to acquisition, further refinement of the technology, or termination and reinvestment of remaining funds to other technologies that add military value.

E. Performance Metrics

In all cases, the technologies being developed within this PE support the Department of the Navy INP and Leap Ahead Programs and are managed at the Office of Naval Research. The primary technological metrics used in this PE involve experiments and tests that demonstrate, in an operationally relevant environment, the proof of concept for the technological capability being developed. Technology development is informed by periodic interaction with Naval warfighters, resource sponsors and the acquisition community. At the lowest level, each project is evaluated against technical and financial milestones on a frequent basis. Annually, each project is reviewed in depth for technical performance and development status by the Chief of Naval Research. Department of the Navy leadership is briefed on the portfolio's status by the Chief of Naval Research.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603382N / *Advanced Combat Systems Tech*	Project (Number/Name) 2480 / *SSL-TM*	

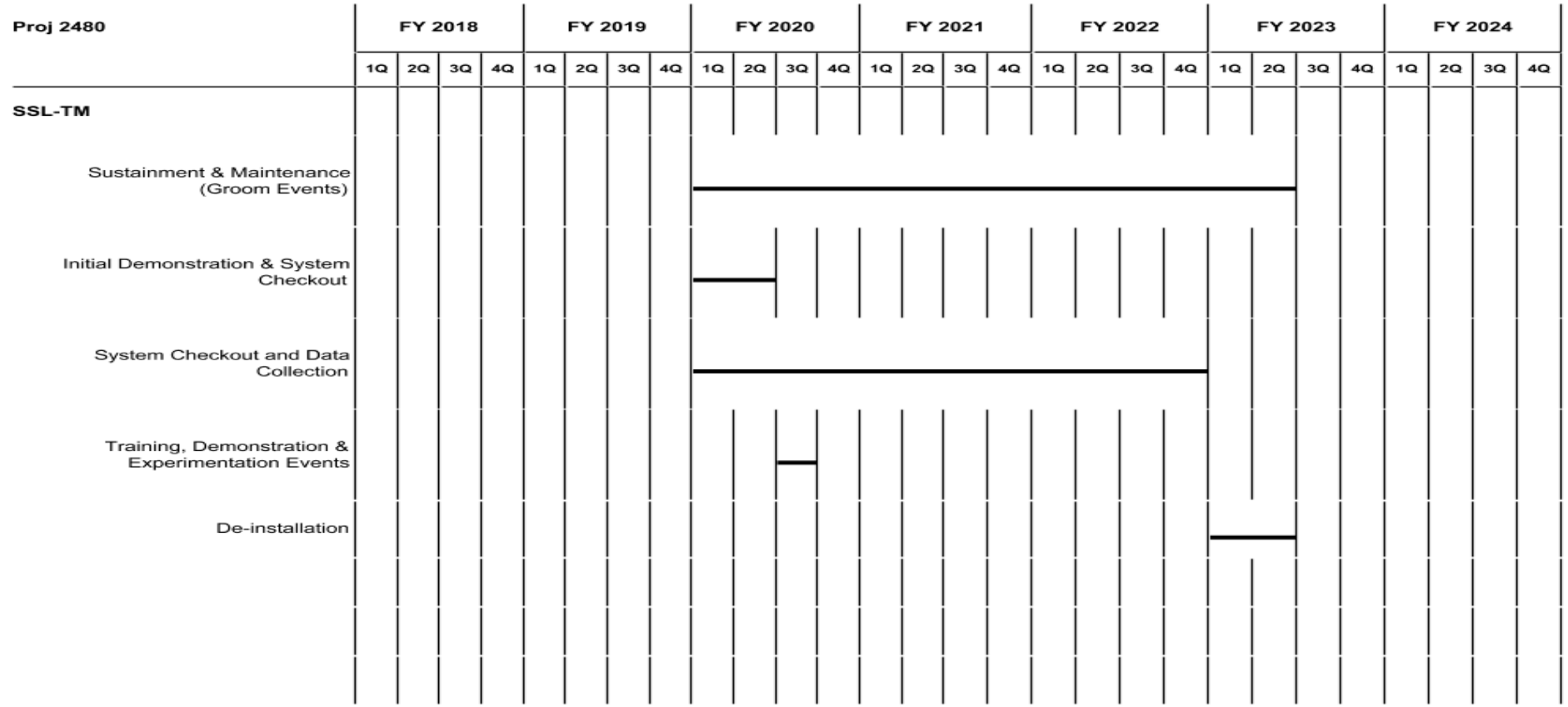
Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
SSL-TM Experimentation and Testing	WR	Naval Surface Warfare Center Dahlgren Division : Dahlgren, VA	0.000	0.000		0.000		1.922	Oct 2019	-		1.922	0.000	1.922	-
SSL-TM Experimentation and Sustainment	WR	Naval Surface Warfare Center, Port Hueneme Divisio : Port Hueneme, CA	0.000	0.000		0.000		1.000	Oct 2019	-		1.000	0.000	1.000	-
SSL-TM Technical and Engineering T&E	C/CPFF	Northrup Grumman : Redondo Beach, CA	0.000	0.000		0.000		1.000	Oct 2019	-		1.000	0.000	1.000	-
		Subtotal	0.000	0.000		0.000		3.922		-		3.922	0.000	3.922	N/A

	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	0.000		0.000		3.922		-		3.922	0.000	3.922	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603382N / *Advanced Combat Systems Tech*	**Project (Number/Name)** 2480 / *SSL-TM*



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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603382N / *Advanced Combat Systems Tech*	**Project (Number/Name)** 2480 / *SSL-TM*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 2480				
SSL-TM: Sustainment & Maintenance (Groom Events): Sustainment & Maintenance (Groom Events)	1	2020	2	2023
SSL-TM: Initial Demonstration & System Checkout: Initial Demonstration & System Checkout	1	2020	2	2020
SSL-TM: System Checkout and Data Collection: System Checkout and Data Collection	1	2020	4	2022
SSL-TM: Training, Demonstration & Experimentation Events: Training, Demonstration & Experimentation Events	3	2020	3	2020
SSL-TM: De-installation: De-installation	1	2023	2	2023

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603382N / *Advanced Combat Systems Tech*	Project (Number/Name) 3422 / *SHARC Surface Platform*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
3422: *SHARC Surface Platform*	0.000	2.627	7.025	9.281	-	9.281	14.757	3.834	0.000	0.000	0.000	37.524
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Sensor Hosting Autonomous Remote Craft (SHARC) Surface Platforms demonstration project is part of the Department of Defense Third Offset Strategy as one element in the Sensor Grid category for 24/7 autonomy infused Situational Awareness (SA). This project will purchase Commercial-off-the-Shelf (COTS) SHARC Platforms (wave gliders) and integrate unique Government-owned classified mission payloads and enhanced capabilities including the detection of threats with persistence. The focus of this effort is to accelerate demonstration of capabilities to meet Combatant Commander (COCOM) requirements that do not exist elsewhere in DoD and provide the fleet with a low cost, asymmetric advantage in support of multiple classified missions. This includes persistent, autonomous situational awareness and early warning of submarines or related submarine activity as well as broad area, clandestine implementation of capabilities that enhance Intelligence Preparation of the Battlefield (IPB) and strike missions. The successful demonstration of one particular payload integration to support a high priority warfighting mission area will be followed by a prototype operational event. These capabilities will enable Concepts of Operation (CONOPS) development in an operationally relevant environment to demonstrate how these technologies can improve the SA to the battlespace Commanders.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Sensor Hosting Autonomous Remote Craft (SHARC)	2.627	7.025	9.281	0.000	9.281
Articles:	-	-	-	-	-
Description: This project will demonstrate the warfighting utility of multiple, long endurance platforms with classified payloads conducting critical Intelligence, Surveillance and Reconnaissance (ISR) missions with simultaneous, wideband data links for signal and imagery data transmission between host assets and Operational level processing systems. Emerging technologies and engineering innovations from Naval/DoD research and development and industry, will be integrated to demonstrate secure and reliable collection, analysis, tactical level access to host asset ISR data and fusion of ISR and targeting data from organic assets and sensors.					
Through FY 2018, the SHARC program has accomplished the following major objectives:					
- The first three COTS platforms were be procured and classified payloads delivered for integration and testing. - Integration of mature technologies was initiated to include enabling payload critical mission capabilities. Also initiates was the adaptation of an existing capability to function as a Universal SHARC Payload module (UPS) to enable all other mission system adaptations.					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603382N / *Advanced Combat Systems Tech*	**Project (Number/Name)** 3422 / *SHARC Surface Platform*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
- Preliminary mission CONOPS development, program planning, trade analysis, integration design requirements development, and systems engineering efforts were be conducted. Additional details are available at higher classification levels. ***FY 2019 Plans:*** - Complete requirements analysis, update component and subsystem specifications, and refine CONOPS. - Procure six SHARC platforms to include additional platforms to meet USPACOM emergent requirements. - Complete design and build the UPS; SPAWARSYSCEN Pacific (SSCPAC) will integrate multiple classified payloads and conduct initial functional lab testing of an both an adapted wide area Anti-Submarine sensor and a strike warfare payload. - Develop and integrate required capability for a high priority IPB mission. - The Maritime Surveillance Systems (MSS) Program Office and SSCPAC will initiate and coordinate the development of system level test plans and conduct initial system level at-sea test and evaluation to assess performance. - Additional details are available at higher classification levels. ***FY 2020 Base Plans:*** - Continue requirements analysis and update component and subsystem specifications as required. - Integrate mature technologies developed in the areas of low probability of intercept and detection (LPI/LPD) techniques, high data rate exchange, long-range multi-band and wideband links, software-defined modes, encryption, and signal processing modules. - Complete payload adaptation for classified Intelligence Preparation of the Battlefield (IPB) mission payload. Conduct integration on SHARC, with functional lab and at-sea testing followed by fleet exercise demonstration. - Develop CONOPS for execution of the prototype operation. - Conduct system level user test and evaluation to assess performance on additional payloads and delivery systems against vetted Measures of Effectiveness (MOE). - Procure nine SHARC platforms and payload systems for FY 2021/2022 high priority IPB Prototype Operation to meet USPACOM ISR mission requirements. - Additional details are available at higher classification levels. ***FY 2020 OCO Plans:***					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603382N / *Advanced Combat Systems Tech*	**Project (Number/Name)** 3422 / *SHARC Surface Platform*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** The increase from FY 2019 to FY 2020 is due to the procurement of additional SHARC platforms in preparation for prototype operations which requires an increase in the number of wave gliders. The IPB payload will also require additional non-recurring engineering for adaptation to the SHARC and its UPS.					
Accomplishments/Planned Programs Subtotals	2.627	7.025	9.281	0.000	9.281

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

FY2019: T&E Milestone: Developmental Test (DT) and assessment of initial payloads installed on SHARC platforms
FY2020: T&E Milestone: DT and assessment of additional payloads installed on SHARC platforms
FY2021: T&E Milestone: Build and validate readiness of integrated Prototype Operational units

E. Performance Metrics

Performance metrics are specific to each of the projects funded. All will include measures identified in the Statement of Objectives (SOO), including completions, successes, terminations, and iterative prototype cycle times reported against schedules and deliverables stated in the requirement documents.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603382N / *Advanced Combat Systems Tech*	Project (Number/Name) 3422 / *SHARC Surface Platform*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Requirements and CONOPS Development	MIPR	Naval Undersea Warfare Center (NUWC) : Keyport, WA	0.000	0.225	Oct 2017	0.450	Oct 2018	0.450	Oct 2019	-		0.450	0.000	1.125	-
Payload Design, Engineering, and Integration	MIPR	Space and Naval Warfare System Center Pacific (SSC : San Diego, CA	0.000	0.644	Oct 2017	2.908	Oct 2018	1.792	Oct 2019	-		1.792	0.000	5.344	-
Purchase COTS SHARC platforms	C/FFP	Space and Naval Warfare System Center Pacific (SSC : San Diego, CA	0.000	1.275	Oct 2017	2.500	Dec 2018	6.100	Oct 2019	-		6.100	0.000	9.875	-
		Subtotal	0.000	2.144		5.858		8.342		-		8.342	0.000	16.344	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Test & Evaluation Phase	MIPR	PMS-485 Maritime Surveillance Systems, SSCPAC : San Diego, CA	0.000	0.158	Oct 2017	0.515	Mar 2019	0.120	Mar 2020	-		0.120	0.000	0.793	-
		Subtotal	0.000	0.158		0.515		0.120		-		0.120	0.000	0.793	N/A

Management Services ($ in Millions)

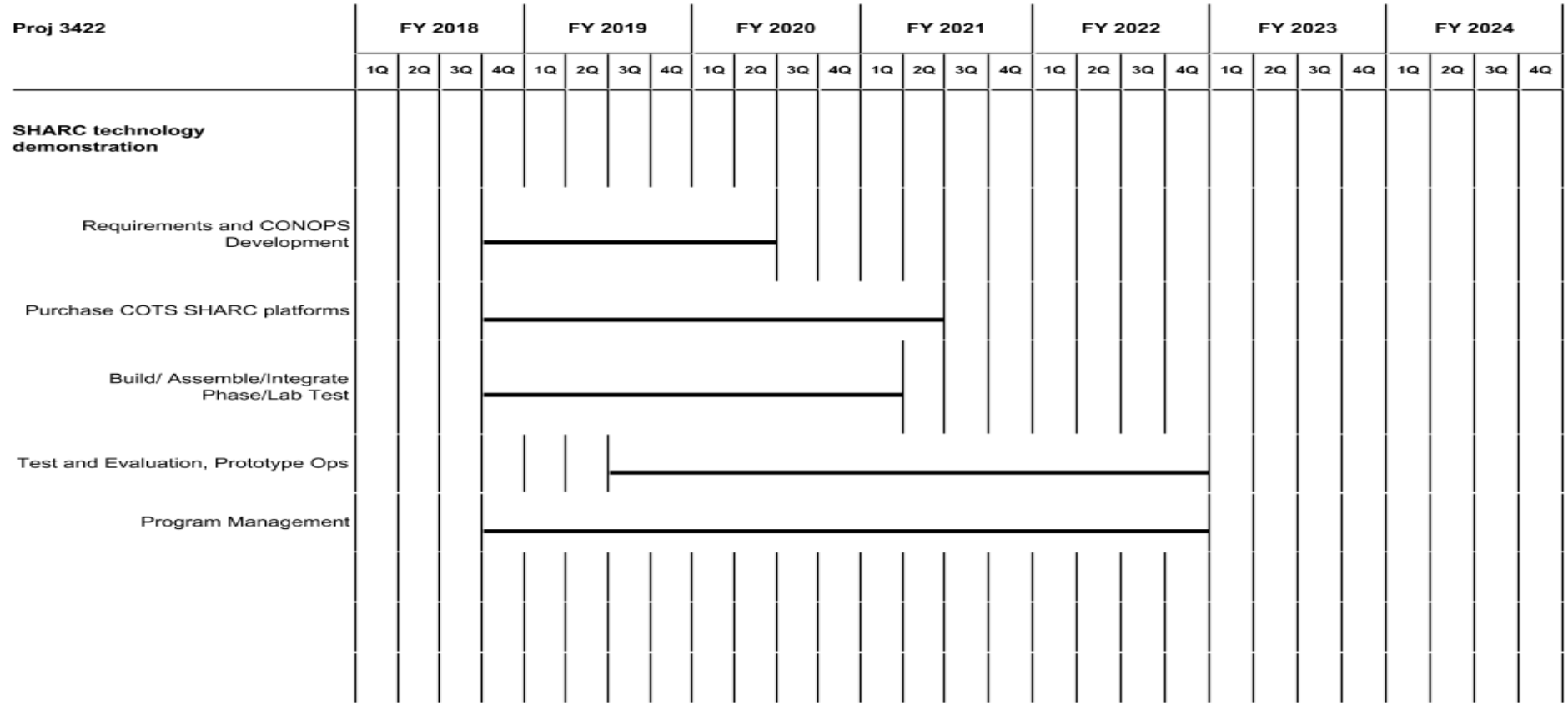
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management	MIPR	PMS-485 Maritime Surveillance Systems, SSCPAC : San Diego, CA	0.000	0.325	Oct 2017	0.652	Oct 2018	0.819	Oct 2019	-		0.819	0.000	1.796	-
		Subtotal	0.000	0.325		0.652		0.819		-		0.819	0.000	1.796	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603382N / *Advanced Combat Systems Tech*	Project (Number/Name) 3422 / *SHARC Surface Platform*	

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	2.627		7.025		9.281		-		9.281	0.000	18.933	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
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2020OSD - 0603382N - 3422

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603382N / *Advanced Combat Systems Tech*	**Project (Number/Name)** 3422 / *SHARC Surface Platform*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 3422				
SHARC technology demonstration: Requirements and CONOPS Development: Requirements and CONOPS Development	4	2018	2	2020
SHARC technology demonstration: Purchase COTS SHARC platforms: Purchase COTS SHARC platforms	4	2018	2	2021
SHARC technology demonstration: Build/ Assemble/Integrate Phase/Lab Test: Build/ Assemble/Integrate Phase/Lab Test	4	2018	1	2021
SHARC technology demonstration: Test and Evaluation, Prototype Ops: Test and Evaluation, Prototype Ops	3	2019	4	2022
SHARC technology demonstration: Program Management: Program Management	4	2018	4	2022

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603382N / *Advanced Combat Systems Tech*	Project (Number/Name) 3423 / *LOCUST*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
3423: *LOCUST*	0.000	0.013	1.954	2.960	-	2.960	5.948	7.940	8.103	8.265	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The LOCUST demonstration is part of the Department of Defense (DOD) Third Offset Strategy as one element in the Effector Grid category for small autonomous systems. LOCUST leverages the BA-3 Innovative Naval Prototype program developing and demonstrating swarming technology. The BA-3 effort is developing both the air vehicle, UAS swarming behaviors, and miniaturized sensor systems. ONR has demonstrated an autonomous system capable of launching 33 UASs in 40 seconds and flying them in a coordinated swarm. This BA-4 effort is trailing the BA-3 demonstration of technologies by a fiscal quarter and then demonstrating the technology in operationally relevant environments with military mission applications. Due to limitation of funding, FY 2018 accomplishments were limited to just the planned warfighter workshops and program planning. The LOCUST budget and schedule have been adjusted accordingly to reflect this situation.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: LOCUST	0.013	1.954	2.960	0.000	2.960
Articles:	-	-	-	-	-
Description: This Project focuses on demonstration of mixed-initiative UAV swarming behaviors, enabling the development of payload appropriate CONOPS/TTPs for Many Vehicle/Many Salvo swarms, and provides unmanned system capability to degrade threat Integrated Air Defense Systems (IADS) in support of follow-on manned system operations.					
FY 2019 Plans: Phase I integration and test activities to assess functional performance of LOCUST Counter-Improvised Explosive Device (IED) subsystems and communications jamming capabilities installed on autonomous platforms and launched from USMC Military-RZR (M-RZR, based off of Polaris RZR off-road platform), M-RZR trailer. Conduct system-level experimentation and demonstration of the prototype system. The Center for Naval Analysis will assess system performance for the ground-launched system and develop Concepts of Operations (CONOPS) and Tactics, Techniques, and Procedures (TTP) to support future USMC operations. In FY 2019, the LOCUST efforts will initiate transition from the Phase I efforts into Phase II demonstrating multi-domain launch of swarming UAVs' to provide information, surveillance, reconnaissance (ISR) and kinetic attack					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603382N / *Advanced Combat Systems Tech*	**Project (Number/Name)** 3423 / *LOCUST*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
for strike of land and sea targets in support of follow-on manned missions. Effort will procure flight assets to begin integration of payloads and flight testing. ***FY 2020 Base Plans:*** In FY 2020, the LOCUST efforts will initiate transition from the Phase I efforts into Phase II demonstrating multi-domain launch of swarming UAVs' to provide information, surveillance, reconnaissance (ISR) and kinetic attack for strike of land and sea targets in support of follow-on manned missions. Specifically, Phase II will develop and demonstrate an unmanned undersea vehicle (UUV)-launched Swarm for conducting counter-Integrated Air Defense Systems missions in support of naval units. This project will demonstrate mixed-initiative UAV swarming behaviors developed by the BA-3 activity, enable the development of payload appropriate CONOPS/TTPs for Many Vehicle/Many Salvo swarms, and provide unmanned system capability to degrade threat IADS in support of follow-on manned system operations ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** The funding increase from FY 2019 to FY 2020 is associated with increased cost for procurement of launcher hardware and planned development tests.					
Accomplishments/Planned Programs Subtotals	0.013	1.954	2.960	0.000	2.960

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

There are multiple phases for this non-acquisition project.

Phase 1 - Marine Corps Warfighting Laboratory (MCWL) Air Combat Element (ACE) will lead the Phase I effort in FY 2018 & FY 2019. MCWL will procure additional launchers, LOCUST platforms and payloads. MCWL will work with the Common Launch Tube Program of Record to procure the multiple missile Common Launch Tube. MCWL will task NAWC AD to help integrate the launcher system onto the MV-22 and support flight test and flight certification. MCWL will use a supporting Warfare Center to integrate the launcher onto a Marine Corps Polaris Corporation M-RZR vehicle or M-RZR trailer. MCWL ACE will closely coordinate with the BA-3 LOCUST program manager to procure the new 6" diameter, additive manufactured, air frame (purchase through BA-3 activity contract). MCWL Experimental Division will define CONOPS/TTPs, the experimental parameters and measures of effectiveness, and operational experiments suitable to apply the capability in a relevant

operational environment to evaluate the military utility of the system to a small Marine Corps maneuver element. The Center for Naval Analysis will consolidate the post demonstration report for the systems military utility.

Phase II -ONR execute a multi-domain swarm effort in FY 2020-2023 to demonstrate the advantages of small swarming UAVs against adversary defenses. ONR will work with the Naval Warfare Development Center (NWDC) to develop CONOPS / TTPS for this mission capability and fleet experimentation. NSWC Panama City Division (NSWC PCD) will provide operational and logistics support for the launch and recovery of the vehicles. Initiation of Phase II in FY2020 intentionally follows the 6.3 INP by two fiscal years to allow the INP to develop and mature the miniaturized payloads required for an operational demo.

Phase III - Beginning in FY 2024, the LOCUST effort will transition to a phase III effort to provide ISR and kinetic strike against a broader target set than in Phase II as well as heterogeneous multi-domain launch platforms.

E. Performance Metrics

MCWL Experimental Division (Phase I) and PACOM (Phase II) will define CONOPS/TTPs, the experimental parameters and measures of effectiveness, and operational experiments suitable to apply the capability in a relevant operational environment to evaluate the military utility of the system to a small Marine Corps maneuver element.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603382N / *Advanced Combat Systems Tech*	Project (Number/Name) 3423 / *LOCUST*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Multi-Rotor Platform Procur	MIPR	NRL : Wash, DC	0.000	0.013	Oct 2017	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Multi-Rotor Platform Payload	MIPR	MITRE : Mclean, VA	0.000	0.000	Jan 2018	0.350	Dec 2018	0.000		-		0.000	Continuing	Continuing	Continuing
Payload Procurement	C/CPFF	Raytheon : Tucson, AZ	0.000	0.000		0.704	Feb 2019	0.000		-		0.000	Continuing	Continuing	Continuing
Multi-Rotor Tests	MIPR	NSWC : Indian Head, MD	0.000	0.000		0.100	Feb 2019	0.000		-		0.000	Continuing	Continuing	Continuing
Fixed-Wing Procurement	C/CPFF	Raytheon : Tuxson, AZ	0.000	0.000		0.800	Feb 2019	0.000		-		0.000	Continuing	Continuing	Continuing
Platform Specific Launcher Development	Various	Various : Various	0.000	0.000		0.000		1.290	Nov 2019	-		1.290	Continuing	Continuing	Continuing
Command and Control Integration	Various	Various : Various	0.000	0.000		0.000		0.560	Nov 2019	-		0.560	Continuing	Continuing	Continuing
Fixed Wing Tests	Various	Various : Various	0.000	0.000		0.000		0.950	Jun 2020	-		0.950	Continuing	Continuing	Continuing
		Subtotal	0.000	0.013		1.954		2.800		-		2.800	Continuing	Continuing	N/A

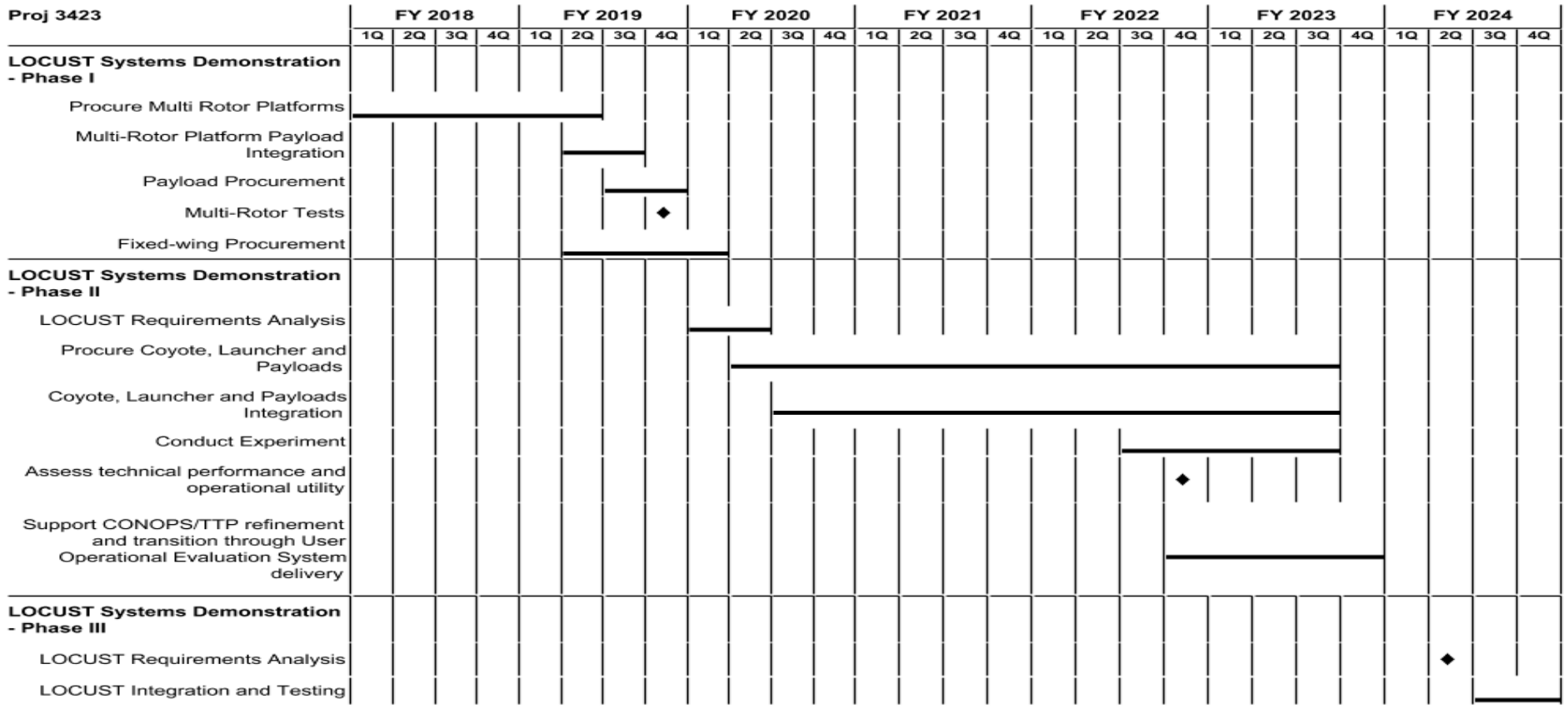
Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Management	TBD	Not Specified : Not Specified	0.000	0.000		0.000		0.160	Oct 2019	-		0.160	0.000	0.160	-
		Subtotal	0.000	0.000		0.000		0.160		-		0.160	0.000	0.160	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	0.013		1.954		2.960		-		2.960	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603382N / *Advanced Combat Systems Tech*	**Project (Number/Name)** 3423 / *LOCUST*



2020PB - 0603382N - 3423

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603382N / *Advanced Combat Systems Tech*	**Project (Number/Name)** 3423 / *LOCUST*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 3423				
LOCUST Systems Demonstration - Phase I: Procure Multi Rotor Platforms: Procure Multi Rotor Platforms	1	2018	2	2019
LOCUST Systems Demonstration - Phase I: Multi-Rotor Platform Payload Integration: Multi-Rotor Platform Payload Integration	2	2019	3	2019
LOCUST Systems Demonstration - Phase I: Payload Procurement: Payload Procurement	3	2019	4	2019
LOCUST Systems Demonstration - Phase I: Multi-Rotor Tests: Multi-Rotor Tests	4	2019	4	2019
LOCUST Systems Demonstration - Phase I: Fixed-wing Procurement: Fixed-wing Procurement	2	2019	1	2020
LOCUST Systems Demonstration - Phase II: LOCUST Requirements Analysis: LOCUST Requirements Analysis	1	2020	2	2020
LOCUST Systems Demonstration - Phase II: Procure Coyote, Launcher and Payloads: Procure Coyote, Launcher and Payloads	2	2020	3	2023
LOCUST Systems Demonstration - Phase II: Coyote, Launcher and Payloads Integration: Coyote, Launcher and Payloads Integration	3	2020	3	2023
LOCUST Systems Demonstration - Phase II: Conduct Experiment: Conduct Experiment	3	2022	3	2023
LOCUST Systems Demonstration - Phase II: Assess technical performance and operational utility: Assess technical performance and operational utility	4	2022	4	2022
LOCUST Systems Demonstration - Phase II: Support CONOPS/TTP refinement and transition through User Operational Evaluation System delivery: Support CONOPS/ TTP refinement and transition through User	4	2022	4	2023
LOCUST Systems Demonstration - Phase III: LOCUST Requirements Analysis: LOCUST Requirements Analysis	2	2024	2	2024

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603382N / *Advanced Combat Systems Tech*	**Project (Number/Name)** 3423 / *LOCUST*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
LOCUST Systems Demonstration - Phase III: LOCUST Integration and Testing: LOCUST Integration and Testing	3	2024	4	2024

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603382N / *Advanced Combat Systems Tech*	Project (Number/Name) 3424 / *Heterogeneous Collaborative Unmanned Systems (HCUS)*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
3424: *Heterogeneous Collaborative Unmanned Systems (HCUS)*	0.000	0.012	1.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	1.012
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Note

This project funding is being realigned in FY 2020 to project 3438 Innovative Naval Prototype (INP) Transition (6.4) within PE 0603382N Advanced Combat Systems Tech.

A. Mission Description and Budget Item Justification

The HCUS demonstration is part of the Department of Defense Third Offset Strategy as one element in the Effector Grid category for small autonomous systems. HCUS provides autonomous, tactical monitoring of an adversary's port-sized littoral area for an extended period of time with capability to apply limited offensive effects on-demand. Vehicles and sensors are intended to be used in contested environments - employing local communications nets, autonomous vehicle behavior, low bandwidth command links and local navigation with no requirement for GPS input.

HCUS systems can be encapsulated and deployed as a single payload, or a small number of payload packages designed for specific missions. The payloads can be carried into theater by various manned or unmanned platforms depending on the degree of stealth required. A week-long project demonstration will simulate covert deployment, operations of autonomous UAVs over the area of interest, data exfiltration to a remote operator, autonomous UAV recharging via USVs and/or UUVs, deployment of unmanned ground sensors for persistent sensing, and remote operator on-demand offensive attack on a simulated target.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Heterogeneous Collaborative Unmanned Systems (HCUS)	0.012	1.000	0.000	0.000	0.000
Articles:	-	-	-	-	-
FY 2019 Plans: Conduct Government program management and oversight of HCUS development activities. Johns Hopkins University Applied Physics Laboratory, in conjunction with NSWC Dahlgren Division, will complete HCUS system-level design and integration and commence manufacturing of initial HCUS systems.					
FY 2020 Base Plans: N/A					
FY 2020 OCO Plans:					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603382N / *Advanced Combat Systems Tech*	**Project (Number/Name)** 3424 / *Heterogeneous Collaborative Unmanned Systems (HCUS)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** The decrease from FY 2019 to FY 2020 reflects the realignment of funding to Project 3438 within this program element to support the Solid State Laser Technology Maturation (SSL-TM) program.					
Accomplishments/Planned Programs Subtotals	0.012	1.000	0.000	0.000	0.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

NSWCDD will provide Government oversight to the project and develop a multi-domain mission planning system compatible with the Aegis Combat System and Ship Self Defense System (SSDS) capable of tasking the JHU-APL autonomous systems. University Affiliated Research Center John Hopkins University: Applied Physics Laboratory will be responsible for the design and development of additive manufactured quad-copters, UUV launch system for UAV launch, low-profile USVs with commercial sensor systems, and unattended ground sensors (UGS) with a UGS deployment capability, the network backbone and long haul communications back to a combat system or Maritime Operations Center.

E. Performance Metrics

Performance metrics are specific to each of the projects funded. All will include measures identified in the Statement of Objectives (SOO), including completions, successes, terminations, and iterative prototype cycle times reported against schedules and deliverables stated in the requirement documents.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603382N / *Advanced Combat Systems Tech*	**Project (Number/Name)** 3424 / *Heterogeneous Collaborative Unmanned Systems (HCUS)*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
HCUS System Development	MIPR	DLA : Alexandria, VA	0.000	0.000	Oct 2017	0.416	Jan 2019	0.000		-		0.000	0.000	0.416	-
HCUS System Development	MIPR	Naval Surface Warfare Center DD : Panama City, FL	0.000	0.000	Oct 2017	0.496	Dec 2018	0.000		-		0.000	0.000	0.496	-
HCUS System Development	MIPR	SPAWAR : San Diego, CA	0.000	0.000		0.088	Dec 2018	0.000		-		0.000	0.000	0.088	-
		Subtotal	0.000	0.000		1.000		0.000		-		0.000	0.000	1.000	N/A

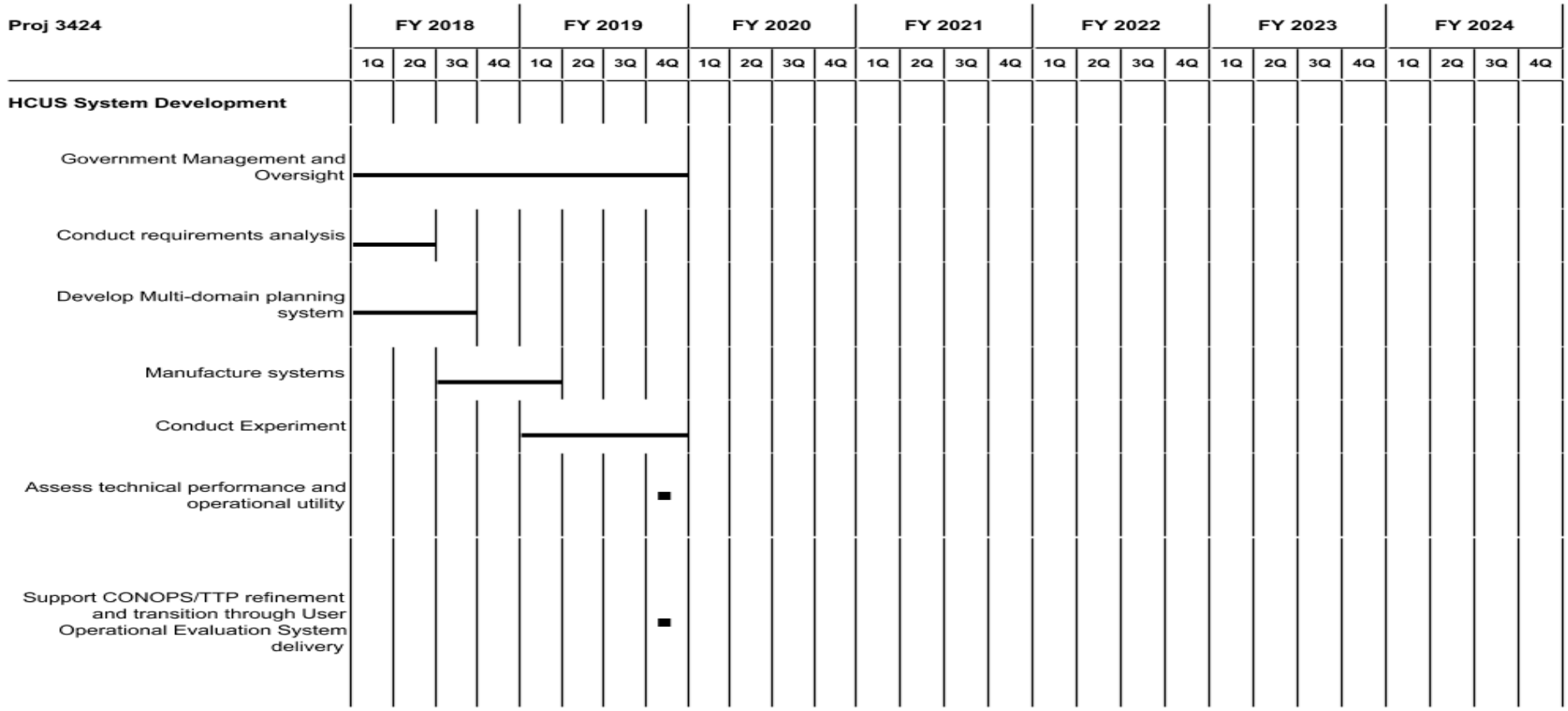
Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Government Management and Oversight	MIPR	NSWC : Dalhgren, VA	0.000	0.012	Oct 2017	0.000		0.000		-		0.000	0.000	0.012	-
		Subtotal	0.000	0.012		0.000		0.000		-		0.000	0.000	0.012	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	0.012		1.000		0.000		-		0.000	0.000	1.012	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603382N / *Advanced Combat Systems Tech*	**Project (Number/Name)** 3424 / *Heterogeneous Collaborative Unmanned Systems (HCUS)*



2020OSD - 0603382N - 3424

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603382N / *Advanced Combat Systems Tech*	**Project (Number/Name)** 3424 / *Heterogeneous Collaborative Unmanned Systems (HCUS)*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 3424				
HCUS System Development: Conduct requirements analysis: Conduct requirements analysis	4	2018	4	2018
HCUS System Development: Procurement UUV Hardware: Procurement UUV Hardware	1	2019	4	2019
HCUS System Development: Conduct Experiment: Conduct Experiment	1	2019	4	2019

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603382N / *Advanced Combat Systems Tech*	Project (Number/Name) 3437 / *EMW/SEWIP/SSEE Accelerator*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
3437: *EMW/SEWIP/SSEE Accelerator*	0.000	0.000	14.389	23.630	-	23.630	23.636	0.000	0.000	0.000	0.000	61.655
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Note

This was a new project in FY 2019 - Electromagnetic Maneuver Warfare/Surface Electronic Warfare Improvement Program to improve real time Electro-Magnetic Maneuver Warfare operations.

A. Mission Description and Budget Item Justification

The Electromagnetic Maneuver Warfare/Surface Electronic Warfare Improvement Program/Ship's Signals Exploitation Equipment (EMW/SEWIP/SSEE) Accelerator is part of the Department of Defense Third Offset Strategy to improve real time Electro-Magnetic Maneuver Warfare operations. EMW/SEWIP/SSEE Accelerator leverages the S&T Budget Activity (BA)-3 Electro-Magnetic Maneuver Warfare technology developments specifically in cross platform operations. The BA-3 effort is developing high speed sensor and electro-magnetic networking, real time spectrum operations and passive targeting technologies. ONR has demonstrated elements of next generation networking, passive tracking, and cross platform combat system coordination. This BA-4 effort is trailing the BA-3 demonstration of technologies deploying and demonstrating the technology in operationally relevant environments with military mission applications. The deployment will allow the ONR to significantly reduce risk, incorporate early warfighter improvements and test with real world data and scenarios.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: EMW/SEWIP/SSEE Accelerator	0.000	14.389	23.630	0.000	23.630
Articles:	-	-	-	-	-
Description: EMW/SEWIP/SSEE accelerator builds off of two BA-3 efforts: Surface platform arrays, radios and control software were developed under the Multi-Link CDL System Future Naval Capability and airborne relay were developed within the High Altitude Relay and Routing Future Naval Capability. To date ONR has demonstrated 4-beam CDL surface arrays, radios and controls via land based motion simulators, while the airborne relay functionality has been demonstrated on a P-3 platform in a relevant environment. This was a new project for this PE in FY 2019 to develop integrated cross platform active and passive sensing solutions, next generation network and real time spectrum operations.					
FY 2019 Plans: Develop and test a multi-beam next generation network allowing significantly more throughputs with low latency designed for cross platform combat system integration, applications to coordinate multiple disparate Electronic					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603382N / *Advanced Combat Systems Tech*	**Project (Number/Name)** 3437 / *EMW/SEWIP/SSEE Accelerator*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Warfare (EW) systems, passive targeting algorithms and real time spectrum operations. This technology accelerator will operationally field 3 shipsets for trials and evaluation. ***FY 2020 Base Plans:*** FY 2020 efforts will develop dual frequency airborn network arrays and networking waveform; test compatibility of airborne systems with fielded surface next gen network arrays; and, for the deployed surface systems, develop and field autojoin and low probability of intercept (LPI) waveforms. This investment will fund expand deployed network capabilities and provide one additional ship set and one airborne relay prototype; provide additional deployed ESM hardware and decoy technologies; and provide Fifth generation fighter integration. Shipsets to be procured include 1 shipboard and 1 airborne deployed prototype. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** The funding increase from FY 2019 to FY 2020 reflects the ramp up of work required to integrate cross platform active and passive sensing solutions, next generation and real time spectrum operations to improve real time Electro-Magnetic Maneuver Warfare operations with additional costs to expand and provide deployed network capabilities including one additional ship set and one airborne relay prototype, additional deployed ESM hardware and decoy technologies and Fifth generation fighter integration.					
Accomplishments/Planned Programs Subtotals	0.000	14.389	23.630	0.000	23.630

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Projects identified for execution under this project number are non-acquisition programs. Each project will develop a project plan to support project execution. Project plans will include a project schedule and technical requirements and objectives to measure project performance. Based on prior BA-3 work prototype contracts are in place and can be used to develop hardware for at sea trials. Software and ship installation will are expected to use a combination of existing shipyard contracts and government field activities.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603382N / *Advanced Combat Systems Tech*	**Project (Number/Name)** 3437 / *EMW/SEWIP/SSEE Accelerator*

E. Performance Metrics

Performance metrics are specific to each of the projects funded. All will include measures identified in the objective statements, including completions, successes, terminations, and iterative development prototype cycle times.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603382N / *Advanced Combat Systems Tech*	Project (Number/Name) 3437 / *EMW/SEWIP/SSEE Accelerator*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Prototype Development	MIPR	NSWC : various	0.000	0.000		6.056	Oct 2018	12.910	Oct 2019	-		12.910	0.000	18.966	-
Prototype Development	PO	NAWC : various	0.000	0.000		3.333	Oct 2018	6.747	Oct 2019	-		6.747	0.000	10.080	-
Prototype Development	MIPR	SUPSHIP : Bath Maine	0.000	0.000		2.000	Oct 2018	1.987	Oct 2019	-		1.987	0.000	3.987	-
Prototype Development	MIPR	NRL : Washington, DC	0.000	0.000		3.000	Oct 2018	1.986	Oct 2019	-		1.986	0.000	4.986	-
Prototype Development	Various	TBD : TBD	0.000	0.000		0.000	Sep 2020	0.000		-		0.000	0.000	0.000	-
		Subtotal	0.000	0.000		14.389		23.630		-		23.630	0.000	38.019	N/A

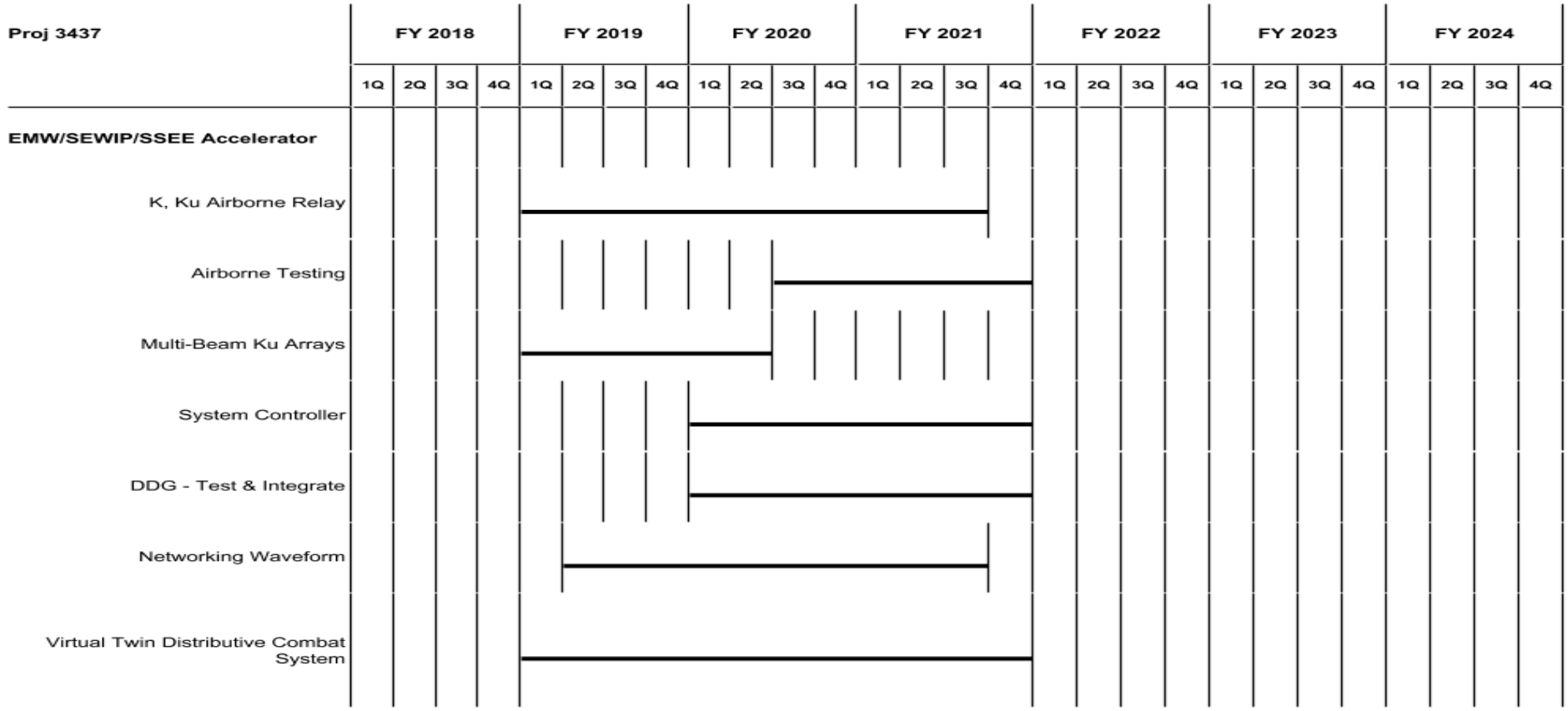
Remarks

NSWC: Prototype development of shipboard next generation networking apertures and EMW cross platform software.
NAWC: Prototype development of airborne next generation apertures and networking software.
SUPSHIP: Installation and testing of Cross platform EMW accelerator prototype on 2 Navy test vessels.
NRL: Installation and testing of Cross platform EMW accelerator prototype on Navy maritime patrol aircraft.

	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	0.000		14.389		23.630		-		23.630	0.000	38.019	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603382N / *Advanced Combat Systems Tech*	**Project (Number/Name)** 3437 / *EMW/SEWIP/SSEE Accelerator*



2020PB - 0603382N - 3437

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603382N / *Advanced Combat Systems Tech*	**Project (Number/Name)** 3437 / *EMW/SEWIP/SSEE Accelerator*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 3437				
EMW/SEWIP/SSEE Accelerator: K, Ku Airborne Relay: K, Ku Airborne Relay	1	2019	3	2021
EMW/SEWIP/SSEE Accelerator: Airborne Testing: Airborne Testing	3	2020	4	2021
EMW/SEWIP/SSEE Accelerator: Multi-Beam Ku Arrays: Multi-Beam Ku Arrays	1	2019	2	2020
EMW/SEWIP/SSEE Accelerator: System Controller: System Controller	1	2020	4	2021
EMW/SEWIP/SSEE Accelerator: DDG - Test & Integrate: DDG - Test & Integrate	1	2020	4	2021
EMW/SEWIP/SSEE Accelerator: Networking Waveform: Networking Waveform	2	2019	3	2021
EMW/SEWIP/SSEE Accelerator: Virtual Twin Distributive Combat System: Virtual Twin Distributive Combat System	1	2019	4	2021

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy											Date: March 2019	
Appropriation/Budget Activity 1319 / 4					R-1 Program Element (Number/Name) PE 0603382N / *Advanced Combat Systems Tech*				Project (Number/Name) 3438 / *Innovative Naval Prototype (INP) Transition (6.4)*			
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
3438: *Innovative Naval Prototype (INP) Transition (6.4)*	0.000	0.000	13.059	23.104	-	23.104	18.215	28.007	36.697	41.508	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Note

This is a new project unit (PU) in FY 2019. This PU is intended to provide advanced component development and prototyping for selected technologies maturing out of or supporting ONR's Leap Ahead Technology (LA-Tech) and Innovative Naval Prototype (INP) BA3 portfolio.

Changes from FY 2019 to FY 2020 includes the new HIJENKS program activity initiated in the PE and Project Unit 3438 as work in this program is transitioning in FY 2020 from Budget Activity (BA) 3 Advanced Technology Development to the BA4 Advanced Component Development and Prototypes phase of development.

A. Mission Description and Budget Item Justification

The efforts described in this mission area address the advanced component development and prototype demonstration associated with ONR's Innovative Naval Prototypes (INP) Program and the Leap Ahead Technology (LA-Tech) investments. INP and LA-Tech investments represent game changing technologies with the potential to revolutionize operational concepts. They are disruptive in nature as they would dramatically change the way naval forces fight. INPs and LA-Techs push the imagination of our nation's technical talent to deliver transformational warfighting capabilities. Successful demonstrations are intended to present the Department of the Navy with a programmatic challenge as these new capabilities can lead to the obsolescence of existing capabilities and significant decisions as to the path forward for integrating the new technological capabilities into the warfighting systems of the future.

ONR manages a continuum of INP and LA-Tech development from BA2 to BA3 to BA4. The goal of these BA4 investments is to further mature development and expend efforts necessary to evaluate integrated technologies, representative modes or prototype systems in high fidelity and realistic operating environments. This BA4 investment includes system specific efforts that help expedite technology transition from the laboratory to operational use. Emphasis is on proving component and subsystem maturity prior to integration in major and complex systems and may involve risk reduction initiatives. Projects in this category involve efforts prior to Milestone B and are referred to as advanced component development activities and include technology demonstrations. It is the goal of these projects to achieve Technology Readiness Levels 6 or 7. Successful experimentation and demonstration highlights the viability of new technological capabilities that could be implemented if an acquisition program were to be established to support further development. The portfolio is periodically refreshed through the selection of new INPs and LA-Tech investments as existing ones are completed.

INP, LA-Tech, and supporting technology investments may include R-2 Activities mission areas such as Unmanned and Autonomous Systems, Directed Energy / Electric Weapons, Electromagnetic Maneuver Warfare, Cyber Warfare, and Undersea Warfare.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603382N / *Advanced Combat Systems Tech*	**Project (Number/Name)** 3438 / *Innovative Naval Prototype (INP) Transition (6.4)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Unmanned and Autonomous Systems: Advanced ASW sensor array package for medium sized unmanned surface vehicles. ***Articles:*** ***Description:*** This is a new project beginning in FY 2019 that will develop, integrate, experiment and demonstrate onboard a medium sized unmanned surface vehicle an advanced ASW sensor array package. This package is intended to be used on a platform being developed with Innovative Prototype (INP) and Leap Ahead Technology (LA-Tech) investments. That platform will serve as host for a wide variety of operationally focused capability payloads such as the advance ASW sensor array package being developed in this activity. These warfighter focused packages will enable Unmanned and Autonomous Systems platforms to support the requirement to augment manned systems with less expensive, unmanned, fully autonomous systems that can operate in all domains. ***FY 2019 Plans:*** Initiate advanced component hardware and software development and the necessary system-to-hull integration which will lead to a prototype demonstration, in an operational environment, of an advanced ASW sensor array package capable of operational use onboard a medium sized autonomous, unmanned surface vehicle. ***FY 2020 Base Plans:*** Prototype demonstration, in an operational environment, by deploying, recovering and towing an advanced ASW sensor array package capable of operational use onboard a medium sized autonomous, unmanned surface vehicle. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** There is no significant change from FY 2019 to FY 2020	0.000 -	5.347 -	5.315 -	0.000 -	5.315 -
Title: Unmanned and Autonomous Systems: Advanced ASW kinetic effects package for medium sized unmanned surface vehicle. ***Articles:*** ***Description:*** This is a new project beginning in FY 2019 that will develop, integrate, experiment and demonstrate onboard a medium sized unmanned surface vehicle an advanced ASW kinetic effects package. This capability package is intended to be used on a platform being developed with Innovative Prototype (INP)	0.000 -	5.712 -	5.815 -	0.000 -	5.815 -

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603382N / *Advanced Combat Systems Tech*	**Project (Number/Name)** 3438 / *Innovative Naval Prototype (INP) Transition (6.4)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
and Leap Ahead Technology (LA-Tech) investments. That platform will serve as host for a wide variety of operationally focused capability payloads such as the advance ASW kinetic effects package being developed in this activity. These warfighter focused packages will enable Unmanned and Autonomous Systems platforms to support the requirement to augment manned systems with less expensive, unmanned, fully autonomous systems that can operate in all domains. ***FY 2019 Plans:*** Initiate advanced component development and the necessary system-to-hull integration which will lead to prototype demonstration, in an operational environment, of an advanced ASW kinetic effects package capable of operational use onboard a medium sized autonomous, unmanned surface vehicle. ***FY 2020 Base Plans:*** Prototype demonstration, in an operational environment, by launching from a manned vessel and engagement of a surrogate of an advanced ASW kinetic effects package capable of operational use onboard a medium sized autonomous, unmanned surface vehicle. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** There is no significant change from FY 2019 to FY 2020					
Title: Unmanned and Autonomous Systems: Advanced aerial lift package for medium sized unmanned surface vehicle. ***Articles:*** ***Description:*** This is a new project beginning in FY 2019 that will develop, integrate, experiment and demonstrate onboard a medium sized unmanned surface vehicle an advanced aerial lift package. This capability package will dramatically increase the range of regard of various sensor payloads that will be carried aloft. It is intended to be used on a platform being developed with Innovative Prototype (INP) and Leap Ahead Technology (LA-Tech) investments. That platform will serve as host for a wide variety of operationally focused capability payloads such as the advance aerial lift package being developed in this activity. These warfighter focused payloads will enable Unmanned and Autonomous Systems platforms to support the requirement to augment manned systems with less expensive, unmanned, fully autonomous systems that can operate in all domains. ***FY 2019 Plans:***	0.000 -	2.000 -	3.967 -	0.000 -	3.967 -

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603382N / *Advanced Combat Systems Tech*	**Project (Number/Name)** 3438 / *Innovative Naval Prototype (INP) Transition (6.4)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Initiate advanced component hardware development and the necessary system-to-hull integration which will lead to prototype demonstration, in an operational environment, of an advanced aerial lift package capable of operational use onboard a medium sized autonomous, unmanned surface vehicle. ***FY 2020 Base Plans:*** Prototype demonstration, in an operational environment, by demonstrating automated TALONs, an advanced aerial lift package capable of operational use, onboard a medium sized autonomous, unmanned surface vehicle. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** The increase from FY 2019 to FY 2020 is due to increased cost to conduct prototype demonstrations and participation from Navy Lab and NASA JPL personnel.					
Title: HIJENKS Operational Acceleration	0.000	0.000	8.007	0.000	8.007
Articles:	-	-	-	-	-
Description: HIJENKS System Integration, T&E and Alternate Platform development and test activity will focus on software development for integration of new High Power Microwave (HPM) capabilities into control systems and mission planning software. Technical objectives of HIJENKS focus on improving the robustness of HPM systems in new airborne platforms and improving the mission planning capability for HPM engagement scenarios. The prototype will mature several of these areas to enable operational capability in a phased approach for multi-platform integration and demonstration combined with validation/certification paths of software and hardware architectures. Activities are intended as risk reduction, operational analysis, and system level environmental test in order to reduce transition program cost for platform capability. Phase 1 FY-20 The first phase of the prototype will focus on initiating platform integration activities for software, mission planning and environmental hardening and alternate platform analysis Phase 2 FY-21 Phase 2 brings component level environmental testing and certification as well as software development for limited pre-planned missions					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603382N / *Advanced Combat Systems Tech*	**Project (Number/Name)** 3438 / *Innovative Naval Prototype (INP) Transition (6.4)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Phase 3 FY-22 Phase 3 brings system level environmental and EMC testing and certification as well as software development for limited dynamic mission planning and expanded target class surrogate development and test Phase 4 FY-23 Phase 4 brings integration and certification of mission planning and weapon control software to reduce transition costs for Program of Record ***FY 2019 Plans:*** N/A ***FY 2020 Base Plans:*** HIJENKS System Integration, T&E and Alternate Platform Phase 1 FY-20 Initiate first phase of the prototype development to focus on initiating platform integration activities for software, mission planning and environmental hardening and alternate platform analysis. Detailed FY 2020 technical plans and objectives at a higher classification to be briefed separately upon request. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** The increase from FY 2019 to FY 2020 reflects elements of the HIJENKS program transitioning from Budget Activity (BA) 3 Advanced Technology Development to BA4 Advanced Component Development and Prototypes.					
Accomplishments/Planned Programs Subtotals	0.000	13.059	23.104	0.000	23.104

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603382N / *Advanced Combat Systems Tech*	**Project (Number/Name)** 3438 / *Innovative Naval Prototype (INP) Transition (6.4)*

D. Acquisition Strategy

The projects identified for execution are non-acquisition programs. The Office of Naval Research will provide Government oversight to the projects. Each project will develop a project plan to support execution. Project plans will include a schedule and the necessary technical requirements and objectives to measure and evaluate performance. Additionally, each project will be subjected to experimentation then demonstrated in operationally relevant environments to assess their ability to meet warfighter requirements. Project deliverables will include the actual integrated hardware/software prototype systems, test reports, and technical data, necessary to support decision making. These decisions include the transition of technologies to acquisition, further refinement of the technology, or termination and reinvestment of remaining funds to other technologies that add military value.

E. Performance Metrics

In all cases, the technologies being developed within this PE support the Department of the Navy INP and Leap Ahead Programs and are managed at the Office of Naval Research. The primary technological metrics used in this PE involve experiments and tests that demonstrate, in an operationally relevant environment, the proof of concept for the technological capability being developed. Technology development is informed by periodic interaction with Naval warfighters, resource sponsors and the acquisition community. At the lowest level, each project is evaluated against technical and financial milestones on a frequent basis. Annually, each project is reviewed in depth for technical performance and development status by the Chief of Naval Research. Department of the Navy leadership is briefed on the portfolio's status by the Chief of Naval Research.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603382N / *Advanced Combat Systems Tech*	Project (Number/Name) 3438 / *Innovative Naval Prototype (INP) Transition (6.4)*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Advanced ASW sensor payload	MIPR	NUWC : Newport, Rhode Island	0.000	0.000		1.200	Oct 2018	1.340	Oct 2019	-		1.340	0.000	2.540	-
Advanced ASW sensor payload	MIPR	JHU-APL : Columbia, Maryland	0.000	0.000		2.100	Oct 2018	1.340	Oct 2019	-		1.340	0.000	3.440	-
Advanced ASW sensor payload	MIPR	SSC-PAC : San Diego, California	0.000	0.000		0.890	Oct 2018	1.302	Oct 2019	-		1.302	0.000	2.192	-
Advanced ASW sensor payload	MIPR	NASA Jet Propulsion Lab : Pasedena, California	0.000	0.000		1.157	Oct 2018	1.333	Oct 2019	-		1.333	0.000	2.490	-
Advanced ASW kinetic payload	MIPR	PSU -ARL : State College, Pennsylvania	0.000	0.000		4.000	Oct 2018	3.889	Oct 2019	-		3.889	Continuing	Continuing	Continuing
Advanced ASW kinetic payload	MIPR	SSC-PAC : San Diego, California	0.000	0.000		1.400	Oct 2018	1.026	Oct 2019	-		1.026	Continuing	Continuing	Continuing
Advanced ASW kinetic payload	MIPR	NASA Jet Propulsion Lab : Pasedena, California	0.000	0.000		0.312	Oct 2018	0.900	Oct 2019	-		0.900	Continuing	Continuing	Continuing
Advanced aerial lift payload	MIPR	NSWC-CD : Bethesda, Maryland	0.000	0.000		0.200	Oct 2018	1.336	Oct 2019	-		1.336	0.000	1.536	-
Advanced aerial lift payload	MIPR	NASA Jet Propulsion Lab : Pasedena, California	0.000	0.000		0.000	Oct 2018	1.335	Oct 2019	-		1.335	0.000	1.335	-
Advanced aerial lift payload	MIPR	SSC-PAC : San Diego, California	0.000	0.000		1.800	Oct 2018	1.296	Oct 2019	-		1.296	0.000	3.096	-
HIJENKS Mission Planning Software Development	WR	NAVAIR : Patuxent River, Md	0.000	0.000		0.000		0.330	Jan 2020	-		0.330	Continuing	Continuing	Continuing
HIJENKS Launch System Software/Hardware Integration	WR	NAVAIR : Patuxent River, Md	0.000	0.000		0.000		0.500	Nov 2019	-		0.500	0.000	0.500	-
HIJENKS System Requirements and CONEMPS	WR	NAVAIR : Patuxent River, Md	0.000	0.000		0.000		0.250	Oct 2019	-		0.250	0.000	0.250	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603382N / *Advanced Combat Systems Tech*	Project (Number/Name) 3438 / *Innovative Naval Prototype (INP) Transition (6.4)*	

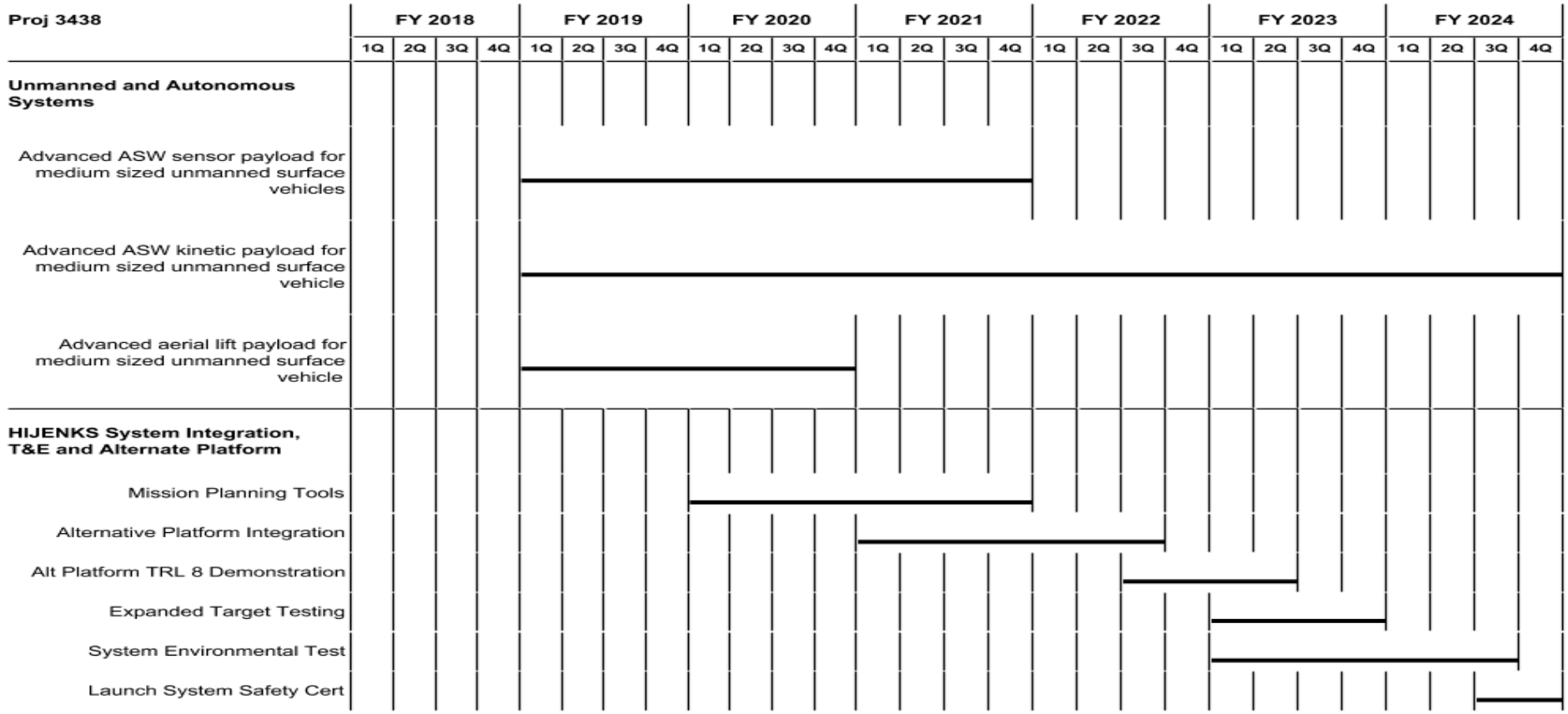
Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
HIJENKS Airborne Launch Study	C/CPFF	Platform Prime : TBD	0.000	0.000		0.000		0.500	Apr 2020	-		0.500	0.000	0.500	-
HIJENKS Mission Analysis	FFRDC	JH APL : Laurel, MD	0.000	0.000		0.000		0.500	Oct 2019	-		0.500	0.000	0.500	-
HIJENKS T&E Launcher	C/CPFF	Platform Prime : TBD	0.000	0.000		0.000		0.300	Apr 2020	-		0.300	0.000	0.300	-
HIJENKS Safe and Arm Design	C/FFP	Platform Prime : TBD	0.000	0.000		0.000		0.500	Jan 2020	-		0.500	0.000	0.500	-
HIJENKS Environmentally Hardened Payload Activities	C/UCA	DOTC - Multiple Awards : Various	0.000	0.000		0.000		1.500	Mar 2020	-		1.500	0.000	1.500	-
HIJENKS Target Procurement and Testing	WR	NRL : Washington, DC	0.000	0.000		0.000		0.500	Oct 2019	-		0.500	0.000	0.500	-
HIJENKS T&E Platform Payload Source Devlopment	C/UCA	DOTC - Multiple Awards : Various	0.000	0.000		0.000		2.927	Nov 2019	-		2.927	0.000	2.927	-
HIJENKS Program Support	WR	NSWCDD and NAWCWD : Dahlgren, VA	0.000	0.000		0.000		0.200	Oct 2019	-		0.200	0.000	0.200	-
		Subtotal	0.000	0.000		13.059		23.104		-		23.104	Continuing	Continuing	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	0.000		13.059		23.104		-		23.104	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603382N / *Advanced Combat Systems Tech*	**Project (Number/Name)** 3438 / *Innovative Naval Prototype (INP) Transition (6.4)*



2020PB - 0603382N - 3438

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603382N / *Advanced Combat Systems Tech*	**Project (Number/Name)** 3438 / *Innovative Naval Prototype (INP) Transition (6.4)*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 3438				
Unmanned and Autonomous Systems: Advanced ASW sensor payload for medium sized unmanned surface vehicles: Advanced ASW sensor payload for medium sized unmanned surface vehicles	1	2019	4	2021
Unmanned and Autonomous Systems: Advanced ASW kinetic payload for medium sized unmanned surface vehicle: Advanced ASW kinetic payload for medium sized unmanned surface vehicle	1	2019	4	2024
Unmanned and Autonomous Systems: Advanced aerial lift payload for medium sized unmanned surface vehicle: Advanced aerial lift payload for medium sized unmanned surface vehicle	1	2019	4	2020
HIJENKS System Integration, T&E and Alternate Platform: Mission Planning Tools: Mission Planning Tools	1	2020	4	2021
HIJENKS System Integration, T&E and Alternate Platform: Alternative Platform Integration: Alternative Platform Integration	1	2021	3	2022
HIJENKS System Integration, T&E and Alternate Platform: Alt Platform TRL 8 Demonstration: Alt Platform TRL 8 Demonstration	3	2022	2	2023
HIJENKS System Integration, T&E and Alternate Platform: Expanded Target Testing: Expanded Target Testing	1	2023	4	2023
HIJENKS System Integration, T&E and Alternate Platform: System Environmental Test: System Environmental Test	1	2023	3	2024
HIJENKS System Integration, T&E and Alternate Platform: Launch System Safety Cert: Launch System Safety Cert	3	2024	4	2024

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy											Date: March 2019	
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0603502N *I Surface & Shallow Water MCM*							
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
Total Program Element	244.710	69.906	120.348	507.000	-	507.000	813.251	848.933	955.274	872.229	Continuing	Continuing
1234: *Unmanned Surface Vehicle (USV)*	88.290	14.989	28.645	31.519	-	31.519	19.105	18.943	19.331	19.715	Continuing	Continuing
2989: *Barracuda*	0.000	20.572	28.803	28.641	-	28.641	33.205	38.387	37.869	38.631	Continuing	Continuing
3066: *Large Unmanned Surface Vehicle (LUSV)*	0.000	0.000	0.000	372.527	-	372.527	535.364	584.323	607.616	637.984	Continuing	Continuing
3067: *Unmanned Surface Vehicle Enabling Capabilities*	0.000	0.000	0.000	50.413	-	50.413	199.277	177.280	247.458	132.039	Continuing	Continuing
3123: *SMCM UUV*	156.420	21.799	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	178.219
3428: *Medium Unmanned Surface Vehicle (MUSV)*	0.000	0.000	2.800	23.900	-	23.900	26.300	30.000	43.000	43.860	Continuing	Continuing
9999: *Congressional Adds*	0.000	12.546	60.100	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	72.646

Note

FY 2018 and future funding for Projects 0530, 1233, and 1235 were realigned to PE 0604127N; Project 2094 to PE 0604031N; and Project 2131 to PE 0604126N.
FY 2019 and future funding for Project 3123 is realigned to PE 0604028N.

A. Mission Description and Budget Item Justification

This program element provides resources for development of mine countermeasures systems to provide minehunting, minesweeping, and neutralization to counter known and projected mine threats. The mine countermeasures systems provide mobile, quick reaction forces capable of land or sea-based minehunting and minesweeping operations worldwide. Resources are for developing and deploying advanced minehunting and minesweeping systems and the intelligence and oceanographic capabilities that will enable mine warfare superiority. Tactics and techniques used vary across a diversity of environments and a diversity of threats, including both asymmetric and emerging. Resources provide for systems and support of mine warfare systems, maritime systems, and expeditionary systems to allow for continuous operations of the Navy's warships and support vessels, other military vessels, and commercial vessels. Core capabilities include forward presence, deterrence, sea control, power projection, maritime security, humanitarian assistance and disaster response to maintain freedom of the seas. Increased capability includes conducting minefield reconnaissance (mine density and location) at high area search rates, improving detection capability, decreasing sensor false alarm rates, reducing or eliminating post-mission analysis detect, classify, identify, decide time, improving neutralization time, improving network communications, automatic target recognition, and achieving in-stride detect-to-engage capability. Concept of operations includes development of cooperative, unmanned, modular systems; the establishment of a capable networked command and control systems; and standing up an accurate and interactive environmental system with the ability to form and disseminate a Common Environmental Picture. Efforts benefit the Mine Countermeasure (MCM) force by transforming the Navy from the platform-centered legacy set of systems to a capability-centered force that is distributed, networked, and able to provide unique maritime influence and access across the entire maritime domain.

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0603502N *I Surface & Shallow Water MCM*

The Surface Mine Countermeasures (SMCM) programs are in general platform independent and will provide detection, classification, localization, identification, neutralization, and influence clearance capabilities. Programs develop: (1) unmanned minehunting capability for surface platforms; (2) the integration and improvement of new and existing systems (3) support for systems which detect, localize, classify, identify, and neutralize all mine types across MCM Avenger Class and other platforms; (4) systems for neutralizing mines and light obstacles through the entire water column to include deep water, open water, shallow water, very shallow water, surf zones, and beach landing craft zones in support of operations; (5) integrate hardware for experimental testing related to surface ship, aircraft, and other cross platform applications; and (6) provide for the future unmanned portion of the FSC strategy.

Medium Unmanned Surface Vehicles (MUSVs) and Large Unmanned Surface Vessels (LUSVs) are segments of the Navy's Unmanned Surface Vehicle Family of Systems (FoS). MUSV is defined as having a reconfigurable mission capability which is accomplished via modular payloads with an initial mission capability to support Battlespace Awareness through Intelligence, Surveillance and Reconnaissance (ISR) and Electronic Warfare (EW). LUSV is defined as having a reconfigurable, multi-mission capability which is accomplished via an organic warfare capability and may be augmented with additional modular payloads. Initial LUSV missions include Anti-Surface Warfare (ASuW) and Strike. MUSVs and LUSVs provide low cost, high endurance, reconfigurable ships able to accommodate various payloads for unmanned missions and augment the Navy's manned surface force. MUSVs and LUSVs will be capable initially of semi-autonomous operation, with operators in-the-loop or on-the-loop. USV Command and Control (C2) will be maintained via the afloat element (i.e., embarked on a United States Navy (USN) combatant/support ship) or via the ashore element (C2 station ashore). While MUSV and LUSV will logically share common (GFE) C2 systems to support fleet integration and operations and may share other autonomy and mechanical technologies (depending on acquisition approaches), they will be primarily differentiated by size and cost as driven by payload capability, capacity and LUSV's organic warfare capability.

Future missions for both MUSV and LUSV will be informed by the Navy's Future Surface Combatant Force (FSCF) Analysis of Alternatives (AoA) and as future payloads and concept of operations (CONOPs) are developed. Under the FSCF, MUSV and LUSV will be referred to as Future Surface Combatant USVs (FSC USVs) and are projected to include missions for Anti-Submarine Warfare (ASW), Logistics, Mine Countermeasures (MCM), Counter Swarm, Armed Escort, and Mine Warfare (i.e., mining). MUSV and LUSV are key enablers of the Navy's Distributed Maritime Operations (DMO) concept, which includes being able to forward deploy (alone or in teams/swarms), team with individual manned combatants or augment battle groups. Fielding of MUSV and LUSV will provide the Navy increased capability and necessary capacity at lower procurement and sustainment costs, reduced risk to sailors and increased readiness by offloading missions from manned combatants.

While unmanned surface vehicles are new additions to fleet units, MUSV and LUSV are intended to be relatively low developmental technologies that combine robust and proven commercial vessel designs with existing military payloads to rapidly and affordably expand the capacity and capability of the surface fleet. Both programs benefit from years of investment and full scale demonstration efforts in autonomy, endurance, command and control, payloads and testing from the Defense Advanced Research Projects Agency (DARPA) Anti-Submarine Warfare Continuous Trail Unmanned Vessel (ACTUV) and Office of Naval Research (ONR) Medium Displacement Unmanned Surface Vehicle (MDUSV)/Sea Hunter (FY 2017 to FY 2021) and Office of the Secretary of Defense Strategic Capabilities Office (OSD SCO) Ghost Fleet Overlord Large USV experimentation effort (FY 2018 to FY 2021). The combination of fleet-ready C2 solutions developed by the Ghost Fleet Overlord program and initial man-in-the-loop or man-on-the-loop control will reduce the risk of fleet integration of unmanned surface vehicles and allow autonomy and payload technologies to develop in parallel with fielding vehicles with standardized interfaces. Fleet learning with early MUSV and LUSV units plus future upgrades of more advanced autonomy technology will allow eventual deployment as fully autonomous vehicles.

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0603502N *I Surface & Shallow Water MCM*

These efforts are broken out into three (3) Project Units (PUs): Medium Unmanned Surface Vehicle (MUSV) (Project 3428), Large Unmanned Surface Vessel (LUSV) (Project 3067) and Unmanned Surface Vessel Enabling Capabilities (Project 3066).

B. Program Change Summary ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	154.117	62.727	76.052	-	76.052
Current President's Budget	69.906	120.348	507.000	-	507.000
Total Adjustments	-84.211	57.621	430.948	-	430.948
• Congressional General Reductions	-	-0.482			
• Congressional Directed Reductions	-	-1.997			
• Congressional Rescissions	-	-			
• Congressional Adds	-	60.100			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-2.025	0.000			
• Program Adjustments	0.000	0.000	432.400	-	432.400
• Rate/Misc Adjustments	0.000	0.000	-1.452	-	-1.452
• Congressional General Reductions Adjustments	-0.216	-	-	-	-
• Congressional Directed Reductions Adjustments	-94.970	-	-	-	-
• Congressional Add Adjustments	13.000	-	-	-	-

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2018	FY 2019
Project: 9999: *Congressional Adds*		
Congressional Add: *Unmanned Influence Sweep System*	12.546	0.000
Congressional Add: *Medium Displacement Unmanned Surface Vehicle*	0.000	42.000
Congressional Add: *Navy Identified MCM USV Requirement*	0.000	14.100
Congressional Add: *Navy Identified UISS Requirement*	0.000	4.000
Congressional Add Subtotals for Project: 9999	12.546	60.100
Congressional Add Totals for all Projects	12.546	60.100

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0603502N *I Surface & Shallow Water MCM*

Change Summary Explanation

FY 2020 funding request was reduced by $3.300 million to account for the availability of prior year execution balances.

Program Adjustments:
FY18: -$84,211K total adjustments; Congressional program adjustments: -$8,000K MCM USV, -$2,260K Knifefish, +$13,000K UISS; Congressional realignments: -$12,900K Projects 0530, 1233, 1235, -$11,623K Project 2131, -$60,187K Project 2094; SBIR -$2,025K; Other Rate Adjustments: -$216K FFRDC.
FY19: +$60,100K Congressional program adjustments: +$14,100K MCM USV, +$42,000K MUSV, +$4,000K UISS, -$1,997K Barracuda schedule delays; -$482K FFRDC
FY20: -$3,300K Under execution reduction; -$1,142K NWCF rate adjustments; -$310K Contract Services Reform reduction; +$424,000K Unmanned Surface Vessel program adjustment; +$11,700K MCM USV program adjustment

Technical: Not applicable.

Schedule: FY18: -$8,000K Congressional program adjustment resulted in the slowing down of efforts related to deploy and retrieve (D&R) payload integration in FY18, resulting in overall schedule slip for the MCM USV program of approximately eight months.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603502N / *Surface & Shallow Water MCM*	Project (Number/Name) 1234 / *Unmanned Surface Vehicle (USV)*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
1234: *Unmanned Surface Vehicle (USV)*	88.290	14.989	28.645	31.519	-	31.519	19.105	18.943	19.331	19.715	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Note

In FY 2018, the Unmanned Influence Sweep System (UISS) received a Congressional Add of $13.000M in Project Unit 9999/C401. In FY 2019, UISS received a Congressional Add of $4.000M in Project Unit 9999/C444. In FY 2019, MCM USV received a Congressional Add of $14.100M in Project Unit 9999/C443.

A. Mission Description and Budget Item Justification

This project provides resources for development, improvement and integration of Unmanned Surface Vehicle (USV) Mine Countermeasure (MCM) systems. A description of the major planned programs includes the following:

1) The Unmanned Influence Sweep System (UISS) utilizes an Unmanned Surface Vehicle (USV) integrated with an Unmanned Surface Sweep System (US3), a magnetic/acoustic sweep system developed to sweep acoustic/magnetic influence mines, which can be deployed from the Littoral Combat Ship (LCS) or a Vessel of Opportunity (VOO).

2) Mine Hunting USVs (MHUs) were delivered in FY 2014 to 5th Fleet in response to an Urgent Operational Need (UON) from Naval Forces Central Command concerning MCM capacity and capability gaps. Four systems (referred to as MHUs 1-4) were provided to Combined Task Force (CTF) 52 to conduct Minehunting Operations. Each MHU consists of a USMI Naval Special Warfare (NSW) 11-meter Rigid Hull Inflatable Boat (RHIB), which was converted to a USV by Naval Undersea Warfare Center Division Newport, and tows an AN/AQS-24B Minehunting sonar. The systems are controlled from a Command and Control (C2) container located on either an underway host platform or on pier-side. MHUs 1-4 are currently in sustainment and will support CTF52 until MCM Mission Packages are deployed to C5F AOR. In FY 2016-2017, Speed to Fleet (S2F) funding supported the design and fabrication of an additional minehunting asset (referred to as "MHU 5") based on the MCM USV craft and integrating the AQS-24B. Beyond FY 2017, all future efforts with MHU 5 are within the MCM USV program.

3) The Mine Countermeasures Unmanned Surface Vehicle (MCM USV) program leverages the USV from the UISS Program of Record (PoR) and adds a modular mission capability through the addition of multiple payloads. MCM USV w/ AQS-20C integrates the existing AQS-20C minehunting sonar. MCM USV w/ AQS-24B continues the Minehunting efforts. In FY 2019 the MCM USV program began initial design efforts to support integration with a Mine Neutralization capability (Barracuda). Minesweeping payloads will be subsumed by the MCM USV PoR in FY 2020.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: UISS Product Development	2.294	1.000	0.000	0.000	0.000
Articles:	-	-	-	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 1234 / *Unmanned Surface Vehicle (USV)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
FY 2019 Plans: -Complete UISS DT, complete UISS Operational Assessment (OA), and achieve Milestone C, which is now anticipated in 3Q FY 2019. - Develop Engineering Change Proposals (ECPs) for EDM and Low Rate Initial Production (LRIP) units in preparation for integration testing and Initial Operational Test and Evaluation (IOT&E). - Conduct systems engineering efforts in support of program and test efforts. ***FY 2020 Base Plans:*** N/A ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Funding decreased from FY 2019 to FY 2020 due to UISS program being subsumed by the MCM USV program in FY 2020.					
Title: UISS Support	0.000	1.250	0.000	0.000	0.000
Articles:	-	-	-	-	-
FY 2019 Plans: - Support engineering, management and logistics efforts for MS C in 3Q FY 2019 and Initial Operational Capability (IOC) in 4Q FY 2019. - Prepare for IOT&E. - Continue development of Full Rate Production (FRP) documentation to release Request for Proposal (RFP) in late FY 2019. - Support LCS Integration and MCM Mission Package (MP) testing. ***FY 2020 Base Plans:*** N/A ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:***					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 1234 / *Unmanned Surface Vehicle (USV)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Funding decreased from FY 2019 to FY 2020 due to UISS program being subsumed by the MCM USV program in FY 2020.					
Title: UISS Test and Evaluation	0.000	1.625	0.000	0.000	0.000
Articles:	-	-	-	-	-
FY 2019 Plans: - Complete UISS DT and OA in support of MS C decision in 3Q FY 2019. - Conduct UISS system level IOT&E in support of FRP decision planned for FY 2020. ***FY 2020 Base Plans:*** N/A ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Funding decreased from FY 2019 to FY 2020 due to UISS program being subsumed by the MCM USV program in FY 2020.					
Title: UISS Management Services	0.000	0.131	0.000	0.000	0.000
Articles:	-	-	-	-	-
FY 2019 Plans: - Oversee ongoing contractor efforts. - Manage MS C documentation completion. - Manage FRP RFP release and proposal evaluation. ***FY 2020 Base Plans:*** N/A ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Funding decreased from FY 2019 to FY 2020 due to UISS program being subsumed by the MCM USV program in FY 2020.					
Title: MHU Support	0.288	0.900	0.913	0.000	0.913

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 1234 / *Unmanned Surface Vehicle (USV)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Articles:	-	-	-	-	-
FY 2019 Plans: - Provide program management, engineering and logistics support for production improvements to forward-deployed MHU 1-4 USVs and C2 Station. Maintain Cybersecurity compliance of system via a software baseline update developed and installed on fielded USVs and C2 container. ***FY 2020 Base Plans:*** - Provide program management, engineering and logistics support for product improvements to forward-deployed MHU 1-4 USVs and C2 Station. Maintain Cybersecurity compliance by developing, managing and installing software updates on fielded MHUs and the C2 container. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Minor increase in FY 2020 for continued MHU support.					
Title: MCM USV Product Development	10.197	15.039	19.184	0.000	19.184
Articles:	-	-	-	-	-
FY 2019 Plans: - Complete initial design and software development efforts for craft and payload integration, command and control, and operations. - Continue system level testing. - Prepare to conduct User Operational Evaluation System (UOES) Employment. - Prepare and support design changes for initial Developmental Testing (DT). - Conduct efforts in preparation for start of MCM USV Full Rate Production (FRP) in FY 2020. - Conduct technical feasibility studies, trade study analysis, tactics development, requirements definition and USV impact studies for Mine Neutralization (Barracuda) integration with MCM USV. - Begin contractor integration testing of MCM USV w/ AQS-24B and MCM USV w/ AQS-20C. - Construct Architecture Framework products, industry requests for information and develop procurement strategy for Mine Neutralization launcher. ***FY 2020 Base Plans:*** - Complete integration of an AQS-20C and AQS-24B with the MCM USV. - Demonstrate system capability from LCS and/or shore operations through Integration Testing.					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 1234 / *Unmanned Surface Vehicle (USV)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
- Finalize technical data packages for MCM USV and sonar deploy and retrieve systems. - Conduct MCM USV + MH DT and UOES. - Continue integration testing with sonar payloads. - Continue ECP development for EDM and LRIP units. - Conduct systems engineering efforts in support of program and test efforts. - Achieve Ready for Training (RFT) status. - Continue tactics development, requirements definition and design of Mine Neutralization (Barracuda) payload and integration with MCM USV. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increase from FY 2019 to FY 2020 due to the MCM USV Development Tests efforts and UOES.					
Title: MCM USV Support	1.960	4.100	5.532	0.000	5.532
Articles:	-	-	-	-	-
FY 2019 Plans: - Continue program management, engineering and technical support for payload integration and testing efforts. - Support testing and User Operational Evaluation System (UOES) efforts for the assessment of system capabilities to determine Military utility. - Support FRP preparations. - Continue to update MCM USV logistics documentation and implement changes required to support UOES Employment and MCM Mission Package (MP) IOT&E. - Determine initial spares required for upcoming DT/UOES test events. - Support development of MCM USV CDD requirements. ***FY 2020 Base Plans:*** - Support testing and assessment of system capabilities to determine Military utility. - Continue efforts for FRP preparations and award. - Continue to update MCM USV documentation to include Mine Neutralization. - Procure initial spares for test events. - Continue engineering, management and logistics support to achieve FRP decisions in FY 2020.					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 1234 / *Unmanned Surface Vehicle (USV)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
- Continue to support MCM MP integration and testing. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increase from FY 2019 to FY 2020 due to commencement of UOES, DT, Full Rate Production decision, and the start of MCM MP test efforts.					
Title: MCM USV Test and Evaluation	0.000	4.350	5.500	0.000	5.500
Articles:	-	-	-	-	-
FY 2019 Plans: - Prepare for system integration and test events to include a UOES test period (for AQS-20C and AQS-24B) and a DT period for the MCM USV w/ AQS-20C sonar in preparation for future MCM MP IOT&E and production decisions. ***FY 2020 Base Plans:*** - Complete contractor integration testing of MCM USV w/ AQS-24B and MCM USV w/ AQS-20C. - Conduct UOES testing with AQS-20C and AQS-24B. - Execute MCM USV DT with AQS-20C. - Commence MCM MP DT support. - Conduct UISS test and evaluation efforts associated with ECP incorporation. - Commence support of MCM MP DT efforts. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increase from FY 2019 to FY 2020 due to commencement of UOES, DT and Full Rate Production decision.					
Title: MCM USV Management Services	0.250	0.250	0.390	0.000	0.390
Articles:	-	-	-	-	-
FY 2019 Plans: - Provide program planning, management and acquisition document updates for the MCM USV program. - Begin FRP RFP development.					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 1234 / *Unmanned Surface Vehicle (USV)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
- Release RFP and begin proposal evaluations. ***FY 2020 Base Plans:*** - Provide program planning, management and acquisition document updates for the MCM USV program. - Conduct FRP proposal evaluation and manage award of FRP contracts. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Funding increased from FY 2019 to FY 2020 due to a Full Rate Production decision and the start of MCM MP test efforts.					
Accomplishments/Planned Programs Subtotals	14.989	28.645	31.519	0.000	31.519

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• 0603596N: *LCS Mission Modules*	3.900	5.000	1.800	-	1.800	0.000	0.000	0.000	0.000	0.000	64.129
• OPN/1601: *LCS MCM Mission Modules*	45.146	98.901	197.129	-	197.129	222.831	222.523	233.151	243.503	1,185.034	2,627.323
• RDTE/0603502N/9999: *Congressional Add*	12.546	60.100	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	72.646
• OPN/2622: *Minesweeping System Replacement*	57.343	32.367	19.448	-	19.448	15.858	16.281	16.753	17.087	Continuing	Continuing

Remarks

RDT&E/0603596N - Funding shown only reflects funding for required USV development efforts.

RDT&E/0603502N/9999 - The above funding line accounts for several programs, of which the Unmanned Surface Vehicle programs are only a portion.

OPN/1601 - The above funding line accounts for several programs, of which the Unmanned Surface Vehicle programs are only a portion.

OPN/2622 - The above funding line accounts for several programs, of which the Unmanned Surface Vehicle programs are only a portion.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 1234 / *Unmanned Surface Vehicle (USV)*

D. Acquisition Strategy

UISS - Requirements are documented in the Unmanned Influence Sweep System (UISS) Capability Production Document (CPD). An Engineering and Manufacturing Development (E&MD) contract was awarded in FY 2014 with options for Low Rate Initial Production (LRIP) in FY 2019. In FY 2019, MCM USV is developing a CDD leveraging existing requirements (UISS, AN/AQS-20, MCM MP, etc.). In FY 2020, MCM USV anticipates a Full Rate Production (FRP) decision and will conduct a full and open competition for FRP contract(s).

E. Performance Metrics

UISS - Successfully reach Milestone C (MS C) in FY 2019. Award LRIP options in FY 2019.
MCM USV - Achieve FRP Decision in FY 2020.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603502N / *Surface & Shallow Water MCM*	Project (Number/Name) 1234 / *Unmanned Surface Vehicle (USV)*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
UISS: Product Development	C/CPIF	Textron Systems, Inc : Hunt Valley, MD	29.893	2.294	Jan 2018	1.000	Jan 2019	0.000		-		0.000	Continuing	Continuing	Continuing
MHU: Product Development	SS/CPFF	JHU APL : Laurel, MD	12.215	0.000		0.000		0.000		-		0.000	0.000	12.215	-
MHU: Product Development	C/FPIF	Textron Systems, Inc : Hunt Valley, MD	7.545	0.000		0.000		0.000		-		0.000	0.000	7.545	-
MHU: Product Development	WR	NSWC PC : Panama City, FL	0.922	0.000		0.000		0.000		-		0.000	0.000	0.922	-
MHU: Product Development	WR	NUWC N : Newport, RI	0.740	0.000		0.000		0.000		-		0.000	0.000	0.740	-
MHU: Product Development	WR	NSWC CD : Bethesda, MD	0.235	0.000		0.000		0.000		-		0.000	0.000	0.235	-
MHU: Product Development	WR	Various : Various	0.570	0.000		0.000		0.000		-		0.000	0.000	0.570	-
MCM USV: Product Development 1	C/CPIF	Textron Systems, Inc : Hunt Valley, MD	0.000	0.000		0.000		2.084	Jan 2020	-		2.084	0.000	2.084	-
MCM USV: Product Development 2	C/FPIF	Textron Systems, Inc : Hunt Valley, MD	9.040	3.180	Jan 2018	3.339	Jan 2019	0.000		-		0.000	Continuing	Continuing	Continuing
MCM USV: Product Development1	C/CPFF	Textron Systems, Inc : Hunt Valley, MD	0.000	0.000		3.100	Jan 2019	9.000	Nov 2019	-		9.000	Continuing	Continuing	Continuing
MCM USV: Product Development	SS/CPFF	Raytheon : Portsmouth, RI	3.185	7.017	Feb 2018	1.975	Feb 2019	2.000	Nov 2019	-		2.000	Continuing	Continuing	Continuing
MCM USV: Product Development	SS/CPFF	JHU APL : Laurel, MD	0.000	0.000		0.750	Feb 2019	2.000	Feb 2020	-		2.000	Continuing	Continuing	Continuing
MCM USV: Product Development	WR	NSWC PC : Panama City, FL	0.925	0.000		2.850	Jan 2019	3.000	Nov 2019	-		3.000	Continuing	Continuing	Continuing
MCM USV: Product Development	WR	NUWC N : Newport, RI	0.770	0.000		0.725	Jan 2019	0.500	Nov 2019	-		0.500	Continuing	Continuing	Continuing
MCM USV: Product Development	WR	NSWC CD : Bethesda, MD	0.980	0.000		2.300	Jan 2019	0.600	Nov 2019	-		0.600	Continuing	Continuing	Continuing
		Subtotal	67.020	12.491		16.039		19.184		-		19.184	Continuing	Continuing	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603502N / *Surface & Shallow Water MCM*	Project (Number/Name) 1234 / *Unmanned Surface Vehicle (USV)*	

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
UISS: Engineering Support	WR	NUWC N : Newport, RI	0.600	0.000		0.250	Dec 2018	0.000		-		0.000	Continuing	Continuing	Continuing
UISS: Engineering Support	WR	NSWC PC : Panama City, FL	2.089	0.000		0.200	Dec 2018	0.000		-		0.000	Continuing	Continuing	Continuing
UISS: Engineering Support	WR	NSWC CD : Bethesda, MD	1.811	0.000		0.100	Dec 2018	0.000		-		0.000	Continuing	Continuing	Continuing
UISS: Engineering Support	C/CPFF	Textron Systems, Inc : Hunt Valley, MD	1.170	0.000		0.100	Jan 2019	0.000		-		0.000	Continuing	Continuing	Continuing
UISS: Integrated Logistics	WR	NSWC PC : Panama City, FL	0.490	0.000		0.200	Dec 2018	0.000		-		0.000	Continuing	Continuing	Continuing
UISS: Integrated Logistics	WR	NSWC CD : Bethesda, MD	0.751	0.000		0.200	Dec 2018	0.000		-		0.000	Continuing	Continuing	Continuing
UISS: Integrated Logistics	C/CPFF	Textron Systems, Inc : Hunt Valley, MD	0.928	0.000		0.200	Dec 2018	0.000		-		0.000	Continuing	Continuing	Continuing
MHU: Engineering Support	WR	SSC PAC : San Diego, CA	0.310	0.028	Dec 2017	0.030	Dec 2018	0.036	Dec 2019	-		0.036	Continuing	Continuing	Continuing
MHU: Engineering Support	WR	NSWC PC : Panama City, FL	0.817	0.116	Feb 2018	0.840	Feb 2019	0.841	Feb 2020	-		0.841	Continuing	Continuing	Continuing
MHU: Engineering Support	WR	NUWC N : Newport, RI	0.737	0.116	Mar 2018	0.000		0.000		-		0.000	0.000	0.853	-
MHU: Engineering Support	WR	NSWC CD : Bethesda, MD	0.250	0.028	Dec 2017	0.030	Dec 2018	0.036	Dec 2019	-		0.036	Continuing	Continuing	Continuing
MHU: Engineering Support	WR	Various : Various	0.520	0.000		0.000		0.000		-		0.000	0.000	0.520	-
MCM USV: Engineering Support	WR	NSWC PC : Panama City, FL	2.458	1.370	Jan 2018	1.400	Jan 2019	1.750	Nov 2019	-		1.750	Continuing	Continuing	Continuing
MCM USV: Engineering Support	WR	NUWC N : Newport, RI	1.830	0.290	Jan 2018	0.800	Jan 2019	0.750	Nov 2019	-		0.750	Continuing	Continuing	Continuing
MCM USV: Engineering Support	WR	NSWC CD : Bethesda, MD	0.000	0.300	Jan 2018	0.000		0.400	Dec 2019	-		0.400	0.000	0.700	-
MCM USV: Engineering Support	C/CPFF	Textron Systems, Inc : Hunt Valley, MD	0.000	0.000		0.215	Jan 2019	1.000	Nov 2019	-		1.000	Continuing	Continuing	Continuing

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
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Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
MCM USV: Integrated Logistics	WR	NSWC PC : Panama City, FL	0.000	0.000		0.000		0.062	Dec 2019	-		0.062	0.000	0.062	-
MCM USV: Integrated Logistics	WR	NSWC CD : Bethesda, MD	0.000	0.000		0.000		0.061	Dec 2019	-		0.061	0.000	0.061	-
MCM USV: Integrated Logistics	SS/CPFF	Raytheon : Portsmouth, RI	0.000	0.000		0.400	Jan 2019	0.400	Dec 2019	-		0.400	Continuing	Continuing	Continuing
MCM USV: Integrated Logistics	SS/CPFF	Northrup Grumman : Annapolis, MD	0.000	0.000		0.300	Mar 2019	0.300	Mar 2020	-		0.300	Continuing	Continuing	Continuing
MCM USV: Integrated Logistics	C/CPFF	Textron Systems, Inc : Hunt Valley, MD	0.000	0.000		0.985	Feb 2019	0.809	Feb 2020	-		0.809	Continuing	Continuing	Continuing
		Subtotal	14.761	2.248		6.250		6.445		-		6.445	Continuing	Continuing	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
UISS: Test and Evaluation	WR	NSWC PC : Panama City, FL	1.030	0.000		1.050	Dec 2018	0.000		-		0.000	Continuing	Continuing	Continuing
UISS: Test and Evaluation	WR	NSWC CD : Bethesda, MD	1.331	0.000		0.400	Dec 2018	0.000		-		0.000	Continuing	Continuing	Continuing
UISS: Test and Evaluation	C/CPIF	Textron Systems, Inc : Hunt Valley, MD	1.709	0.000		0.175	Dec 2018	0.000		-		0.000	Continuing	Continuing	Continuing
MCM USV: Test and Evaluation	WR	NSWC PC : Panama City, FL	0.000	0.000		2.200	Mar 2019	2.500	Dec 2019	-		2.500	Continuing	Continuing	Continuing
MCM USV: Test and Evaluation	WR	NSWC CD : Bethesda, MD	0.000	0.000		0.250	Mar 2019	1.500	Dec 2019	-		1.500	Continuing	Continuing	Continuing
MCM USV: Test and Evaluation	SS/CPFF	Raytheon : Portsmouth, RI	0.000	0.000		0.400	Mar 2019	0.500	Dec 2019	-		0.500	Continuing	Continuing	Continuing
MCM USV: Test and Evaluation	C/CPFF	Textron Systems, Inc : Hunt Valley, MD	0.000	0.000		1.500	Mar 2019	1.000	Dec 2019	-		1.000	0.000	2.500	-
		Subtotal	4.070	0.000		5.975		5.500		-		5.500	Continuing	Continuing	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
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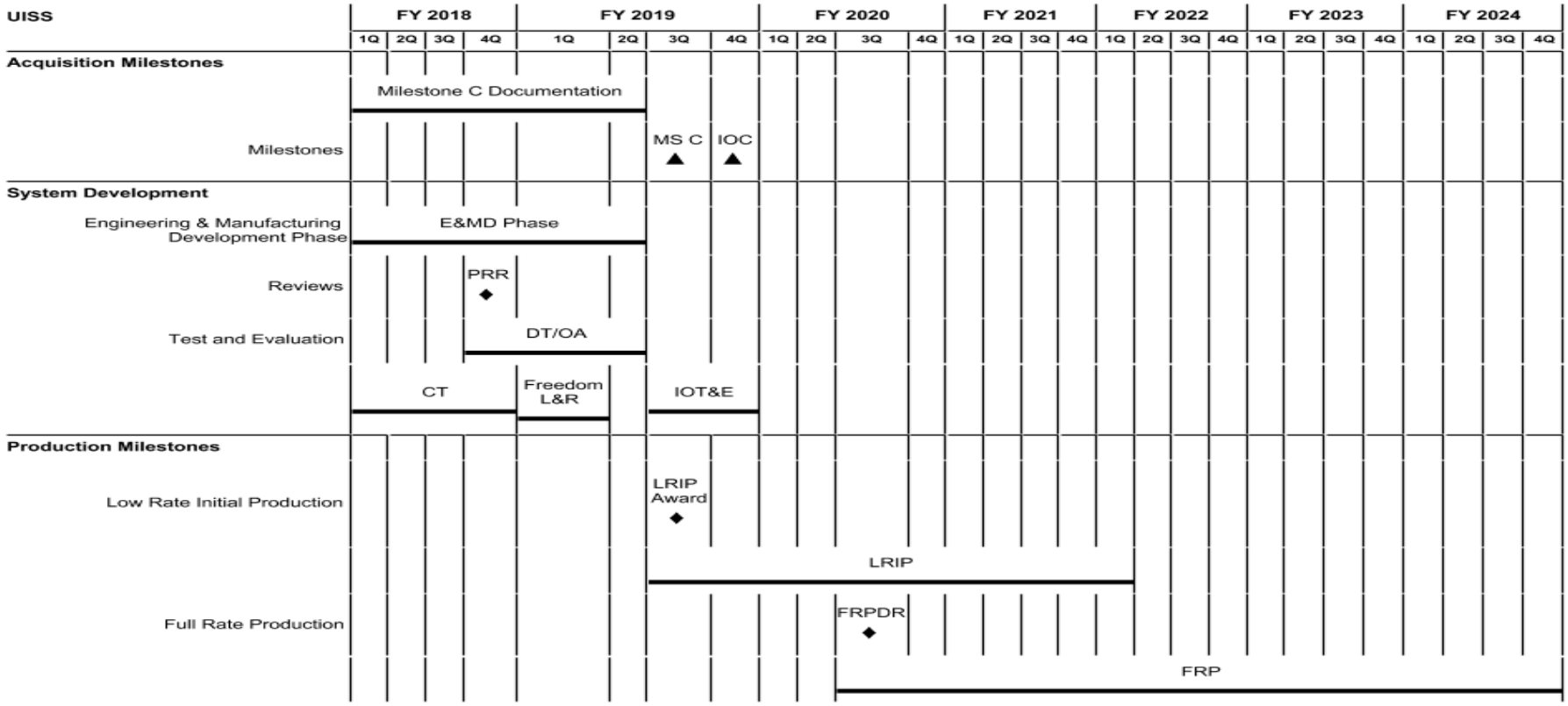
Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
UISS: Travel	WR	NAVSEA : Washington, DC	0.275	0.000		0.020	Jan 2019	0.000		-		0.000	Continuing	Continuing	Continuing
UISS: Management	C/CPAF	TBD : TBD	2.164	0.000		0.111	Nov 2018	0.000		-		0.000	Continuing	Continuing	Continuing
MCM USV: Travel	WR	NAVSEA : Washington, DC	0.000	0.100	Jan 2018	0.100	Jan 2019	0.120	Jan 2020	-		0.120	Continuing	Continuing	Continuing
MCM USV: Management	C/CPAF	TBD : TBD	0.000	0.150	Nov 2017	0.150	Nov 2018	0.270	Nov 2019	-		0.270	Continuing	Continuing	Continuing
		Subtotal	2.439	0.250		0.381		0.390		-		0.390	Continuing	Continuing	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	88.290	14.989		28.645		31.519		-		31.519	Continuing	Continuing	N/A

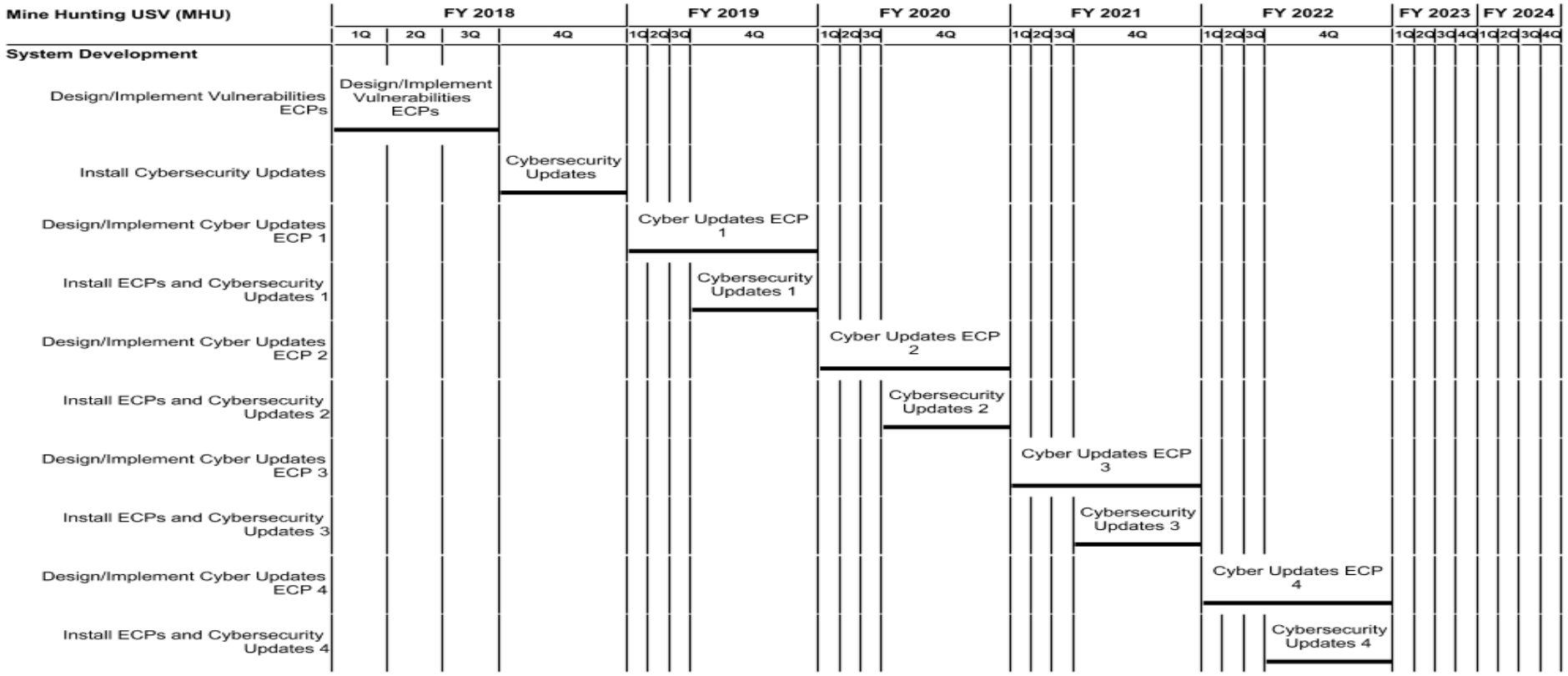
Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
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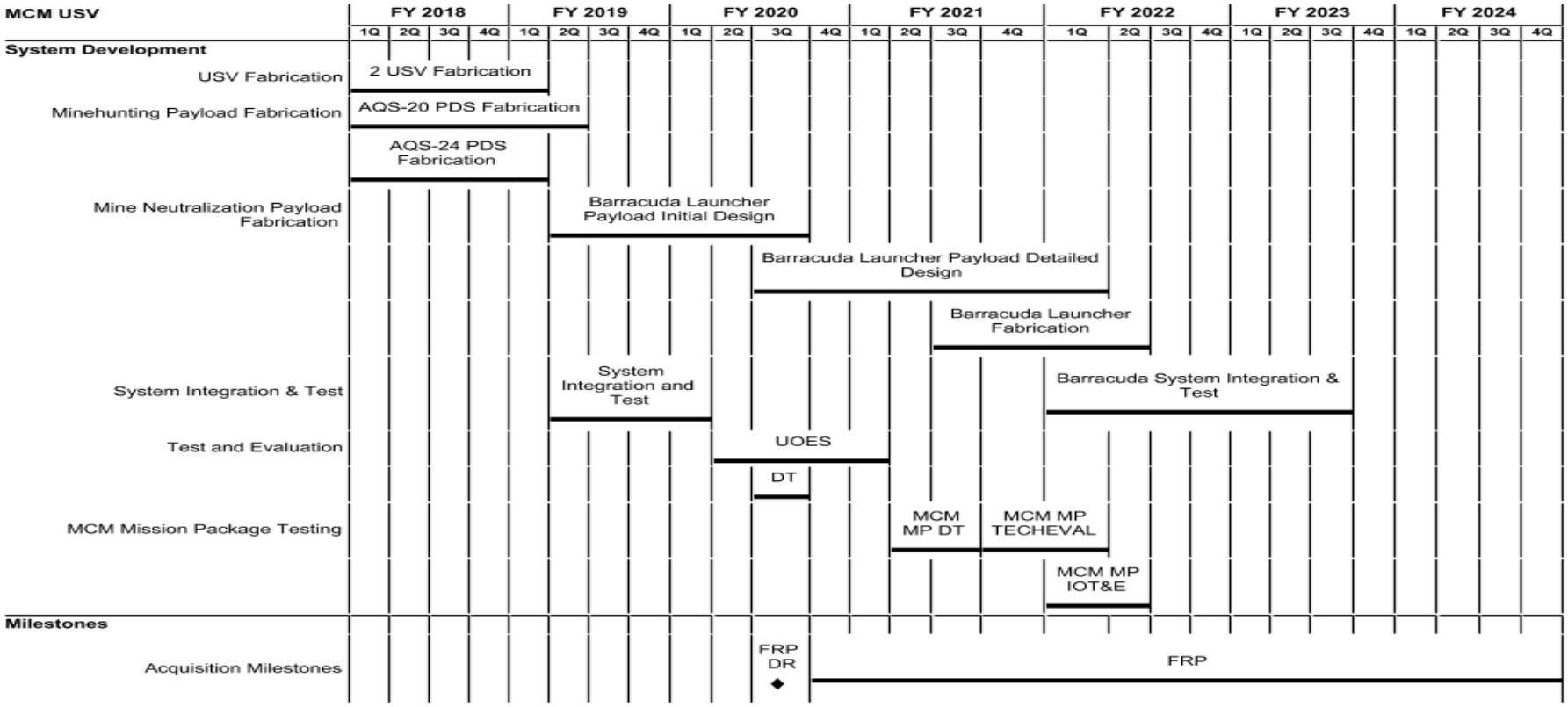
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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
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Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
UISS				
Acquisition Milestones: Milestone C Documentation	1	2018	2	2019
Acquisition Milestones: Milestones: Milestone C	3	2019	3	2019
Acquisition Milestones: Milestones: Initial Operational Capability	4	2019	4	2019
System Development: Engineering & Manufacturing Development Phase: Engineering & Manufacturing Development Phase	1	2018	2	2019
System Development: Reviews: Production Readiness Review (PRR)	4	2018	4	2018
System Development: Test and Evaluation: DT Testing	4	2018	2	2019
System Development: Test and Evaluation: LCS L&R	1	2019	1	2019
System Development: Test and Evaluation: Initial Operational Test & Evaluation	3	2019	4	2019
System Development: Test and Evaluation: Contractor Testing	1	2018	4	2018
Production Milestones: Low Rate Initial Production: LRIP Contract Award	3	2019	3	2019
Production Milestones: Low Rate Initial Production: LRIP phase	3	2019	1	2022
Production Milestones: Full Rate Production: Full Rate Production Decision Review	3	2020	3	2020
Production Milestones: Full Rate Production: Full Rate Production	3	2020	4	2024
Mine Hunting USV (MHU)				
System Development: Design/Implement Vulnerabilities ECPs: Design/Implement Vulnerabilities ECPs	1	2018	3	2018
System Development: Install Cybersecurity Updates: Install Cybersecurity Updates	4	2018	4	2018
System Development: Design/Implement Cyber Updates ECP 1: Design/Implement Cyber Updates ECP 1	1	2019	4	2019
System Development: Install ECPs and Cybersecurity Updates 1: Install ECPs and Cybersecurity Updates 1	4	2019	4	2019

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 1234 / *Unmanned Surface Vehicle (USV)*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
System Development: Design/Implement Cyber Updates ECP 2: Design/Implement Cyber Updates ECP 2	1	2020	4	2020
System Development: Install ECPs and Cybersecurity Updates 2: Install ECPs and Cybersecurity Updates 2	4	2020	4	2020
System Development: Design/Implement Cyber Updates ECP 3: Design/Implement Cyber Updates ECP 3	1	2021	4	2021
System Development: Install ECPs and Cybersecurity Updates 3: Install ECPs and Cybersecurity Updates 3	4	2021	4	2021
System Development: Design/Implement Cyber Updates ECP 4: Design/Implement Cyber Updates ECP 4	1	2022	4	2022
System Development: Install ECPs and Cybersecurity Updates 4: Install ECPs and Cybersecurity Updates 4	4	2022	4	2022
MCM USV				
System Development: USV Fabrication: 2 USV Fabrication	1	2018	1	2019
System Development: Minehunting Payload Fabrication: AQS-20 PDS Fabrication	1	2018	2	2019
System Development: Minehunting Payload Fabrication: AQS-24 PDS Fabrication	1	2018	1	2019
System Development: Mine Neutralization Payload Fabrication: Barracuda Launcher Payload Initial Design	2	2019	3	2020
System Development: Mine Neutralization Payload Fabrication: Barracuda Launcher Payload Detailed Design	3	2020	1	2022
System Development: Mine Neutralization Payload Fabrication: Barracuda Launcher Fabrication	3	2021	2	2022
System Development: System Integration & Test: System Integration and Test	2	2019	1	2020
System Development: System Integration & Test: Barracuda System Integration & Test	1	2022	3	2023
System Development: Test and Evaluation: UOES	2	2020	1	2021
System Development: Test and Evaluation: Development Test	3	2020	3	2020
System Development: MCM Mission Package Testing: Developmental Testing	2	2021	3	2021

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
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	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
System Development: MCM Mission Package Testing: Tech Eval	4	2021	1	2022
System Development: MCM Mission Package Testing: IOT&E	1	2022	2	2022
Milestones: Acquisition Milestones: Full Rate Production Decision Review	3	2020	3	2020
Milestones: Acquisition Milestones: Full Rate Production	4	2020	4	2024

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
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COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
2989: *Barracuda*	0.000	20.572	28.803	28.641	-	28.641	33.205	38.387	37.869	38.631	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Note

FY 2020 funding request was reduced by $3.300M to account for the availability of prior year execution balances.

A. Mission Description and Budget Item Justification

The Barracuda program provides an expendable, low cost, and unmanned mine neutralization capability against previously located near-surface mines with the potential to address other targets. Barracuda is a mine neutralization system with the form factor of an A-size sonobuoy. It is a modular weapon that will be stored and assembled on LCS, will be deployed from the Mine Countermeasures Unmanned Surface Vehicle (MCM USV), and will maintain communications with the operator on LCS while autonomously re-acquiring mines in the near surface and await a fire command from the operator on board LCS.

An Analysis of Alternatives (AoA) for near surface mine neutralization requirements was conducted in June 2015 and Barracuda was selected. The Barracuda Capabilities Development Document (CDD) was approved on September 2016. The Barracuda program achieved Milestone B on 12 April 2018.

The Department awarded a cost-plus incentive contract for the Barracuda detail design, development, test, and qualification to Raytheon (Integrated Defense Systems, Portsmouth, RI) on April 17, 2018, with an awarded value of $84.8 million. The maximum contract value for Barracuda detailed design and development to include all EDMs, LRIP units, and support equipment is $364.3 million, with a period of performance through November 2022. The program has conducted system functional and requirements reviews in November 2018 and a preliminary design review in March 2019. A critical design review is scheduled for March 2020, which precedes the start of qualification and performance testing.

Barracuda provides the only near surface mine neutralization system that will allow the Littoral Combat Ship (LCS) Mine Countermeasure (MCM) Mission Package (MP) to fully meet its two mine hunting performance requirements. Initial Barracuda deployment will be on the MCM USV as part of the LCS MCM MP.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Barracuda: Product Development	16.118	23.828	23.785	0.000	23.785
Articles:	-	-	-	-	-
FY 2019 Plans: Complete System Requirements and Functional Review (SRR & SFR). Begin component modeling, simulation, fabrication and testing to verify design at Preliminary Design Review (PDR) in 2QFY19. Following PDR, the program will commence detailed system design and preparations for Critical Design Review in 2QFY20. Conduct and manage safety reviews as design matures.					
FY 2020 Base Plans:					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Conduct Barracuda Critical Design Review (CDR) and conduct contractor led initial system qualification and performance demonstration. Complete CDR Safety Reviews in advance of EDM procurement. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** No significant change from FY 2019 to FY 2020.					
Title: Barracuda: Engineering Support ***Articles:*** ***FY 2019 Plans:*** Evaluate and manage contractor deliverables, overseeing system engineering design effort. ***FY 2020 Base Plans:*** Complete CDR. Continue to evaluate and manage contractor deliverables and contractor detailed design effort in preparation for EDM purchase and developmental testing. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** No significant change from FY 2019 to FY 2020.	4.168 -	4.758 -	4.621 -	0.000 -	4.621 -
Title: Barracuda: Management Services ***Articles:*** ***FY 2019 Plans:*** Continue to provide program management, financial management and engineering support. ***FY 2020 Base Plans:*** Continue to provide program management, financial management and engineering support. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:***	0.286 -	0.217 -	0.235 -	0.000 -	0.235 -

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
No significant change from FY 2019 to FY 2020.					
Accomplishments/Planned Programs Subtotals	20.572	28.803	28.641	0.000	28.641

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Transition ONR FNC SS DTE to Barracuda in FY17 and FY18 to reduce design risk for a low cost modular neutralizer that leverages economies of scale and reduces total ownership cost. Barracuda RFP was released in 3QFY17. Milestone B was accomplished in 3QFY18. Cost plus incentive fee base contract (awarded April 2018) to design and deliver 750 Engineering Development Models (EDMs) with two cost plus fixed fee Low Rate Initial Production (LRIP) options to manufacture and deliver 1000 Barracudas per option. Base award will occur in 3QFY18. The government will manage a production cost model throughout the detailed design effort to deliver a low cost design in the Technical Data Package (TDP). There will be Government Purpose Rights on the TDP that will enable release of the TDP for a full and open competition of the Full Rate Production (FRP) contract planned in FY25. Initial Operating Capability (IOC) planned for 4QFY24.

E. Performance Metrics

Efficient design, fabrication, and testing to deliver a low cost solution that achieves required probability of kill against near surface mines.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
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Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Barracuda Hardware/ Support	C/CPIF	Raytheon (Integrated Defense Systems) : Portsmouth, RI	0.000	16.118	Apr 2018	23.828	Jan 2019	23.785	Jan 2020	-		23.785	0.000	63.731	92.000
		Subtotal	0.000	16.118		23.828		23.785		-		23.785	0.000	63.731	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Barracuda Engineering Support	WR	NUWC NPT : Newport, RI	0.000	0.544	Dec 2017	0.449	Dec 2018	0.569	Dec 2019	-		0.569	Continuing	Continuing	Continuing
Barracuda Engineering Services	C/CPIF	JHU APL : Baltimore, MD	0.000	0.598	Dec 2017	0.710	Dec 2018	0.801	Dec 2019	-		0.801	Continuing	Continuing	Continuing
Barracuda Engineering Support	WR	NSWC, PC : Panama City, FL	0.000	1.322	Dec 2017	1.352	Dec 2018	1.400	Dec 2019	-		1.400	Continuing	Continuing	Continuing
Barracuda Support	WR	NSWC, IHD : Indian Head, MD	0.000	1.257	Dec 2017	1.359	Dec 2018	1.275	Dec 2019	-		1.275	0.000	3.891	-
Barracuda Support	WR	Naval Research Lab : Washington, DC	0.000	0.193	Dec 2017	0.578	Dec 2018	0.302	Dec 2019	-		0.302	0.000	1.073	-
Barracuda Support	WR	NSWC, Carderock : Bethesda, MD	0.000	0.254	Dec 2017	0.310	Dec 2018	0.274	Dec 2019	-		0.274	0.000	0.838	-
		Subtotal	0.000	4.168		4.758		4.621		-		4.621	Continuing	Continuing	N/A

Management Services ($ in Millions)

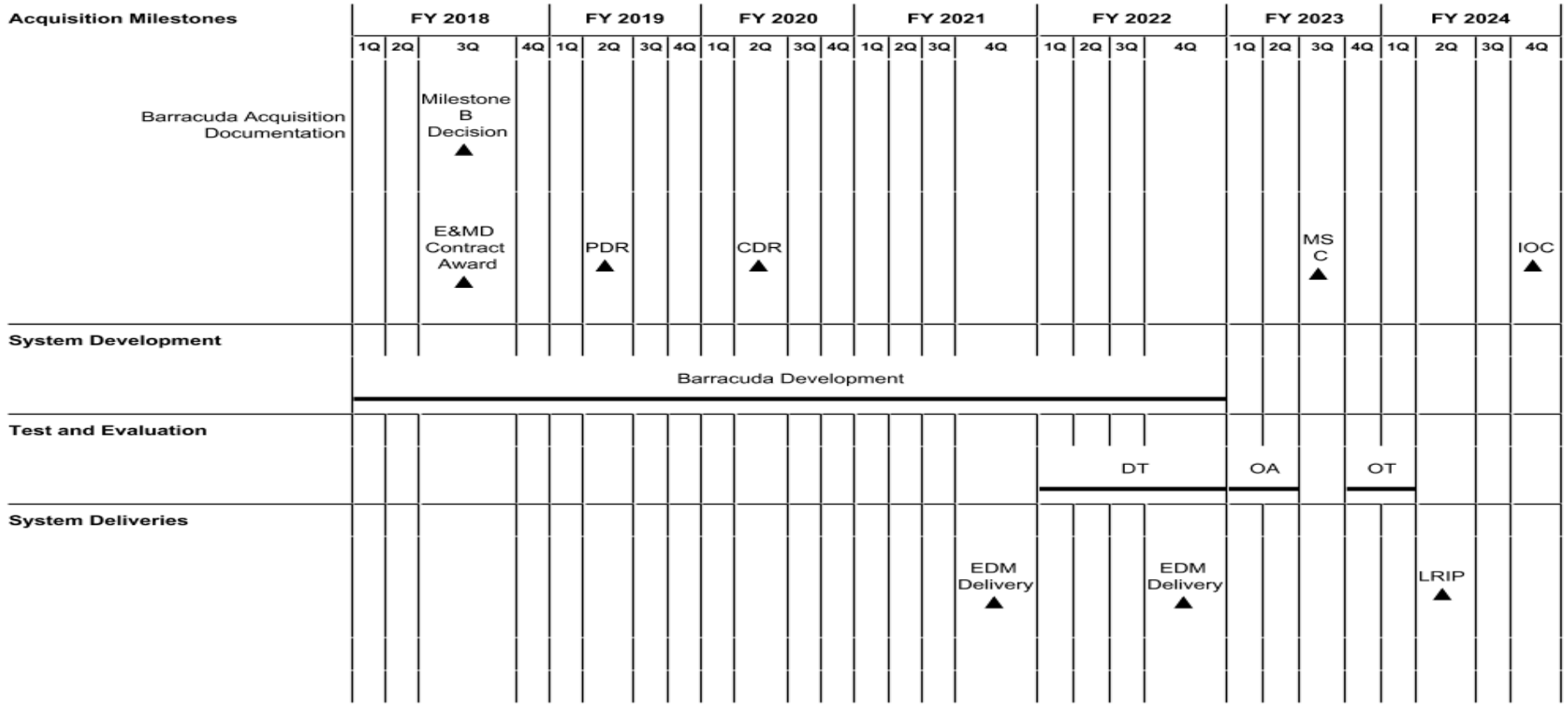
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Barracuda Management Support	WR	NSWC, PC : Panama City, FL	0.000	0.286	Dec 2017	0.217	Dec 2018	0.235	Dec 2019	-		0.235	0.000	0.738	-
		Subtotal	0.000	0.286		0.217		0.235		-		0.235	0.000	0.738	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
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	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	20.572		28.803		28.641		-		28.641	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
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Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Acquisition Milestones				
Barracuda Acquisition Documentation: Milestone B	3	2018	3	2018
Barracuda Acquisition Documentation: Contract Award	3	2018	3	2018
Barracuda Acquisition Documentation: Prelimindary Design Review	2	2019	2	2019
Barracuda Acquisition Documentation: Critical Design Review	2	2020	2	2020
Barracuda Acquisition Documentation: Milestone C	3	2023	3	2023
Barracuda Acquisition Documentation: Initial Operational Capability	4	2024	4	2024
System Development: Barracuda Development	1	2018	4	2022
Test and Evaluation: Development Testing	1	2022	4	2022
Test and Evaluation: Operational Assessment	1	2023	2	2023
Test and Evaluation: Operational Test	4	2023	1	2024
System Deliveries: Incremental Engineering Development Model Deliveries 1	4	2021	4	2021
System Deliveries: Incremental Engineering Development Model Deliveries 2	4	2022	4	2022
System Deliveries: Incremental Low Rate Initial Production Deliveries	2	2024	2	2024

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603502N / *Surface & Shallow Water MCM*	Project (Number/Name) 3066 / *Large Unmanned Surface Vehicle (LUSV)*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
3066: *Large Unmanned Surface Vehicle (LUSV)*	0.000	0.000	0.000	372.527	-	372.527	535.364	584.323	607.616	637.984	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Note

The Large Unmanned Surface Vehicle (LUSV) project leverages efforts under PE 0604250D8Z through the Office of the Secretary of Defense (OSD) Strategic Capabilities Office (SCO) Ghost Fleet - Overlord project. This project is a new start for the Navy in FY2020

A. Mission Description and Budget Item Justification

As part of the Unmanned Surface Vehicle (USV) Family of Systems (FoS), the Large USV (LUSV) project provides resources for the detailed design, fabrication, testing and support of the LUSV. LUSV is defined as having a reconfigurable, multi-mission capability which is accomplished via an organic warfare capability and may be augmented with additional modular payloads. The LUSV organic warfare capability will be procured under the Unmanned Surface Vessel Enabling Capabilities project unit and is intended to utilize existing payloads including Navy launchers and sensors. Modular payloads may be developed separately by other programs or prototyping efforts and will be further developed and/or integrated into LUSV under the Enabling Capabilities project unit that supports MUSV and LUSV. LUSVs are assumed to be greater than 50m in length in order to deliver the organic payload capability and endurance required. LUSVs will be based on commercial designs with organic capability added to provide additional Anti-Surface Warfare (ASuW) and Strike capacity to the surface fleet. LUSVs will provide relatively low cost, high endurance, reconfigurable ships able to accommodate various payloads for unmanned missions to augment the Navy's manned surface force.

LUSVs will be long endurance vessels with large payload capacity, designed to conduct a variety of warfare operations independently or in conjunction with manned surface combatants. LUSVs will be capable of semi-autonomous or fully autonomous operation, with operators in-the-loop or on-the-loop. USV Command and Control (C2) will be maintained via the afloat element (i.e., embarked on a United States Navy (USN) combatant/support ship), or via the ashore element (C2 station ashore). LUSV C2, combat and/or weapon system integration will employ tamper proofing and security controls to prevent disclosure of data and electronic warfare defenses during autonomous operation. LUSVs will employ a Risk Management Framework (RMF) approach with physical, technical and administrative security controls. LUSVs will have hardware and software components to protect classified/sensitive functions, countermeasures designed to thwart adversary exploitation, classified data sanitation requirements, anti-tamper mechanisms to prevent disclosure of data and autonomous zeroization, and electronic warfare defenses. LUSVs will be capable of weeks-long deployments and trans-oceanic transits and operate aggregated with Carrier Strike Groups (CSGs) and Surface Action Groups (SAGs), as well as have the ability to deploy independently.

LUSV will leverage efforts external to this project unit accomplished through the Office of the Secretary of Defense (OSD) Strategic Capabilities Office (SCO) Ghost Fleet - Overlord project investments in FY 2018 (continuing through FY 2021). Overlord converts existing commercial fast supply vessels into experimentation LUSVs, with the end goal to demonstrate relevant Navy Surface Warfare missions utilizing modular prototype payloads. The Overlord systems will also advance the technology needed for autonomous operation of pier-launched vessels as well as increase the reliability and redundancy required to support an unmanned Hull, Mechanical, and Electrical (HM&E) system. The Overlord systems will be able to travel thousands of miles between port visits, as well as operate for weeks at a time. The Overlord

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
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program will procure 2 experimentation LUSVs (based on existing fast supply vessels) in FY 2019 and will develop fleet-ready C2 elements that will be directly incorporated into MUSV and LUSV.

The Navy is able to rapidly initiate the LUSV program in FY 2020 as a direct result of transitioning the OSD SCO Ghost Fleet Overlord technology. In addition to the two experimentation LUSVs procured in FY 2019 by the Ghost Fleet Program, the Navy will procure two FY 2020 experimentation LUSVs of the same configuration (from the same vendors on the same contracts) as the Ghost Fleet Overlord systems and modular payloads will be procured to fully populate the 4 Overlord (2 SCO funded in FY 2019 and 2 Navy funded in FY 2020) experimentation LUSVs. While the Overlord configuration rapidly delivers an initial LUSV capability, it does not provide the integrated and organic capability or capacity intended for the LUSV program. The Navy intends to begin procuring LUSVs at a rate of 2 per year starting in FY 2021. Design contracts will be competitively awarded in FY 2020 to develop an LUSV with an integrated (GFE) launcher system and capacity for additional modular payloads. LUSVs of this configuration will be procured starting in FY 2021 with competitive detail design and construction contract(s). Payloads will be procured separately.

Future missions for LUSV will be informed by the Navy's Future Surface Combatant Force (FSCF) Analysis of Alternatives (AoA) and as future payloads and concept of operations (CONOPs) are developed. LUSV is a key enabler of the Navy's Distributed Maritime Operations (DMO) concept, which includes being able to forward deploy (alone or in teams/swarms), team with individual manned combatants or augment battle groups with an LUSV distributed Anti-Surface Warfare (ASuW) and Strike capacity. Fielding of LUSV will provide the Navy increased capability and necessary capacity at lower projected procurement and sustainment costs, reduced risk to sailors and increased readiness by offloading missions from manned combatants.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Product Development	0.000	0.000	346.002	0.000	346.002
Articles:	-	-	-	-	-
FY 2019 Plans: N/A					
FY 2020 Base Plans: In order to reduce risk and ensure technology reaches the required maturity level to support LUSV plans in FY 2021, the Navy plans to procure quantity two (2) additional Overlord configuration experimentation LUSVs via the existing Ghost Fleet - Overlord contract vehicle established under PE 0604250D8Z through the Office of the Secretary of Defense (OSD) Strategic Capabilities Office (SCO) in FY 2020. These vessels are based on commercial designs. The Navy will procure and provide GFE in the form of communications gear, USV Command and Control (C2) software, and prototype modular payloads (also developed by separate OSD SCO programs). While these systems will be deployable assets, the Navy plans to place these units in a Surface Development Squadron to ensure Tactics, Techniques and Procedures are developed to allow the fleet to operate and fight alongside manned systems.					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 3066 / *Large Unmanned Surface Vehicle (LUSV)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
LUSVs will need to be developed and constructed to meet the capabilities required by the Navy. There is no platform that exists that meets all Navy payload capabilities within the necessary operational envelope. The Navy will execute a design contract in FY 2020 to convert existing commercial vessels to operate unmanned while meeting the payload capacity to fulfill ASuW requirements. The OSD SCO Overlord program will influence the requirements and specifications for the Navy's desired LUSV. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Funding supports the award of two (2) experimentation LUSVs and procurement of modular payloads.					
Title: Support ***Articles:*** ***FY 2019 Plans:*** N/A ***FY 2020 Base Plans:*** Award design contract(s) to convert existing commercial platforms to LUSVs capable of meeting Top Level Requirements (TLR). The LUSV design will be driven by a government-produced performance specification and enforce the principles of open architecture through interface control documents for all major subsystems. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** FY 2020 support funding supports the procurement of two (2) experimentation LUSVs and procurement of modular payloads.	0.000 -	0.000 -	24.525 -	0.000 -	24.525 -
Title: Management Services ***Articles:*** ***FY 2019 Plans:*** N/A ***FY 2020 Base Plans:*** Develop all governing documentation as required to support advancement of the LUSV program. This includes the creation of the following artifacts: System Engineering Plan (SEP), Test and Evaluation Strategy (TES),	0.000 -	0.000 -	2.000 -	0.000 -	2.000 -

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 3066 / *Large Unmanned Surface Vehicle (LUSV)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Life Cycle Support Plan (LCSP), Cybersecurity Strategy, Open Systems Architecture Management Plan, Corrosion Prevention and Control Plan, Weight Control Plan, Quality Assurance Program Plan, Reliability and Maintainability Program Plan, Configuration Management Plan, Software Development Plan and Program Protection Plan (PPP). ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Funding supports the management of contract award of two (2) experimentation LUSVs and procurement of modular payloads.					
Accomplishments/Planned Programs Subtotals	0.000	0.000	372.527	0.000	372.527

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

To mitigate technical risk, two Overlord configuration experimentation LUSVs will be procured in FY 2020 using the existing OSD SCO Overlord contracts. LUSV will pursue authority for FY 2020 contract awards under the U.S. Code, Title X, Statute 2358 for Research and Development Projects. Navy required capabilities will be captured in a Top Level Requirements (TLR) document approved by the OPNAV Director of Surface Warfare. A full and open Concept Design RFP will be released to industry in FY 2019 (Note: Congressional Add of $42.000M in Project Unit 9999/C442) with a plan to award multiple Concept Design contracts in FY 2020. Concept Design(s) delivered in FY 2020/2021 will inform the Navy's full and open Detailed Design and Construction (DD&C) RFP, which will be released to industry in FY 2020. In FY 2021 a DD&C contract for initial LUSVs will be awarded to one or more vendors. Two LUSVs will be procured annually starting in FY 2021 and continuing to FY 2024. The Navy is evaluating the ideal transition point to an ACAT program with procurement (SCN) funding.

E. Performance Metrics

Award of Overlord configuration experimentation LUSV options in FY 2020.
Award of LUSV Concept Design contract(s) in FY 2020.
Award of LUSV DD&C contract(s) in FY 2021.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
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Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Design Support	C/CPIF	TBD : TBD	0.000	0.000		0.000		70.000	Jan 2020	-		70.000	Continuing	Continuing	Continuing
Fabrication & System/ Payload Integration	C/CPIF	TBD : TBD	0.000	0.000		0.000		180.040	Jan 2020	-		180.040	Continuing	Continuing	Continuing
GFE/Long Lead Time Material	C/FFP	TBD : TBD	0.000	0.000		0.000		89.962	Jan 2020	-		89.962	0.000	89.962	-
LUSV Specification/ Contract Support	WR	Various : Various	0.000	0.000		0.000		6.000	Jan 2020	-		6.000	0.000	6.000	-
		Subtotal	0.000	0.000		0.000		346.002		-		346.002	Continuing	Continuing	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
SUPSHIP, WF Center Support	WR	Various : Various	0.000	0.000		0.000		20.350	Jan 2020	-		20.350	Continuing	Continuing	Continuing
LUSV Source Selection	WR	Various : Various	0.000	0.000		0.000		4.175	Jan 2020	-		4.175	0.000	4.175	-
		Subtotal	0.000	0.000		0.000		24.525		-		24.525	Continuing	Continuing	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Travel	WR	NAVSEA : Washington, DC	0.000	0.000		0.000		0.200	Jan 2020	-		0.200	Continuing	Continuing	Continuing
Management Services	WR	Various : Various	0.000	0.000		0.000		1.800	Jan 2020	-		1.800	0.000	1.800	-
		Subtotal	0.000	0.000		0.000		2.000		-		2.000	Continuing	Continuing	N/A

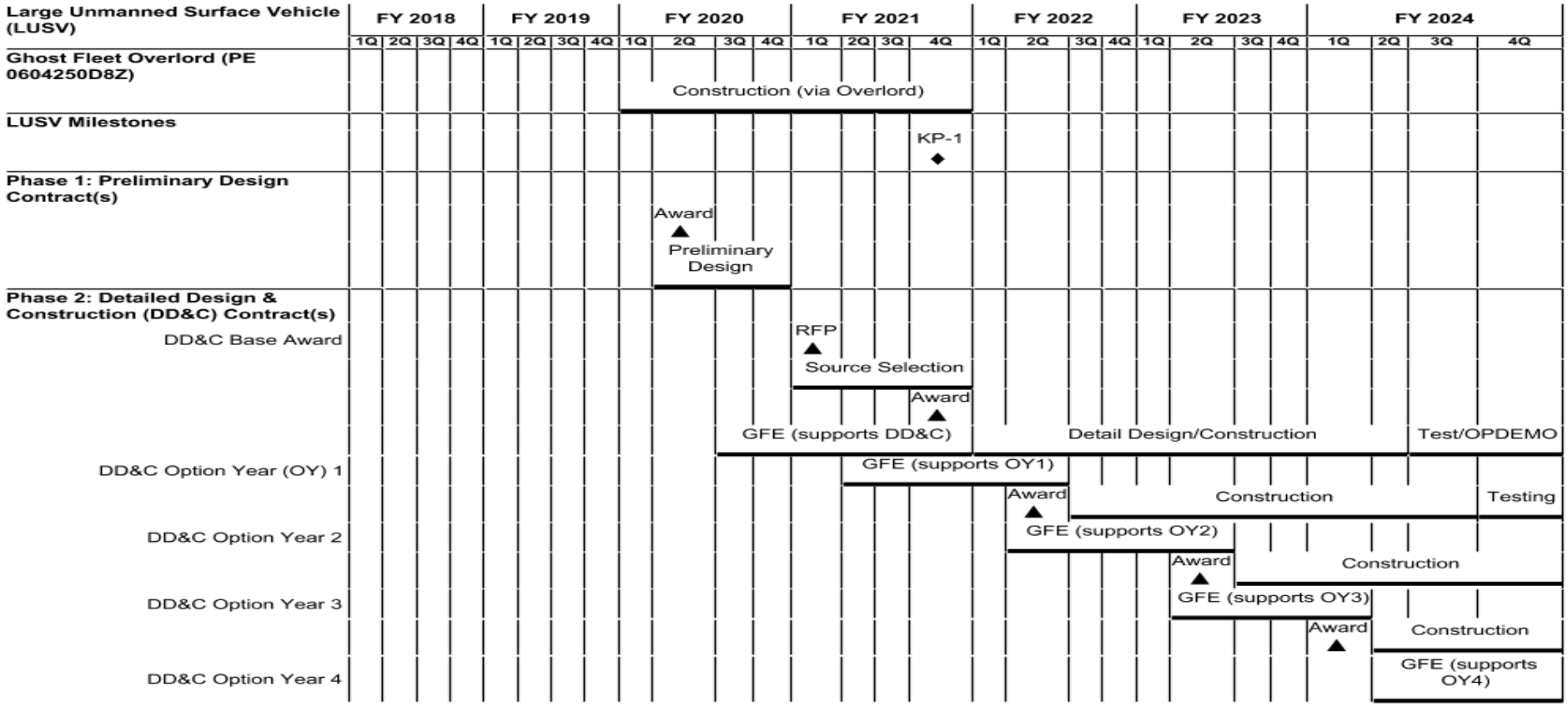
	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	0.000		0.000		372.527		-		372.527	Continuing	Continuing	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
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	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
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Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Large Unmanned Surface Vehicle (LUSV)				
Ghost Fleet Overlord (PE 0604250D8Z): Construction (via Overlord)	1	2020	4	2021
LUSV Milestones: Knowledge Point 1	4	2021	4	2021
Phase 1: Preliminary Design Contract(s): Preliminary Design Contract(s) Award	2	2020	2	2020
Phase 1: Preliminary Design Contract(s): Preliminary Design	2	2020	4	2020
Phase 2: Detailed Design & Construction (DD&C) Contract(s): DD&C Base Award: RFP	1	2021	1	2021
Phase 2: Detailed Design & Construction (DD&C) Contract(s): DD&C Base Award: Source Selection	1	2021	4	2021
Phase 2: Detailed Design & Construction (DD&C) Contract(s): DD&C Base Award: Award	4	2021	4	2021
Phase 2: Detailed Design & Construction (DD&C) Contract(s): DD&C Base Award: GFE LLTM in support of DD&C	3	2020	4	2021
Phase 2: Detailed Design & Construction (DD&C) Contract(s): DD&C Base Award: Detailed Design and Construction (DD&C)	1	2022	2	2024
Phase 2: Detailed Design & Construction (DD&C) Contract(s): DD&C Base Award: Test/OPDEMO	3	2024	4	2024
Phase 2: Detailed Design & Construction (DD&C) Contract(s): DD&C Option Year (OY) 1: GFE LLTM	2	2021	2	2022
Phase 2: Detailed Design & Construction (DD&C) Contract(s): DD&C Option Year (OY) 1: Option Year 1 Award	2	2022	2	2022
Phase 2: Detailed Design & Construction (DD&C) Contract(s): DD&C Option Year (OY) 1: Construction	3	2022	3	2024
Phase 2: Detailed Design & Construction (DD&C) Contract(s): DD&C Option Year (OY) 1: Testing	4	2024	4	2024

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
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	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Phase 2: Detailed Design & Construction (DD&C) Contract(s): DD&C Option Year 2: GFE LLTM	2	2022	2	2023
Phase 2: Detailed Design & Construction (DD&C) Contract(s): DD&C Option Year 2: Option Year 2 Award	2	2023	2	2023
Phase 2: Detailed Design & Construction (DD&C) Contract(s): DD&C Option Year 2: Construction	3	2023	4	2024
Phase 2: Detailed Design & Construction (DD&C) Contract(s): DD&C Option Year 3: GFE LLTM	2	2023	1	2024
Phase 2: Detailed Design & Construction (DD&C) Contract(s): DD&C Option Year 3: Option Year 3 Award	1	2024	1	2024
Phase 2: Detailed Design & Construction (DD&C) Contract(s): DD&C Option Year 3: Construction	2	2024	4	2024
Phase 2: Detailed Design & Construction (DD&C) Contract(s): DD&C Option Year 4: GFE LLTM	2	2024	4	2024

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603502N / *Surface & Shallow Water MCM*	Project (Number/Name) 3067 / *Unmanned Surface Vehicle Enabling Capabilities*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
3067: *Unmanned Surface Vehicle Enabling Capabilities*	0.000	0.000	0.000	50.413	-	50.413	199.277	177.280	247.458	132.039	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Note

This project is a new start in FY2020

A. Mission Description and Budget Item Justification

In order to accelerate future capability and support steady growth of the Navy's Unmanned Surface Vehicle (USV) Family of Systems (FoS), the Unmanned Surface Vessel Enabling Capabilities project includes development, test, and integration of USV technologies; the advancement of Defense Advanced Research Projects Agency (DARPA), Office of Naval Research (ONR) and Industry USV efforts for associated technologies and the development and fabrication of payloads for LUSVs. USV technology efforts in this project unit support demonstration of mission level autonomy, communications, command and control, navigation compliance with the International Regulations for Preventing Collisions at Sea 1972 (COLREGS), endurance, at sea replenishment, payload feasibility, mission planning and execution for the Office of the Secretary of Defense (OSD) Strategic Capabilities Office (SCO) Overlord efforts, and enabling technologies for other USVs in the USV FoS, as applicable.

Modular payloads employed by Medium Unmanned Surface Vehicles (MUSVs) and Large Unmanned Surface Vessels (LUSVs) will be developed under this project unit. Payloads will be customized to meet Navy needs and demonstrate useful capability for the Fleet. MUSVs will achieve their mission capability through their employment of modular payloads. LUSVs will augment their organic warfare capability with additional modular payloads.

Efforts for the LUSV organic warfare capability will also be developed under this project. In order to support the LUSV primary missions, investment in LUSV payload development, payload integration, and Integrated Combat System (ICS) development is required. Investment is also needed to support LUSV payload testing and follow-on operations. Due to the nature of this project, specific applications and detailed plans are available at a higher classification.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Product Development	0.000	0.000	44.613	0.000	44.613
Articles:	-	-	-	-	-
FY 2019 Plans: N/A					
FY 2020 Base Plans:					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Utilize Future Surface Combatant Force (FSCF) Technology Investment Strategy to transition mature products to USVs that increase capabilities to levels required to support Navy Warfighting Requirements Efforts include developing and integrating innovative payloads onto USVs to improve warfighting capabilities. Utilize FSCF payload investments developed by Office of the Secretary of Defense (OSD) Strategic Capabilities Office (SCO) to support the acquisition and integration of payload capabilities, development of the Integrated Combat System (ICS) and plans for industry competition for both large and small businesses (i.e., Request for Proposal (RFP) development, SBIR Phase III). Leveraging the Naval Research and Development Enterprise and Industry, options will be assessed for the impact to warfighting capabilities. Additionally, market research and technology feasibility studies will assess options available and the impact to warfighting capabilities. FY 2020 efforts will include technical studies for Elevated Sensor technologies/modalities to provide wide defensive radar coverage and detect/track/identify objects from extended distances. Efforts will also include the development of Elevated Sensor contract(s) to design, develop, and demonstrate a persistent airborne system capable of providing USVs with more time and more battle space to identify potential threats and make critical decisions. Initial requirements derived through market research and studies will drive design efforts of prototype systems of explosive and non-lethal payloads. The payloads will be initially integrated and demonstrated on the OSD SCO Overlord efforts, and developed for integration into other applicable FoS USVs when ready. Additional tasks include Fleet experimentation with both Overlord and Sea Hunter USVs. Develop and deliver ICS that will be ready for combined and integrated capabilities, with the ICS infrastructure ready to support any future capabilities. Each subsequent increment will be back-compatible to upgrade previous increments, resulting in the first 8 LUSVs with a common and certified ICS that can be rapidly upgraded and modernized as necessary. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** FY 2020 funding represents development and integration ramp necessary to transition separate SCO prototype efforts into a single ICS infrastructure that can support LUSV payloads, for integration and testing of Payload module, increased coordination of autonomy and common control efforts and completion of prototype fabrication efforts, and operational employment of payloads through experimentation across designated missions to meet the first LUSVs and MUSVs.					
Title: Support	0.000	0.000	5.750	0.000	5.750

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Articles:	-	-	-	-	-
FY 2019 Plans: N/A ***FY 2020 Base Plans:*** In conjunction with the Office of the Chief of Naval Operations (OPNAV), update requirements documents, develop interface control specifications and architecture documentation, develop ship design and top side layout drawings and develop T&E plan for USV ICS and payloads. Update documentation and continue work on development of common autonomy standards, interfaces, and systems and support modeling/simulation efforts and prototype development. Update CCS documentation and support testing and design efforts. Sustainment, operation and maintenance of experimental MUSV and LUSV platforms. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** FY 2020 funding supports integration and testing of payload modules, increased coordination of autonomy and common control efforts, completion of prototype fabrication efforts, engineering and programmatic documentation required in support of for USV ICS and payloads, development and transition to ensure thorough Request for Proposals (RFPs), contract evaluation consistency, development sufficiency, and fielding efficiency and sustainment of experimental MUSV and LUSV platforms. This reduces program risk to capability development and fielding.					
Title: Management Services	0.000	0.000	0.050	0.000	0.050
Articles:	-	-	-	-	-
FY 2019 Plans: N/A ***FY 2020 Base Plans:*** Provide execution of the product development and support tasks. Develop acquisition documents to include Systems Engineering Plan (SEP), T&E Master Plan, integrated master schedule, risk evaluations and Independent Cost Estimates (ICE) based on the required capabilities. Oversee transition of payload prototypes and associated experimentation and risk reduction efforts. Coordinate with and across supporting					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
activities (e.g., Program Executive Office (PEO) Integrated Warfare Systems (IWS), PEO Command, Control, Communications, Computers and Intelligence (C4I)), warfare centers, labs, and industry partners to address requirements, manage funding and execute plans for the integration of LUSV payloads with the USV ICS. Oversee transition of payload prototypes and associated experimentation and risk reduction efforts. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** FY 2020 funding supports integration and testing of Payload module, increased coordination of autonomy and common control efforts, completion of prototype fabrication efforts, review and approval of engineering and programmatic documentation required in support of LUSV ICS and payloads, development and transition to ensure thorough Request for Proposals (RFPs), contract evaluation consistency, development sufficiency and fielding efficiency. This reduces program risk to capability development and fielding.					
Accomplishments/Planned Programs Subtotals	0.000	0.000	50.413	0.000	50.413

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

USV Enabling Capabilities efforts will accelerate future capability and support steady growth of the Navy's Unmanned Surface Vehicle (USV) Family of Systems (FoS). By leveraging efforts from the Naval Research and Development Enterprise and Industry for associated technologies and payloads and integrating them into USVs at the appropriate level of technical maturity, USV capabilities for the Fleet will be increasingly enhanced. Coordination with UxS platforms will eliminate redundant efforts, encourage innovation and improve coordination of unmanned systems across multiple domains. Leveraging the SCO developed standalone capabilities, the plan is to develop these capabilities for the initial LUSVs and then transition those capabilities into the LUSV through incremental development and integration across the funding portfolio, from an ICS that will be ready for combined and integrated capabilities, with the ICS infrastructure ready to support any future capabilities. Each subsequent increment will be back-compatible to upgrade previous increments, resulting in the first 8 LUSVs with a common and certified ICS that can be rapidly upgraded and modernized as necessary. The Navy will accomplish efforts under USV Enabling Capabilities through existing contract vehicles prepared for SCO and ONR efforts, the USV FoS Indefinite Delivery Indefinite Quantity (IDIQ) Multiple Award Contract (MAC) which will be awarded in FY 2020, the prime contract awarded for MUSV DD&C, the prime contract(s) awarded for LUSV DD&C and existing contracts for payload fabrication.

E. Performance Metrics

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
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Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Integrated Combat Systems (ICS) Integration Development	Various	TBD : TBD	0.000	0.000		0.000		38.738	Jan 2020	-		38.738	Continuing	Continuing	Continuing
Consulting Services	WR	TBD : TBD	0.000	0.000		0.000		1.625	Jan 2020	-		1.625	Continuing	Continuing	Continuing
Elevated Sensors	C/CPIF	TBD : TBD	0.000	0.000		0.000		0.750	Jan 2020	-		0.750	0.000	0.750	-
Experimentation	WR	Various : Various	0.000	0.000		0.000		3.500	Jan 2020	-		3.500	0.000	3.500	-
		Subtotal	0.000	0.000		0.000		44.613		-		44.613	Continuing	Continuing	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Autonomy	Various	Various : Various	0.000	0.000		0.000		0.750	Jan 2020	-		0.750	Continuing	Continuing	Continuing
Command and Control (C2) Integration	Various	Various : Various	0.000	0.000		0.000		1.500	Jan 2020	-		1.500	Continuing	Continuing	Continuing
USV Squadron Operations & Sustainment	WR	Various : Various	0.000	0.000		0.000		2.500	Jan 2020	-		2.500	Continuing	Continuing	Continuing
Delta Req, RFP Dev, Evaluation	WR	Various : Various	0.000	0.000		0.000		1.000	Jan 2020	-		1.000	0.000	1.000	-
		Subtotal	0.000	0.000		0.000		5.750		-		5.750	Continuing	Continuing	N/A

Management Services ($ in Millions)

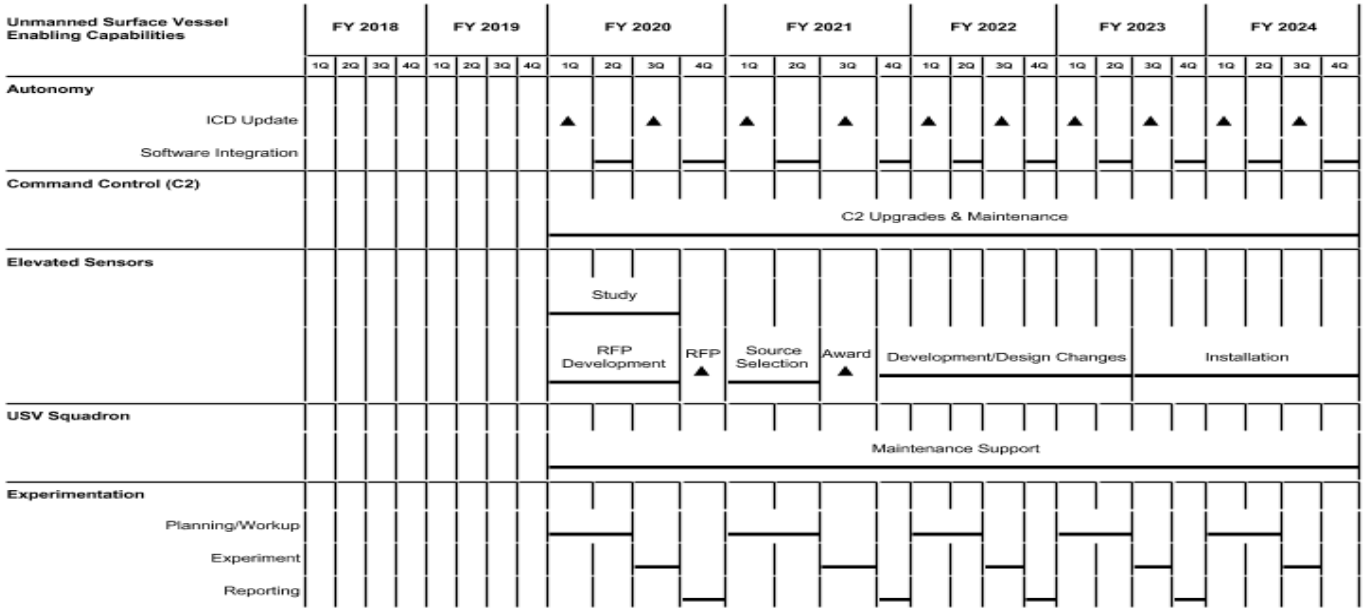
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Management Services	WR	NAVSEA : Washington, DC	0.000	0.000		0.000		0.050	Jan 2020	-		0.050	Continuing	Continuing	Continuing
		Subtotal	0.000	0.000		0.000		0.050		-		0.050	Continuing	Continuing	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603502N / *Surface & Shallow Water MCM*	Project (Number/Name) 3067 / *Unmanned Surface Vehicle Enabling Capabilities*	

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	0.000		0.000		50.413		-		50.413	Continuing	Continuing	N/A

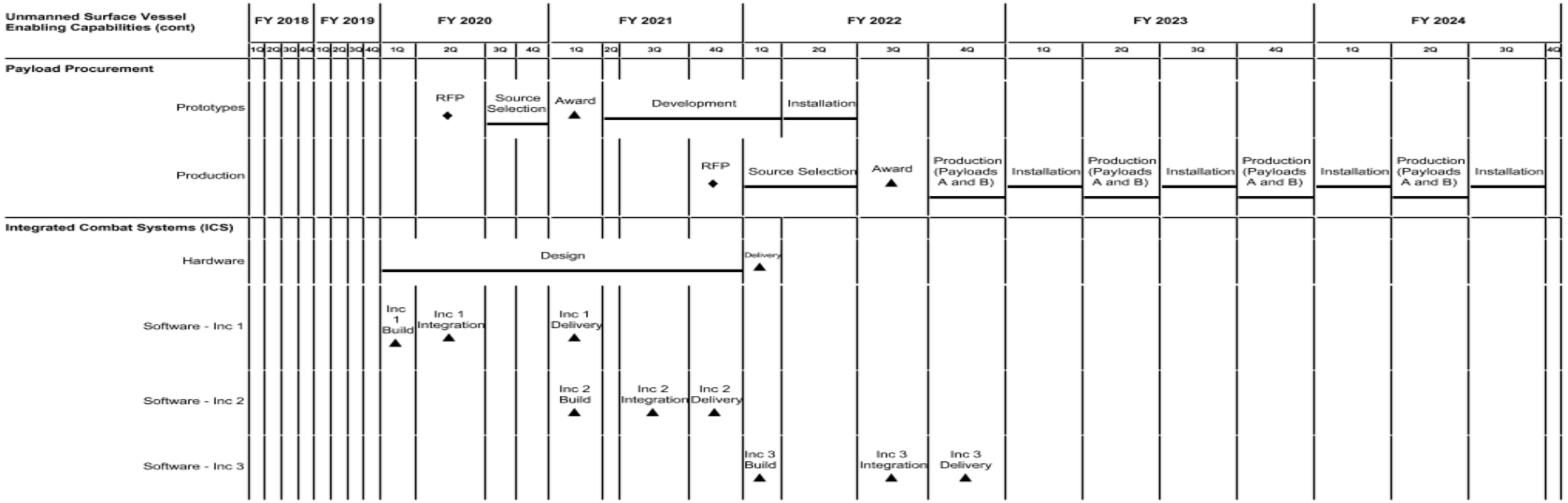
Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 3067 / *Unmanned Surface Vehicle Enabling Capabilities*



2020PB - 0603502N - 3067

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 3067 / *Unmanned Surface Vehicle Enabling Capabilities*



2020PB - 0603502N - 3067

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 3067 / *Unmanned Surface Vehicle Enabling Capabilities*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Unmanned Surface Vessel Enabling Capabilities				
Autonomy: ICD Update: 1	1	2020	1	2020
Autonomy: ICD Update: 2	3	2020	3	2020
Autonomy: ICD Update: 3	1	2021	1	2021
Autonomy: ICD Update: 4	3	2021	3	2021
Autonomy: ICD Update: 5	1	2022	1	2022
Autonomy: ICD Update: 6	3	2022	3	2022
Autonomy: ICD Update: 7	1	2023	1	2023
Autonomy: ICD Update: 8	3	2023	3	2023
Autonomy: ICD Update: 9	1	2024	1	2024
Autonomy: ICD Update: 10	3	2024	3	2024
Autonomy: Software Integration: 1	2	2020	2	2020
Autonomy: Software Integration: 2	4	2020	4	2020
Autonomy: Software Integration: 3	2	2021	2	2021
Autonomy: Software Integration: 4	4	2021	4	2021
Autonomy: Software Integration: 5	2	2022	2	2022
Autonomy: Software Integration: 6	4	2022	4	2022
Autonomy: Software Integration: 7	2	2023	2	2023
Autonomy: Software Integration: 8	4	2023	4	2023
Autonomy: Software Integration: 9	2	2024	2	2024
Autonomy: Software Integration: 10	4	2024	4	2024
Command Control (C2): Command and Control (C2)	1	2020	4	2024

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 3067 / *Unmanned Surface Vehicle Enabling Capabilities*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Elevated Sensors: Study	1	2020	3	2020
Elevated Sensors: RFP Solicitation Development	1	2020	3	2020
Elevated Sensors: RFP Release	4	2020	4	2020
Elevated Sensors: Source Selection	1	2021	2	2021
Elevated Sensors: Award	3	2021	3	2021
Elevated Sensors: Development/Design Changes	4	2021	2	2023
Elevated Sensors: Installation	3	2023	4	2024
USV Squadron: Maintenance Support	1	2020	4	2024
Experimentation: Planning/Workup: 1	1	2020	2	2020
Experimentation: Planning/Workup: 2	1	2021	2	2021
Experimentation: Planning/Workup: 3	1	2022	2	2022
Experimentation: Planning/Workup: 4	1	2023	2	2023
Experimentation: Planning/Workup: 5	1	2024	2	2024
Experimentation: Experiment: 1	3	2020	3	2020
Experimentation: Experiment: 2	3	2021	3	2021
Experimentation: Experiment: 3	3	2022	3	2022
Experimentation: Experiment: 4	3	2023	3	2023
Experimentation: Experiment: 5	3	2024	3	2024
Experimentation: Reporting: 1	4	2020	4	2020
Experimentation: Reporting: 2	4	2021	4	2021
Experimentation: Reporting: 3	4	2022	4	2022
Experimentation: Reporting: 4	4	2023	4	2023
Experimentation: Reporting: 5	4	2024	4	2024
Unmanned Surface Vessel Enabling Capabilities (cont)				
Payload Procurement: Prototypes: RFP Released	2	2020	2	2020

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 3067 / *Unmanned Surface Vehicle Enabling Capabilities*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Payload Procurement: Prototypes: Source Selection	3	2020	4	2020
Payload Procurement: Prototypes: Award	1	2021	1	2021
Payload Procurement: Prototypes: Development	2	2021	1	2022
Payload Procurement: Prototypes: Installation	2	2022	2	2022
Payload Procurement: Production: RFP Released	4	2021	4	2021
Payload Procurement: Production: Source Selection	1	2022	2	2022
Payload Procurement: Production: Award	3	2022	3	2022
Payload Procurement: Production: Production 1	4	2022	4	2022
Payload Procurement: Production: Production 2	2	2023	2	2023
Payload Procurement: Production: Production 3	4	2023	4	2023
Payload Procurement: Production: Production 4	2	2024	2	2024
Payload Procurement: Production: Installation 1	1	2023	1	2023
Payload Procurement: Production: Installation 2	3	2023	3	2023
Payload Procurement: Production: Installation 3	1	2024	1	2024
Payload Procurement: Production: Installation 4	3	2024	3	2024
Integrated Combat Systems (ICS): Hardware: Virtual Combat Management System (VCMS) Design	1	2020	4	2021
Integrated Combat Systems (ICS): Hardware: VCMS Delivery	1	2022	1	2022
Integrated Combat Systems (ICS): Software - Inc 1: VCMS Inc 1 Software Build	1	2020	1	2020
Integrated Combat Systems (ICS): Software - Inc 1: VMCS Inc 1 System Integration & Virtualization	2	2020	2	2020
Integrated Combat Systems (ICS): Software - Inc 1: VCMS Inc 1 Delivery	1	2021	1	2021
Integrated Combat Systems (ICS): Software - Inc 2: VCMS Inc 2 Software Build	1	2021	1	2021
Integrated Combat Systems (ICS): Software - Inc 2: VCMS Inc 2 System Integration & Virtualization	3	2021	3	2021
Integrated Combat Systems (ICS): Software - Inc 2: VCMS Inc 2 Delivery	4	2021	4	2021

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 3067 / *Unmanned Surface Vehicle Enabling Capabilities*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Integrated Combat Systems (ICS): Software - Inc 3: VCMS Inc 3 Software Build	1	2022	1	2022
Integrated Combat Systems (ICS): Software - Inc 3: VCMS Inc 3 Integration & Virtualization	3	2022	3	2022
Integrated Combat Systems (ICS): Software - Inc 3: VCMS Inc 3 Delivery	4	2022	4	2022

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603502N / *Surface & Shallow Water MCM*	Project (Number/Name) 3123 / *SMCM UUV*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
3123: *SMCM UUV*	156.420	21.799	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	178.219
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Note

FY 2019 and future funding for Project 3123 is in Program Element (PE) 0604028N. Project realigned from PE 0603502N starting in FY 2019.

A. Mission Description and Budget Item Justification

As part of the UUV Family of Systems (FoS) and in support of the MCM MP, the Knifefish Surface Mine Countermeasures Unmanned Undersea Vehicle (SMCM UUV) program develops advanced Unmanned Undersea Vehicles (UUVs) to support clandestine mine detection capability against volume, bottom, and buried mines. Equipment includes vehicles and associated systems support equipment. In parallel, Pre-Planned Product Improvement (P3I) design efforts aligned to Fleet needs are ongoing to support insertion of incremental capability when the technology is ready. Planned P3I candidates being considered include increased detection range capability, communications upgrades, on-board sonar processing and target recognition, command and control improvements, increased operational depth, and other smaller tasks, as well as potential future payloads as required.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Knifefish SMCM UUV	21.799	0.000	0.000	0.000	0.000
Articles:	-	-	-	-	-
FY 2019 Plans: Funding realigned to PE 0604028N.					
FY 2020 Base Plans: N/A					
FY 2020 OCO Plans: N/A					
Accomplishments/Planned Programs Subtotals	21.799	0.000	0.000	0.000	0.000

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• OPN/2622: *Minesweeping Replacement*	57.343	32.367	19.448	-	19.448	15.858	16.281	16.753	17.087	Continuing	Continuing

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 3123 / *SMCM UUV*

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• OPN/1601: *LCS MCM Mission Modules*	45.146	98.901	197.129	-	197.129	222.831	222.523	233.151	243.503	1,213.078	2,655.367
• RDTEN/0604028N/3123: *SMCM UUV*	0.000	16.717	22.747	-	22.747	20.666	16.413	6.789	2.541	Continuing	Continuing
• OPN/1611: *Small and Medium UUVs*	0.000	0.000	40.547	-	40.547	38.817	24.310	8.564	35.170	Continuing	Continuing

Remarks

The above OPN funding lines account for several programs, of which the Knifefish program is only a portion.

D. Acquisition Strategy

The Knifefish program, initiated in FY11 and competitively sourced to General Dynamics Mission Systems (GDMS), develops Surface Mine Countermeasure Unmanned Undersea Vehicles (SMCM UUVs) equipped with advanced Low Frequency Broadband (LFBB) sonar to provide volume, bottom, and buried mine detection capability, when operated from the Littoral Combat Ship (LCS) Mine Countermeasure Mission Package (MCM MP) or Vessel of Opportunity (VOO). An Engineering Development Model (EDM) system was fabricated and tested through Developmental Testing (DT). After incorporating fixes and upgrades discovered during DT and from Fleet operator inputs, an Operational Assessment (OA) will be conducted from a VOO in order to inform a Milestone C (MS C) decision and Low Rate Initial Production (LRIP) award with an option for up to five Knifefish systems. An FRP Decision Review will be conducted after completion of Initial Operational Test and Evaluation (IOT&E) of the Knifefish system. Operational integration testing with the LCS will occur as test ships are available, but prior to Initial Operational Capability (IOC). Following IOT&E, a full and open competitive FRP contract will be awarded. The overall approach is to deliver systems through incrementally increasing capability via three block upgrades, balancing technology development maturity against a manageable level of risk to the program. Capability improvements via P3I will be developed concurrently within each block as baseline systems are produced. New P3I capability blocks will not transition to the production system until stable requirements are established, demonstrated, and verified for the respective P3I block. Originally designated an ACAT III program, Knifefish was directed to follow Accelerated Acquistion principles as part of the UUV Family of Systems (FoS) by the Assistant Secretary Navy for Research, Development, and Acquisition (ASN RDA) and the Chief of Naval Operations (CNO) in October 2017.

E. Performance Metrics

Successful Milestone C in 2Q FY 2019, FRP decision in 3Q FY 2020 and IOC in 4Q FY 2020.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 3123 / *SMCM UUV*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
SMCM UOES Development	C/CPAF	BLUEFIN : CAMBRIDGE, MA	15.142	0.000		0.000		0.000		-		0.000	0.000	15.142	-
Knifefish Development	C/CPIF	Various : Various	17.497	0.000		0.000		0.000		-		0.000	0.000	17.497	-
Knifefish Development & Engineering Support	C/CPIF	General Dynamics AIS : McLeansville, NC	81.820	6.542	Dec 2017	0.000		0.000		-		0.000	0.000	88.362	-
Hardware/Software Development - Support Equipment	WR	NSWC, PC : PANAMA CITY, FL	5.429	0.237	Dec 2017	0.000		0.000		-		0.000	0.000	5.666	-
Knifefish P3I Development Contractor	C/CPIF	GDMS : McLeansville, NC	0.000	6.386	Dec 2017	0.000		0.000		-		0.000	0.000	6.386	-
		Subtotal	119.888	13.165		0.000		0.000		-		0.000	0.000	133.053	N/A

Remarks

FY 2019 and future funding has been realigned to Program Element (PE) 0604028N.

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Engineering Support	WR	NSWC, PC : PANAMA CITY, FL	19.138	3.558	Dec 2017	0.000		0.000		-		0.000	0.000	22.696	-
Engineering Support	WR	NUWC, Newport : NEWPORT, RI	6.218	0.993	Dec 2017	0.000		0.000		-		0.000	0.000	7.211	-
Engineering Support	WR	VARIOUS : VARIOUS	4.792	0.610	Dec 2017	0.000		0.000		-		0.000	0.000	5.402	-
Engineering Support P3I	WR	NSWC, PC : PANAMA CITY, FL	0.000	0.000		0.000		0.000		-		0.000	0.000	0.000	-
Engineering Support P3I	WR	NUWC, Newport : NEWPORT, RI	0.000	0.000		0.000		0.000		-		0.000	0.000	0.000	-
Engineering Support P3I	WR	VARIOUS : VARIOUS	0.000	1.628	Dec 2017	0.000		0.000		-		0.000	0.000	1.628	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603502N / *Surface & Shallow Water MCM*	Project (Number/Name) 3123 / *SMCM UUV*	

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
		Subtotal	30.148	6.789		0.000		0.000		-		0.000	0.000	36.937	N/A

Remarks

FY 2019 and future funding has been realigned to PE 0604028N.

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Developmental Test & Evaluation	WR	NOMWC : STENNIS, MS	0.526	0.000		0.000		0.000		-		0.000	0.000	0.526	-
Government T&E Support	WR	VARIOUS : VARIOUS	1.329	0.000		0.000		0.000		-		0.000	0.000	1.329	-
Test and Evaluation	WR	COMOPTEVFOR : NORFOLK, VA	0.556	0.263	Dec 2017	0.000		0.000		-		0.000	0.000	0.819	-
Government T&E Support	WR	NSWC, PC : PANAMA CITY, FL	0.449	0.000		0.000		0.000		-		0.000	0.000	0.449	-
		Subtotal	2.860	0.263		0.000		0.000		-		0.000	0.000	3.123	N/A

Remarks

FY 2019 and future funding has been realigned to PE 0604028N.

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management Support	C/CPFF	VARIOUS : WASHINGTON, DC	3.120	1.242	Feb 2018	0.000		0.000		-		0.000	0.000	4.362	-
Travel	WR	NAVSEA : WNY, DC	0.357	0.340	Dec 2017	0.000		0.000		-		0.000	0.000	0.697	-
Acquisition Workforce	WR	VARIOUS : VARIOUS	0.047	0.000		0.000		0.000		-		0.000	0.000	0.047	-
		Subtotal	3.524	1.582		0.000		0.000		-		0.000	0.000	5.106	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 3123 / *SMCM UUV*

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract

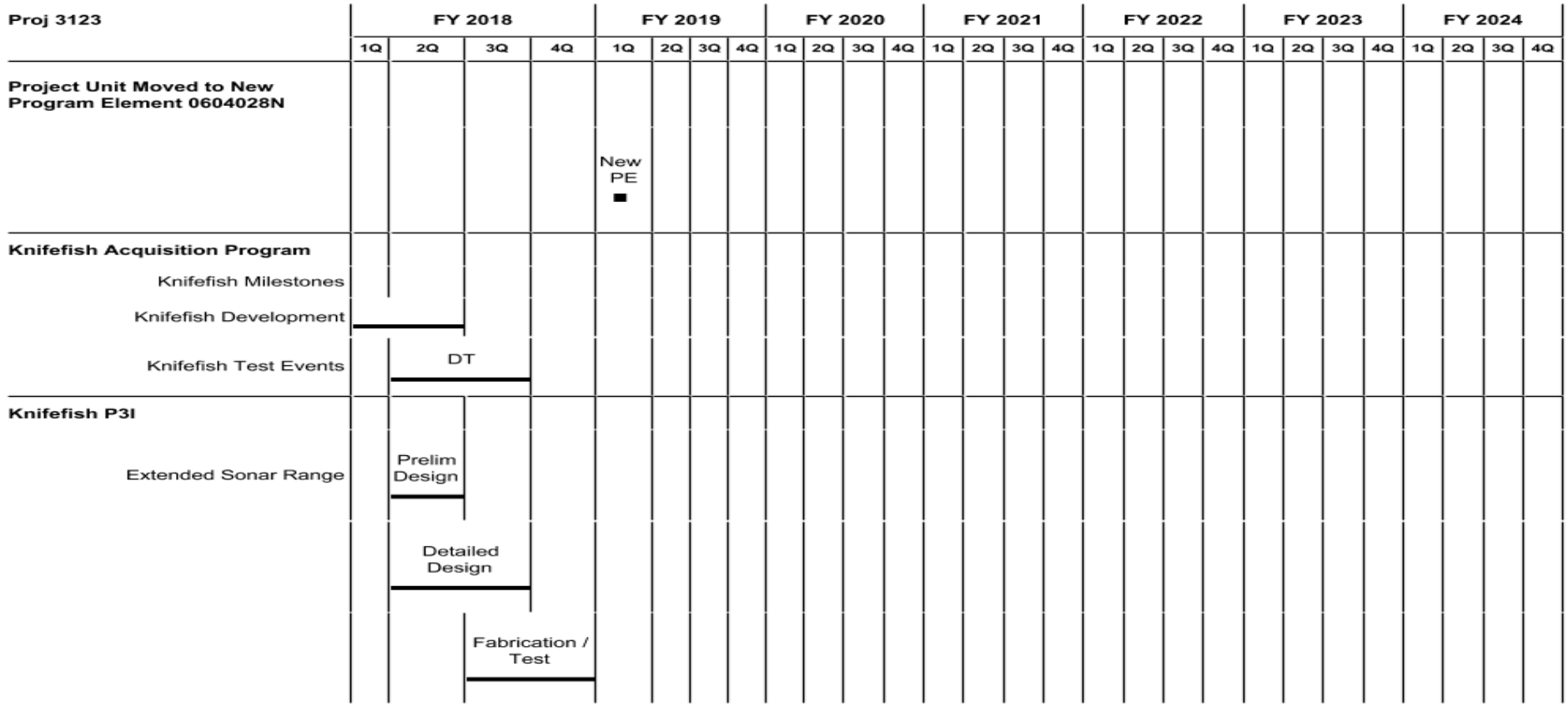
Remarks

FY 2019 and future funding has been realigned to PE 0604028N.

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	156.420	21.799		0.000		0.000		-		0.000	0.000	178.219	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 3123 / *SMCM UUV*



2020DON - 0603502N - 3123

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 3123 / *SMCM UUV*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 3123				
Project Unit Moved to New Program Element 0604028N:	1	2019	1	2019
Knifefish Acquisition Program: Knifefish Development:	1	2018	2	2018
Knifefish Acquisition Program: Knifefish Test Events: DT	2	2018	3	2018
Knifefish P3I: Extended Sonar Range: Extended Range Prelim Design	2	2018	2	2018
Knifefish P3I: Extended Sonar Range: Extended Range Detailed Design	2	2018	3	2018
Knifefish P3I: Extended Sonar Range: Extended Range Fabrication/Test	3	2018	4	2018

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603502N / *Surface & Shallow Water MCM*	Project (Number/Name) 3428 / *Medium Unmanned Surface Vehicle (MUSV)*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
3428: *Medium Unmanned Surface Vehicle (MUSV)*	0.000	0.000	2.800	23.900	-	23.900	26.300	30.000	43.000	43.860	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Note

In FY 2019, the Medium Unmanned Surface Vehicle (MUSV) received a Congressional Add of $42.000M in Project Unit 9999/C442. Efforts described here are directly supported by efforts in PU 9999/C442. In addition, the MUSV project leverages efforts external to this program element under Defense Advanced Research Projects Agency (DARPA) Anti-Submarine Warfare Continuous Trail Unmanned Vessel (ACTUV) and Office of Naval Research (ONR) Medium Displacement Unmanned Surface Vehicle (MDUSV)/Sea Hunter projects.

A. Mission Description and Budget Item Justification

As part of the Unmanned Surface Vehicle (USV) Family of Systems (FoS), the Medium Unmanned Surface Vehicle (MUSV) project provides resources for the detailed design, fabrication, testing and support of the MUSV. MUSV is defined as having a reconfigurable mission capability which is accomplished via modular payloads with an initial mission capability to support Battlespace Awareness through Intelligence, Surveillance and Reconnaissance (ISR) and Electronic Warfare (EW). Modular payloads may be developed separately by other programs or prototyping efforts and will be further developed and/or integrated into MUSV under the Unmanned Surface Vessel Enabling Capabilities project unit that supports MUSV and LUSV. MUSVs will provide low cost, high endurance, reconfigurable ships able to accommodate various payloads for unmanned missions to augment the Navy's manned surface force.

MUSVs will support the Navy's ability to produce, deploy and disburse ISR/EW capabilities in sufficient quantities and provide/improve distributed situational awareness in maritime Areas of Responsibility (AORs). MUSVs will be designed to be attritable assets if used in a peer or near-peer conflict. MUSVs will initially be capable of semi-autonomous operation, with operators in-the-loop or on-the-loop. USV Command and Control (C2) will be maintained via the afloat element (i.e., embarked on a United States Navy (USN) combatant/support ship), or via the ashore element (C2 station ashore). MUSV C2, combat and/or weapon system integration will employ tamper proofing and security controls to prevent disclosure of data and electronic warfare defenses during autonomous operation. MUSVs will employ a Risk Management Framework (RMF) approach with physical, technical and administrative security controls. MUSVs will have hardware and software components to protect classified/sensitive functions, countermeasures designed to thwart adversary exploitation, classified data sanitation requirements, anti-tamper mechanisms to prevent disclosure of data and autonomous zeroization and electronic warfare defenses. MUSVs will be capable of weeks-long deployments and trans-oceanic transits, and operate aggregated with Carrier Strike Groups (CSGs) and Surface Action Groups (SAGs), as well as have the ability to deploy independently.

MUSV leverages efforts external to this project unit accomplished through Defense Advanced Research Projects Agency (DARPA) Anti-Submarine Warfare Continuous Trail Unmanned Vessel (ACTUV) and Office of Naval Research (ONR) Medium Displacement Unmanned Surface Vehicle (MDUSV)/Sea Hunter investments in autonomy, endurance, command and control, payloads and testing in FY 2017 (continuing through FY 2021). Beginning in FY 2019, the Navy will commence transition of MDUSV Sea Hunter I and Sea Hunter II assets to Commander Naval Surface Forces under the MUSV project. In addition, the MUSV C2 concept directly leverages the fleet-ready C2 solution developed for unmanned surface vessels in the OSD SCO Ghost Fleet Overlord LUSV experimentation program.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 3428 / *Medium Unmanned Surface Vehicle (MUSV)*

Future missions for MUSV will be informed by the Navy's Future Surface Combatant Force (FSCF) Analysis of Alternatives (AoA) and as concept of operations (CONOPs) are developed. There is an opportunity to increase medium sized payloads based on the findings from the AoA, and as technology develops. MUSV will be a key enabler of the Navy's Distributed Maritime Operations (DMO) concept, which includes being able to forward deploy (alone or in teams/swarms), team with individual manned combatants or augment battle groups. Fielding of MUSV will provide the Navy increased capability and necessary capacity at lower procurement and sustainment costs, reduced risk to sailors and increased readiness by offloading missions from manned combatants.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Product Development	0.000	1.900	16.000	0.000	16.000
Articles:	-	-	-	-	-
FY 2019 Plans: Develop and finalize MUSV Top Level Requirements which documents the required warfighting capabilities; Issue a Request for Information to solicit industry feedback to help inform and finalize the Navy's initial Acquisition Strategy. Finalize Acquisition Strategy. Note: Congressional Add of $42.000M in Project Unit 9999/ C442 describes additional FY 2019 Plans culminating in the award of Detailed Design and Construction (DD&C) contract and Kick-off meeting.					
FY 2020 Base Plans: Continue to execute DD&C contract for MUSV prototype (contract award described under Congressional Add of $42.000M in Project Unit 9999/C442). Conduct System Readiness and System Functional Reviews. Evaluate and approve industry's preliminary and detailed designs for MUSV through Preliminary Design Review (PDR) and Critical Design Review (CDR). Procure materials in support of fabrication. Begin construction of hull and assembly of subcomponents. Begin software modifications to existing autonomy systems to comply with Navy requirements.					
FY 2020 OCO Plans: N/A					
FY 2019 to FY 2020 Increase/Decrease Statement: Increase in funding from FY 2019 to FY 2020 is due to transition from requirements generation to detailed design and construction of MUSV. Note: Congressional Add of $42.000M in Project Unit 9999/C442 describes additional FY 2019 efforts.					
Title: Support	0.000	0.700	6.200	0.000	6.200
Articles:	-	-	-	-	-
FY 2019 Plans:					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 3428 / *Medium Unmanned Surface Vehicle (MUSV)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
The Navy will commence the transition of the ONR MDUSV/Sea Hunter program from the Office of Naval Research. The Navy will draft the transition plan from MDUSV/Sea Hunter program. Plans include the continued operation of the Sea Hunter I USV for technology demonstration, tactics development, sustainment planning, experimentation, CONOPs planning, and USV test planning. Note: Congressional Add of $42.000M in Project Unit 9999 describes additional FY 2019 Plans. ***FY 2020 Base Plans:*** The Navy will transition both Sea Hunter I and Sea Hunter II to Commander Naval Surface Forces through FY 2021. The Navy will prepare solicitations for Sea Hunter original equipment manufacturer (OEM) support and the development of training and maintenance documentation in preparation of fleet-based operations and sustainment. The Navy will provide systems engineering, design analysis, hull and assembly oversight, and integration support related to the execution of the DD&C contract. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increase in funding provides engineering support to the Detailed Design and Construction (DD&C) of MUSV #1.					
Title: Management Services	0.000	0.200	1.700	0.000	1.700
Articles:	-	-	-	-	-
FY 2019 Plans: Develop artifacts to support the approval of a MUSV DD&C contract award. This includes finalizing the Acquisition Strategy and completing the Acquisition Plan for MUSV. Note: Congressional Add of $42.000M in Project Unit 9999/C442 describes additional FY 2019 Plans. ***FY 2020 Base Plans:*** Develop all governing MUSV documentation as required to support advancement of the prototype program. This includes the creation of the following artifacts: System Engineering Plan (SEP), Test and Evaluation Strategy (TES), Life Cycle Support Plan (LCSP), Cybersecurity Strategy, Open Systems Architecture Management Plan, Corrosion Prevention and Control Plan, Weight Control Plan, Quality Assurance Program Plan, Reliability and Maintainability Program Plan, Configuration Management Plan, Software Development Plan and Program Protection Plan (PPP). The Navy will provide program management support related to the execution of the DD&C contract. ***FY 2020 OCO Plans:***					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 3428 / *Medium Unmanned Surface Vehicle (MUSV)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increase in funding provides management in support of the Detailed Design and Construction (DD&C) of MUSV #1.					
Accomplishments/Planned Programs Subtotals	0.000	2.800	23.900	0.000	23.900

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

MUSV will pursue a Rapid Prototyping Program designation and follow a Middle Tier Acquisition approach per Section 804 of the Fiscal Year (FY) 2016 National Defense Authorization Act (NDAA), as amended in FY 2017 NDAA (codified at 10 U.S.C. sub sec 2302 note). Navy required capabilities will be captured in a Top Level Requirements (TLR) document approved by the OPNAV Director of Surface Warfare. A development RFP will be released to industry in FY 2019, containing options for additional USVs contingent on validation of warfighting requirements. A full and open procurement will take place in FY 2019, awarding a single MUSV prototype at the end of FY 2019 (Note: Congressional Add of $42.000M in Project Unit 9999/C442). The requirements of the MUSV will allow proposals from both traditional defense and commercial shipyards. Estimated delivery of the initial prototype will be FY 2022. Rapid prototyping efforts with the FY19 MUSV will inform procurement of additional MUSV units and eventual transition to an ACAT program and procurement funding.

E. Performance Metrics

Successful DD&C Contract Award in FY 2019 (Note: Congressional Add of $42.000M in Project Unit 9999/C442).
Successful testing and Military Utility Assessment (MUA) in FY 2022.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603502N / *Surface & Shallow Water MCM*	Project (Number/Name) 3428 / *Medium Unmanned Surface Vehicle (MUSV)*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Detailed Design & Construction	TBD	TBD : TBD	0.000	0.000		0.000		14.980	Jan 2020	-		14.980	0.000	14.980	-
Requirements Development	WR	NSWC DD : Dahlgren, VA	0.000	0.000		0.250	Dec 2018	0.000		-		0.000	0.000	0.250	-
Requirements Development	WR	NSWC CD : Bethesda, MD	0.000	0.000		0.353	Dec 2018	0.000		-		0.000	0.000	0.353	-
Requirements Development	WR	SSC PAC : San Diego, CA	0.000	0.000		0.240	Dec 2018	0.000		-		0.000	0.000	0.240	-
Requirements Development	WR	NSWC PD : Philadelphia, PA	0.000	0.000		0.400	Dec 2018	0.000		-		0.000	0.000	0.400	-
Requirements Development	SS/CPFF	JHU APL : Laurel, MD	0.000	0.000		0.657	Jan 2019	0.000		-		0.000	0.000	0.657	-
Consulting Services	TBD	TBD : TBD	0.000	0.000		0.000		1.020	Jan 2020	-		1.020	0.000	1.020	-
		Subtotal	0.000	0.000		1.900		16.000		-		16.000	0.000	17.900	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Engineering Support	WR	Various : Various	0.000	0.000		0.000		3.840	Jan 2020	-		3.840	Continuing	Continuing	Continuing
Engineering Support	WR	NSWC DD : Dahlgren, VA	0.000	0.000		0.230	Dec 2018	0.480	Dec 2019	-		0.480	0.000	0.710	-
Engineering Support	WR	SSC PAC : San Diego, CA	0.000	0.000		0.240	Dec 2018	1.340	Dec 2019	-		1.340	0.000	1.580	-
Engineering Support	WR	NSWC PD : Philadelphia, PA	0.000	0.000		0.150	Dec 2018	0.180	Dec 2019	-		0.180	0.000	0.330	-
Engineering Support	SS/CPFF	JHU APL : Laurel, MD	0.000	0.000		0.080	Jan 2019	0.360	Dec 2019	-		0.360	0.000	0.440	-
		Subtotal	0.000	0.000		0.700		6.200		-		6.200	Continuing	Continuing	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603502N / *Surface & Shallow Water MCM*	Project (Number/Name) 3428 / *Medium Unmanned Surface Vehicle (MUSV)*	

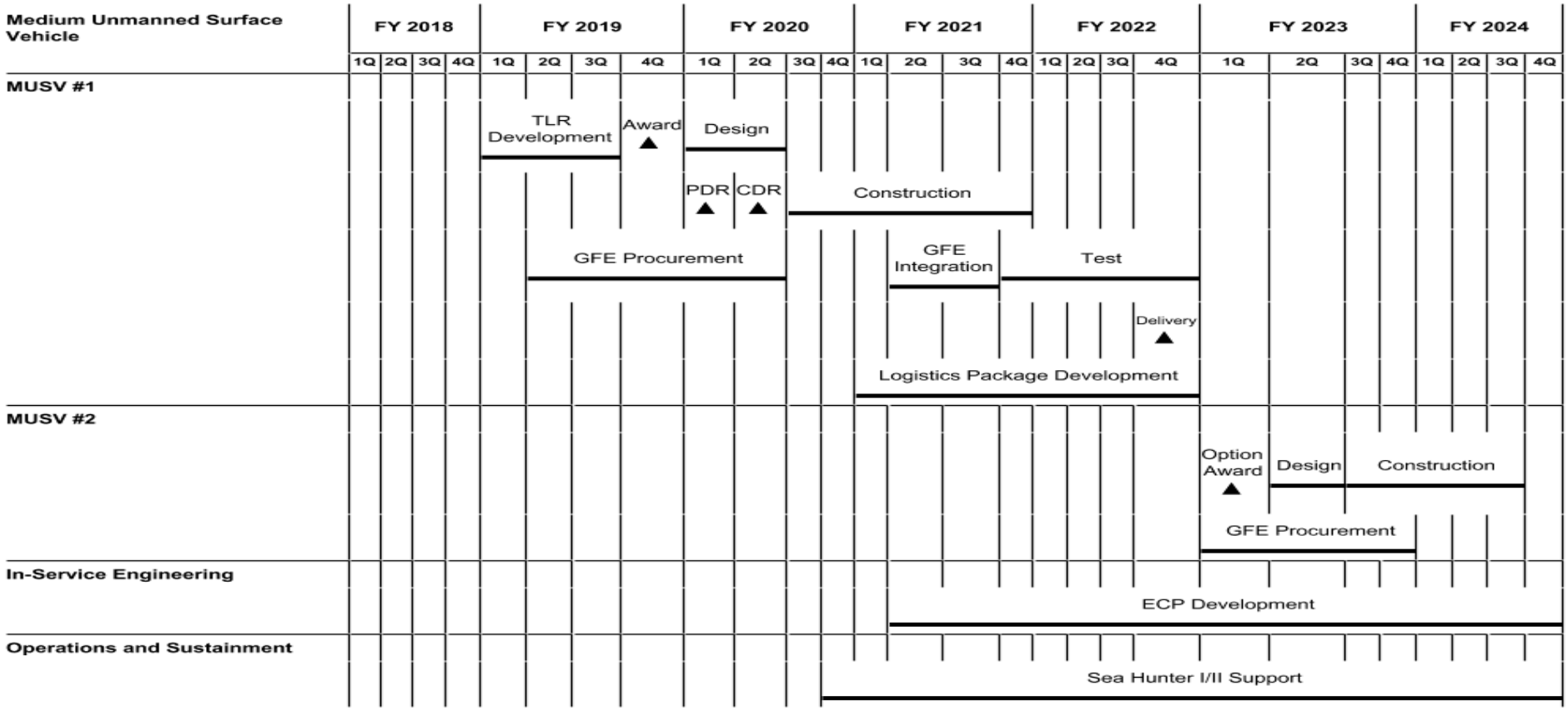
Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management Support	C/CPFF	Various : Washington, DC	0.000	0.000		0.200	Dec 2018	1.700	Dec 2019	-		1.700	Continuing	Continuing	Continuing
		Subtotal	0.000	0.000		0.200		1.700		-		1.700	Continuing	Continuing	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	0.000		2.800		23.900		-		23.900	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 3428 / *Medium Unmanned Surface Vehicle (MUSV)*



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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 3428 / *Medium Unmanned Surface Vehicle (MUSV)*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Medium Unmanned Surface Vehicle				
MUSV #1: Top Level Requirements (TLR) Development	1	2019	3	2019
MUSV #1: Contract Award	4	2019	4	2019
MUSV #1: Detailed Design	1	2020	2	2020
MUSV #1: Preliminary Design Review (PDR)	1	2020	1	2020
MUSV #1: Critical Design Review (CDR)	2	2020	2	2020
MUSV #1: Construction	3	2020	4	2021
MUSV #1: Government Furnished Equipment (GFE) Procurement	2	2019	2	2020
MUSV #1: GFE Integration	2	2021	3	2021
MUSV #1: Test	4	2021	4	2022
MUSV #1: Delivery	4	2022	4	2022
MUSV #1: Logistics Package Development	1	2021	4	2022
MUSV #2: Option Award	1	2023	1	2023
MUSV #2: Design	2	2023	2	2023
MUSV #2: Construction	3	2023	3	2024
MUSV #2: GFE Procurement	1	2023	4	2023
In-Service Engineering: Engineering Change Proposal (ECP) Development	2	2021	4	2024
Operations and Sustainment: Sea Hunter I/II Support	4	2020	4	2024

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603502N / *Surface & Shallow Water MCM*	Project (Number/Name) 9999 / *Congressional Adds*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
9999: *Congressional Adds*	0.000	12.546	60.100	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	72.646
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

MUSV leverages efforts external to this project unit accomplished through Defense Advanced Research Projects Agency (DARPA) Anti-Submarine Warfare Continuous Trail Unmanned Vessel (ACTUV) and Office of Naval Research (ONR) Medium Displacement Unmanned Surface Vehicle (MDUSV)/Sea Hunter investments in autonomy, endurance, command and control, payloads and testing in FY 2017 (continuing through FY 2021). Beginning in FY 2019, the Navy will commence transition of MDUSV Sea Hunter I and Sea Hunter II assets to Commander Naval Surface Forces under the MUSV project. In addition, the MUSV C2 concept directly leverages the fleet-ready C2 solution developed for unmanned surface vessels in the OSD SCO Ghost Fleet Overlord LUSV experimentation program.

This project also provides resources for development, improvement and integration of Unmanned Surface Vehicle (USV) Mine Countermeasure (MCM) systems. A description of the major planned programs includes the following:

The Unmanned Influence Sweep System (UISS) utilizes an Unmanned Surface Vehicle (USV) integrated with an Unmanned Surface Sweep System (US3), a magnetic/acoustic sweep system developed to sweep acoustic/magnetic influence mines, which can be deployed from the Littoral Combat Ship (LCS) or a Vessel of Opportunity (VOO).

The Mine Countermeasures Unmanned Surface Vehicle (MCM USV) program leverages the USV from the UISS Program of Record (PoR) and adds a modular mission capability through the addition of multiple payloads. MCM USV w/ AQS-20C integrates the existing AQS-20C minehunting sonar. MCM USV w/ AQS-24B continues the Minehunting efforts. In FY 2019 the MCM USV program began initial design efforts to support integration with a Mine Neutralization capability (Barracuda). Minesweeping payloads will be subsumed by the MCM USV PoR in FY 2020.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019
Congressional Add: Unmanned Influence Sweep System	12.546	0.000
FY 2018 Accomplishments: Product Development: Supported completion of CT and initial UISS Developmental Testing (DT) in support of Milestone C which is anticipated in 3Q FY 2019. During initial DT efforts, identified any design changes that are needed in support of follow on production efforts. Evaluated tech refresh product improvements. Support: Supported engineering, management, and integrated logistics for TDP, conducted Functional Configuration Audit (FCA), and Production Readiness Review (PRR). Prepared for a Milestone C decision in 3Q FY 2019 and prepared for Initial Operational Capability (IOC) in FY 2019.		

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 9999 / *Congressional Adds*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019
Test & Evaluation: Began DT and prepared for LCS integration efforts for risk reduction and system verification in preparation for OA. Management: Oversaw ongoing contractor efforts. Managed efforts to get to Milestone C decision in 3Q FY 2019 and started preparations for IOC in FY 2019. ***FY 2019 Plans:*** N/A		
Congressional Add: Medium Displacement Unmanned Surface Vehicle ***FY 2018 Accomplishments:*** N/A ***FY 2019 Plans:*** Product Development: Generate and release Request for Proposal (RFP), including performance specification, for procurement of MUSV; and hold Industry Day; conduct source selection efforts; and award contract for Detailed Design and Construction (DD&C) of MUSV prototype; conduct Kick-off meeting. The Navy will develop the Acquisition Plan to support the procurement of two additional Overlord LUSVs and establishment of the Navy's LUSV program starting in FY 2020. The Navy will develop cost estimates based on the results of the Overlord Agreements being executed by OSD SCO. Conduct Warfighting analysis utilizing Navy Warfare Centers and Federally Funded Research and Development Centers (FFRDCs) to develop requirements and understand design trade space for the LUSV. Support: PEO USC will assume development and construction oversight of the Sea Hunter II USV. Management Services: Creation of a MUSV Prototyping Plan.	0.000	42.000
Congressional Add: Navy Identified MCM USV Requirement ***FY 2018 Accomplishments:*** N/A ***FY 2019 Plans:*** Product Development: Complete initial design and software development efforts for craft and payload integration, command and control, and operations. Continue system level testing. Prepare to conduct User Operational Evaluation System (UOES) Employment. Prepare and support design changes for initial Developmental Testing (DT). Conduct technical feasibility studies, trade study analysis, tactics development, requirements definition and USV impact studies for Mine Neutralization (Barracuda) integration with MCM USV. Begin contractor integration testing of MCM USV w/ AQS-24B and MCM USV w/ AQS-20C.	0.000	14.100

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 9999 / *Congressional Adds*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019
Support: Continue program management, engineering and technical support for payload integration and testing efforts. Support testing and User Operational Evaluation System (UOES) efforts for the assessment of system capabilities to determine Military utility. Determine initial spares required for upcoming DT/UOES test events. Management Services: Provide program planning, management and acquisition document updates for the MCM USV program.		
Congressional Add: Navy Identified UISS Requirement ***FY 2018 Accomplishments:*** N/A ***FY 2019 Plans:*** Product Development: Complete UISS DT, complete UISS Operational Assessment (OA), and achieve Milestone C, which is now anticipated in 3Q FY 2019. Develop Engineering Change Proposals (ECPs) for EDM and Low Rate Initial Production (LRIP) units in preparation for integration testing and Initial Operational Test and Evaluation (IOT&E). Conduct systems engineering efforts in support of program and test efforts. Support: Support engineering, management and logistics efforts for MS C in 3Q FY 2019 and Initial Operational Capability (IOC) in 4Q FY 2019. Prepare for IOT&E. Continue development of Full Rate Production (FRP) documentation to release Request for Proposal (RFP) in late FY 2019. Test and Evaluation: Complete UISS DT and OA in support of MS C decision in 3Q FY 2019. Conduct UISS system level IOT&E in support of FRP decision planned for FY 2020. Management Services: Oversee ongoing contractor efforts. Manage MS C documentation completion. Manage FRP RFP release and proposal evaluation.	0.000	4.000
Congressional Adds Subtotals	12.546	60.100

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• RDTE/0603502N/1234: *Unmanned Surface Vehicle (USV)*	14.989	28.645	31.519	-	31.519	19.105	18.943	19.331	19.715	Continuing	Continuing
• RDTE/0603502N/3428: *Medium Unmanned Surface Vehicle (MDUSV)*	0.000	2.800	23.900	-	23.900	26.300	30.000	43.000	43.860	Continuing	Continuing

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 9999 / *Congressional Adds*

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost

Remarks

D. Acquisition Strategy

MUSV will pursue a Rapid Prototyping Program designation and follow a Middle Tier Acquisition approach per Section 804 of the Fiscal Year (FY) 2016 National Defense Authorization Act (NDAA), as amended in FY 2017 NDAA (codified at 10 U.S.C. sub sec 2302 note). Navy required capabilities will be captured in a Top Level Requirements (TLR) document approved by the OPNAV Director of Surface Warfare. A development RFP will be released to industry in FY 2019, containing options for additional USVs contingent on validation of warfighting requirements. A full and open procurement will take place in FY 2019, awarding a single MUSV prototype at the end of FY 2019 (Note: Congressional Add of $42.000M in Project Unit 9999/C442). The requirements of the MUSV will allow proposals from both traditional defense and commercial shipyards. Estimated delivery of the initial prototype will be FY 2022. Rapid prototyping efforts with the FY19 MUSV will inform procurement of additional MUSV units and eventual transition to an ACAT program and procurement funding.

UISS requirements are documented in the Unmanned Influence Sweep System (UISS) Capability Production Document (CPD). An Engineering and Manufacturing Development (E&MD) contract was awarded in FY 2014 with options for Low Rate Initial Production (LRIP) in FY 2019.

In FY 2019, MCM USV is developing a CDD leveraging existing requirements (UISS, AN/AQS-20, MCM MP, etc.). In FY 2020, MCM USV anticipates a Full Rate Production (FRP) decision and will conduct a full and open competition for FRP contract(s).

E. Performance Metrics

MUSV - Successful Material Development Decision in FY 2020. Successful RET execution in FY 2021. CDD-V and RFP release in FY 2022.

UISS - Successfully reach Milestone C in FY 2019. Award LRIP options in FY 2019.

MCM USV - Achieve FRP Decision in FY 2020.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603502N / *Surface & Shallow Water MCM*	Project (Number/Name) 9999 / *Congressional Adds*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
UISS: Product Devlopment	C/CPIF	Textron Systems, Inc. : Hunt Valley, MD	0.000	7.663	Jan 2018	1.391	Jan 2019	0.000		-		0.000	0.000	9.054	-
MCM USV: Product Development	C/CPFF	Textron Systems, Inc. : Hunt Valley, MD	0.000	0.000		12.500	Mar 2019	0.000		-		0.000	0.000	12.500	-
MUSV: Product Development	C/FPIF	TBD : TBD	0.000	0.000		38.138	Sep 2019	0.000		-		0.000	0.000	38.138	-
MUSV: Product Development	WR	SSC LANT : Charleston, SC	0.000	0.000		0.249	Jan 2019	0.000		-		0.000	0.000	0.249	-
MUSV: Product Development	WR	NSWC CD : Bethesda, MD	0.000	0.000		0.887	Dec 2018	0.000		-		0.000	0.000	0.887	-
MUSV: Product Development	WR	SSC PAC : San Diego, CA	0.000	0.000		2.000	Feb 2019	0.000		-		0.000	0.000	2.000	-
		Subtotal	0.000	7.663		55.165		0.000		-		0.000	0.000	62.828	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
UISS: Engineering Support	WR	NUWC N : Newport, RI	0.000	0.188	Dec 2017	0.100	Jan 2019	0.000		-		0.000	0.000	0.288	-
UISS: Engineering Support	WR	NSWC PC : Panama City, FL	0.000	2.000	Dec 2017	0.600	Jan 2019	0.000		-		0.000	0.000	2.600	-
UISS: Engineering Support	WR	NSWC CD : Bethesda, MD	0.000	0.500	Dec 2017	0.000		0.000		-		0.000	0.000	0.500	-
UISS: Integrated Logistics	WR	NSWC PC : Panama City, FL	0.000	0.314	Dec 2017	0.000		0.000		-		0.000	0.000	0.314	-
UISS: Integrated Logistics	WR	NSWC CD : Bethesda, MD	0.000	0.266	Dec 2017	0.000		0.000		-		0.000	0.000	0.266	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603502N / *Surface & Shallow Water MCM*	Project (Number/Name) 9999 / *Congressional Adds*	

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
MCM USV: Engineering Support	C/CPFF	Textron Systems, Inc. : Hunt Valley, MD	0.000	0.000		1.301	Mar 2019	0.000		-		0.000	0.000	1.301	-
MUSV: Engineering Support	WR	SSC LANT : Charleston, SC	0.000	0.000		0.165	Jan 2019	0.000		-		0.000	0.000	0.165	-
MUSV: Integrated Logistics	WR	TBD : TBD	0.000	0.000		0.080	Aug 2019	0.000		-		0.000	0.000	0.080	-
		Subtotal	0.000	3.268		2.246		0.000		-		0.000	0.000	5.514	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
UISS: Test and Evaluation	WR	NSWC PC : Panama City, FL	0.000	0.045	Dec 2017	0.400	Jan 2019	0.000		-		0.000	0.000	0.445	-
UISS: Test and Evaluation	WR	NSWC CD : Bethesda, MD	0.000	1.300	Dec 2017	1.000	Jan 2019	0.000		-		0.000	0.000	2.300	-
UISS: Test and Evaluation	C/CPFF	Textron Systems, Inc. : Hunt Valley, MD	0.000	0.020	Dec 2017	0.000		0.000		-		0.000	0.000	0.020	-
		Subtotal	0.000	1.365		1.400		0.000		-		0.000	0.000	2.765	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
UISS: Travel	WR	NAVSEA : Washington, DC	0.000	0.040	Jan 2018	0.100	Mar 2019	0.000		-		0.000	0.000	0.140	-
UISS: Management	WR	TBD : TBD	0.000	0.210	Nov 2017	0.409	Nov 2018	0.000		-		0.000	0.000	0.619	-
MCM USV: Management	WR	TBD : TBD	0.000	0.000		0.299	Mar 2019	0.000		-		0.000	0.000	0.299	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 9999 / *Congressional Adds*

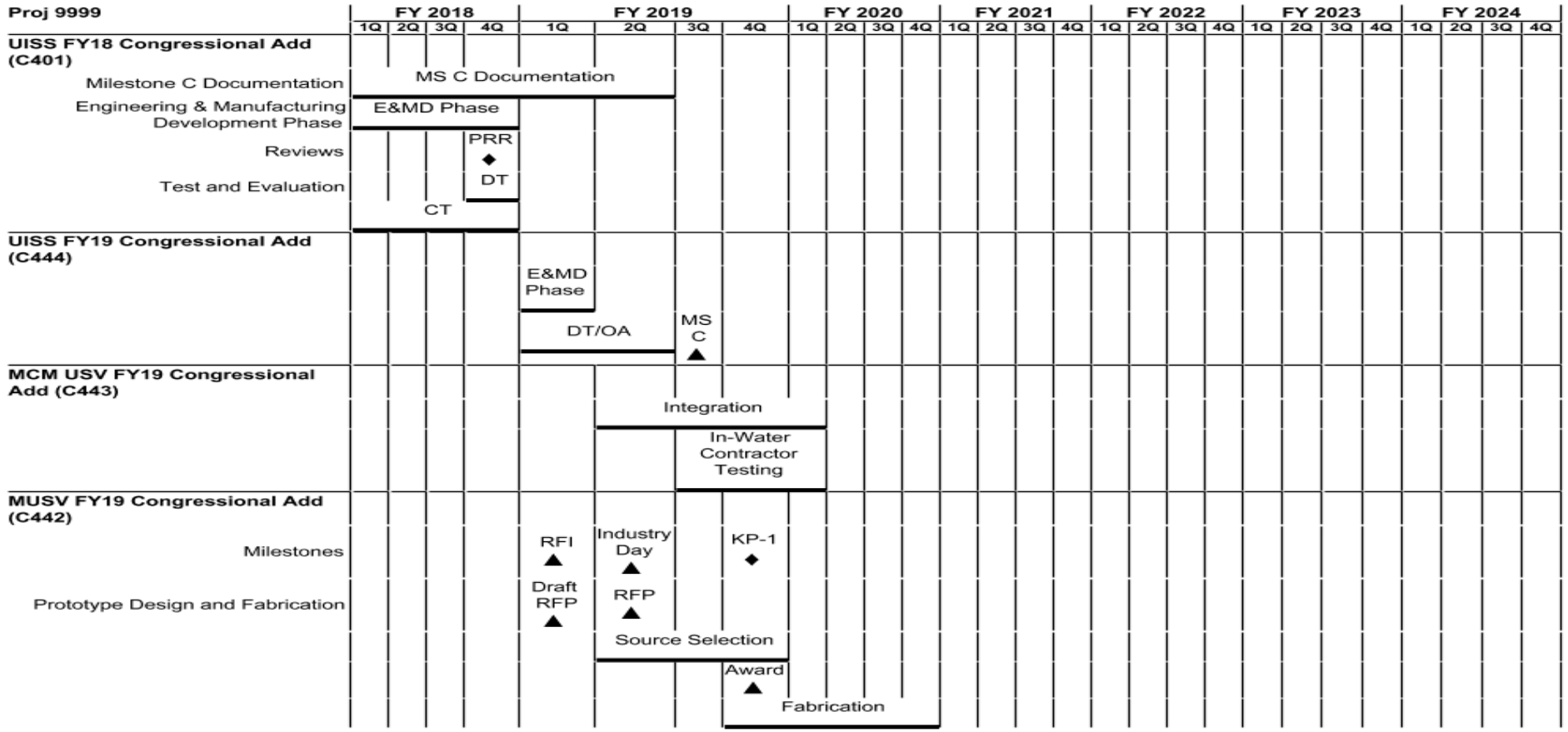
Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
MUSV: Travel	WR	NAVSEA : Washington, DC	0.000	0.000		0.151	Mar 2019	0.000		-		0.000	0.000	0.151	-
MUSV: Management	WR	TBD : TBD	0.000	0.000		0.330	Mar 2019	0.000		-		0.000	0.000	0.330	-
		Subtotal	0.000	0.250		1.289		0.000		-		0.000	0.000	1.539	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	12.546		60.100		0.000		-		0.000	0.000	72.646	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 9999 / *Congressional Adds*



2020PB - 0603502N - 9999

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 9999 / *Congressional Adds*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 9999				
UISS FY18 Congressional Add (C401): Milestone C Documentation: Milestone C Documentation	1	2018	2	2019
UISS FY18 Congressional Add (C401): Engineering & Manufacturing Development Phase: Engineering & Manufacturing Development Phase	1	2018	4	2018
UISS FY18 Congressional Add (C401): Reviews: Production Readiness Review (PRR)	4	2018	4	2018
UISS FY18 Congressional Add (C401): Test and Evaluation: Developmental Testing	4	2018	4	2018
UISS FY18 Congressional Add (C401): Test and Evaluation: Contractor Testing	1	2018	4	2018
UISS FY19 Congressional Add (C444): Engineering & Manufacturing Development Phase	1	2019	1	2019
UISS FY19 Congressional Add (C444): DT/OA Testing	1	2019	2	2019
UISS FY19 Congressional Add (C444): Milestone C	3	2019	3	2019
MCM USV FY19 Congressional Add (C443): Craft/Payload Integration	2	2019	1	2020
MCM USV FY19 Congressional Add (C443): In-Water Contractor Testing	3	2019	1	2020
MUSV FY19 Congressional Add (C442): Milestones: Industry RFI	1	2019	1	2019
MUSV FY19 Congressional Add (C442): Milestones: Industry Day	2	2019	2	2019
MUSV FY19 Congressional Add (C442): Milestones: Knowledge Point 1	4	2019	4	2019
MUSV FY19 Congressional Add (C442): Prototype Design and Fabrication: Draft RFP Released	1	2019	1	2019
MUSV FY19 Congressional Add (C442): Prototype Design and Fabrication: RFP Released	2	2019	2	2019
MUSV FY19 Congressional Add (C442): Prototype Design and Fabrication: Source Selection	2	2019	4	2019

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 9999 / *Congressional Adds*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
MUSV FY19 Congressional Add (C442): Prototype Design and Fabrication: Contract Award	4	2019	4	2019
MUSV FY19 Congressional Add (C442): Prototype Design and Fabrication: Design & Fabrication	4	2019	4	2020

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy												Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0603506N *I Surface Ship Torpedo Defense*							
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
Total Program Element	749.538	24.174	7.100	15.800	-	15.800	14.400	0.900	0.000	0.000	0.000	811.912
0225: *Surface Ship Torpedo Defense (SSTD)*	749.538	14.523	7.100	15.800	-	15.800	14.400	0.900	0.000	0.000	0.000	802.261
9999: *Congressional Adds*	0.000	9.651	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	9.651

A. Mission Description and Budget Item Justification

The Surface Ship Torpedo Defense (SSTD) program provides a detect-to-engage layered torpedo defense capability. The four major efforts that comprise SSTD are the AN/SLQ-25 (NIXIE) system, Torpedo Warning System (TWS), the Countermeasure Anti-Torpedo (CAT) and Acoustic Device Countermeasure (Surface ADC MK2). CAT and TWS are development programs. The CAT program develops a canisterized Anti-Torpedo Torpedo (ATT). The TWS program develops the required torpedo detection, classification and localization (TDCL) ship systems to employ CAT. The TWS and CAT systems make up the Anti-Torpedo Torpedo Defense System (ATTDS).

The ATTDS provides a hard kill torpedo defense capability on High Value Units (HVU's). The program has developed and fielded five ATTDS Engineering Design Model (EDM) systems on CVNs. Each EDM system is one TWS with a CAT load out of a maximum of eight CATs. Starting in FY20 The ATTDS Program will commence a sundown effort to return the five CVNs to their original configuration. The AN/SLQ-25 (NIXIE) is a towed acoustic and non-acoustic countermeasure system. The AN/SLQ-25 program develops countermeasure technologies and capabilities to improve ship survivability against future torpedo threats.

Research and development of new technologies and capabilities developed under the Future Naval Capabilities (FNC), Small Business and Innovative Research (SBIR), and other Research, Development, Test & Evaluation (RDT&E) initiatives. New and emerging hardware and software are evaluated in representative acoustic environments, against projected threats through both digital and hardware-in-the-loop simulations, to determine their effectiveness and impact on improving ship survivability. The technology is then incorporated into the appropriate product line.

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0603506N *I Surface Ship Torpedo Defense*

B. Program Change Summary ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	14.974	8.570	0.000	-	0.000
Current President's Budget	24.174	7.100	15.800	-	15.800
Total Adjustments	9.200	-1.470	15.800	-	15.800
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-1.470			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.800	0.000			
• Program Adjustments	0.000	0.000	15.800	-	15.800
• Rate/Misc Adjustments	0.000	0.000	0.000	-	0.000
• Congressional Add Adjustments	10.000	-	-	-	-

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2018	FY 2019
Project: 9999: *Congressional Adds*		
Congressional Add: *Program Increase*	9.651	0.000
Congressional Add Subtotals for Project: 9999	9.651	0.000
Congressional Add Totals for all Projects	9.651	0.000

Change Summary Explanation

The FY2020 funding increase ($15.800M) supports removal of the Anti-Torpedo Torpedo Defense System (ATTDS) from the five CVNs and returning them to their original configuration by installing the AN/SLQ-25 (NIXIE) they were equipped with previously. The funding will also support mission readiness for ATTDS equipped ships prior to the availability that will implement the conversion to their original configuration. This entails the sundown effort of ATTDS.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603506N / *Surface Ship Torpedo Defense*	Project (Number/Name) 0225 / *Surface Ship Torpedo Defense (SSTD)*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
0225: *Surface Ship Torpedo Defense (SSTD)*	749.538	14.523	7.100	15.800	-	15.800	14.400	0.900	0.000	0.000	0.000	802.261
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Countermeasure Anti- Torpedo (CAT) program developed a canisterized Anti-Torpedo Torpedo (ATT). The Torpedo Warning System (TWS) developed the required torpedo detection, classification and localization (TDCL)systems. The Countermeasure TWS and CAT systems make up the Anti-Torpedo Torpedo Defense System (ATTDS).

The ATTDS provides a hard kill torpedo defense capability on High Value Units (HVU's). The program has developed and fielded five ATTDS Engineering Design Model (EDM) systems on CVNs. Each EDM system is one TWS with a CAT load out of a maximum of eight CATs. The program delivered its first prototype system in FY13 and has delivered and installed its fifth and final system in FY17. Along with delivering and installing systems on CVN's, the ATTDS Program completed system salvo software development and a Quick Reaction Assessment (QRA) test in 1QFY18.

In FY19, software support, material system changes, and system reliability enhancements will remain the program's top priorities to ensure the highest operational availability and performance of the systems. CVN Installation and/or removal will occur in FY20 through FY23.

Research and development of new technologies and capabilities developed under the Future Naval Capabilities (FNC), Small Business and Innovative Research (SBIR), and other Research, Development, Test & Evaluation (RDT&E) initiatives. New and emerging hardware and software are evaluated in representative acoustic environments, against projected threats through both digital and hardware-in-the-loop simulations, to determine their effectiveness and impact on improving ship survivability. The technology is then incorporated into the appropriate product line.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Countermeasure Anti-Torpedo (CAT)	6.549	2.130	5.500	0.000	5.500
Articles:	-	-	-	-	-
FY 2019 Plans: Continue land based reliability Data collection on returning deployed CATs and ATTs. Continue engineering changes on CAT materials and CAT software upgrades. Support software resolution through Program Trouble Reports (PTRs). Continue Development of the EX-819 container.					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603506N / *Surface Ship Torpedo Defense*	**Project (Number/Name)** 0225 / *Surface Ship Torpedo Defense (SSTD)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Initiate System Sundown Plan. ***FY 2020 Base Plans:*** Continue CVN System Sundown Plan. Continued engineering changes on CAT materials and CAT software upgrades. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** The FY2020 funding increase supports removal of the Anti-Torpedo Torpedo Defense System (ATTDS) from the five CVNs and returning them to their original configuration by installing the AN/SLQ-25 (NIXIE) they were equipped with previously. The funding will also support mission readiness for ATTDS equipped ships prior to the availability that will implement the conversion to their original configuration.					
Title: Torpedo Warning System (TWS)	7.974	4.970	10.300	0.000	10.300
Articles:	-	-	-	-	-
FY 2019 Plans: Continue land based reliability Data collection on returning deployed TWS systems. Continue engineering changes on TWS software upgrades. Support software resolution through Program Trouble Reports (PTRs). Initiate System Sundown Plan. ***FY 2020 Base Plans:*** Continue CVN System Sundown plan according to sponsor direction. Continued engineering changes on TWS software upgrades. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** The FY2020 funding increase supports removal of the Anti-Torpedo Torpedo Defense System (ATTDS) from the five CVNs and returning them to their original configuration by installing the AN/SLQ-25 (NIXIE) they were equipped with previously. The funding will also support mission readiness for ATTDS equipped ships prior to the availability that will implement the conversion to their original configuration.					
Accomplishments/Planned Programs Subtotals	14.523	7.100	15.800	0.000	15.800

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603506N / *Surface Ship Torpedo Defense*	**Project (Number/Name)** 0225 / *Surface Ship Torpedo Defense (SSTD)*

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• OPN/2213: *Surface Ship Torpedo Def (SSTD)*	12.867	4.777	12.439	-	12.439	13.149	13.372	13.532	13.800	Continuing	Continuing
• WPN/3113: *Surface Ship Torpedo Def (SSTD)*	5.240	6.353	0.000	5.561	5.561	5.671	5.597	5.446	5.552	Continuing	Continuing

Remarks

OPN/2213 funds the AN/SLQ-25 System. No ATTDS OPN funding in FY18 and out.
WPN/3113 funds the Surface Acoustic Device Countermeasure, ADC MK2 Mod 6 and Surface ADC Ready Stowage Lockers. No WPN ATTDS funding in FY18 and out.

D. Acquisition Strategy

CAT Program: The Program completed a Systems Requirements Review (SRR) and Preliminary Design Review (PDR) on the Engineering Development Model (EDM) design. ARL Penn State (ARL/PSU) has completed a Technical Data Package (TDP) that can be used in the future system builds. CAT system SALVO Software has been tested and is currently in fleet use. Funding in FY19 is for EDM support and ATT post deployment EDM maintenance.

TWS Program: Development and production of the new sensors was conducted by ULTRA/3Phoenix. Five complete sensor sets have been delivered. Ready-stowage racks, and fire control systems have been developed by Pacific Engineering Incorporated (PEI) and In-Depth Engineering, respectively. System integration supported fabrication and fielding of the five complete systems. TWS SALVO software has been tested and is currently in fleet use. Funding in FY19 is for EDM support and TWS post deployment software and hardware engineering review.

E. Performance Metrics

Torpedo Effectiveness for the CAT
Torpedo Reliability and Availability for the CAT
Torpedo Detection Classification and Localization (TDCL)
False Alert Rate TDCL probability of correct classification
TWS System Reliability and Availability

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603506N / *Surface Ship Torpedo Defense*	Project (Number/Name) 0225 / *Surface Ship Torpedo Defense (SSTD)*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Systems Engineering	WR	NUWC : Newport, RI	47.931	2.400	Nov 2017	1.100	Nov 2018	7.500	Nov 2019	-		7.500	0.000	58.931	-
Systems Engineering ATT Dev.	C/CPFF	PSU/ARL : State College, PA	302.243	3.549	Dec 2017	1.100	Dec 2018	2.000	Dec 2019	-		2.000	0.000	308.892	-
Systems Engineering	C/CPFF	JHU/APL : Baltimore , MD	1.740	0.000		0.000		0.000		-		0.000	0.000	1.740	-
Systems Engineering Warhead Dev.	WR	NSWC : Indian Head, MD	79.190	1.100	Nov 2017	0.900	Nov 2018	1.100	Nov 2019	-		1.100	0.000	82.290	-
Systems Engineering	WR	NUWC : Keyport,WA	59.631	1.000	Nov 2017	0.900	Nov 2018	1.500	Nov 2019	-		1.500	0.000	63.031	-
Systems Engineering TDCL	C/CPFF	Ultra : Braintree, MA	11.640	0.000		0.000		0.000		-		0.000	0.000	11.640	Continuing
Systems Engineering ATT	WR	ONR : Arlington, VA	1.680	0.000		0.000		0.000		-		0.000	0.000	1.680	-
Systems Engineering TDCL	C/CPFF	AAC : Hauppage, NY	4.480	0.000		0.000		0.000		-		0.000	0.000	4.480	Continuing
Systems Engineering	WR	OPTEVFOR : Norfolk, VA	2.430	0.000		0.000		0.000		-		0.000	0.000	2.430	-
Systems Engineering	C/CPFF	ArgonST : Manassas, VA	0.800	0.000		0.000		0.000		-		0.000	0.000	0.800	Continuing
Systems Engineering TDCL	WR	NSWC : Dahlgren, VA	10.032	0.000		0.000		0.000		-		0.000	0.000	10.032	Continuing
Systems Engineering TDCL	WR	SPAWAR : San Diego, CA	11.118	0.000		0.000		0.000		-		0.000	0.000	11.118	Continuing
Systems Engineering	C/CPFF	UT/ARL : Arlington, TX	0.600	0.000		0.000		0.000		-		0.000	0.000	0.600	Continuing
Systems Engineering	C/CPFF	Alion : Bridgeport, CT	14.858	0.000		0.000		0.000		-		0.000	0.000	14.858	Continuing
Systems Engineering	WR	NUWC DET : Norfolk, VA	41.781	0.000		0.000		0.000		-		0.000	0.000	41.781	-
Systems Development	C/CPFF	3 Phoenix : Fairfax, VA	122.545	3.974	Dec 2017	1.100	Dec 2018	1.600	Dec 2019	-		1.600	0.000	129.219	Continuing
Integrated Logistic Spt	WR	NSWC Crane : Crane, IN	1.113	0.000		0.000		0.000		-		0.000	0.000	1.113	Continuing
Systems Engineering	C/CPFF	PEI : Roca, NE	4.745	0.000		0.000		0.000		-		0.000	0.000	4.745	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603506N / *Surface Ship Torpedo Defense*	Project (Number/Name) 0225 / *Surface Ship Torpedo Defense (SSTD)*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Systems Engineering	WR	CARDEROCK : Bethesda, MD	1.630	0.000		0.000		0.000		-		0.000	0.000	1.630	-
Systems Engineering	C/CPFF	CGI : Washington, DC	0.200	0.000		0.000		0.000		-		0.000	0.000	0.200	-
Systems Engineering	C/BA	Dam Neck : Virginia Beach, VA	0.022	0.000		0.000		0.000		-		0.000	0.000	0.022	-
Systems Engineering	C/BA	NSWC Panama City : Panama City, FL	0.255	0.000		0.000		0.000		-		0.000	0.000	0.255	-
Systems Engineering	C/BA	Devron 26 : Not Specified	0.139	0.000		0.000		0.000		-		0.000	0.000	0.139	-
Systems Engineering	WR	Puget Sounds : Norfolk, VA	0.200	0.000		0.000		0.000		-		0.000	0.000	0.200	-
Systems Engineering	WR	NAVAIR (NAWC WD) : Patuxent River, MD	0.140	0.000		0.000		0.000		-		0.000	0.000	0.140	-
Systems Engineering	WR	NORFOLK SHIPYARD : Norfolk, VA	0.150	0.000		0.000		0.000		-		0.000	0.000	0.150	-
Systems Engineering	WR	NORFOLK PLANNING YARD : Norfolk, VA	0.090	0.000		0.000		0.000		-		0.000	0.000	0.090	-
		Subtotal	721.383	12.023		5.100		13.700		-		13.700	0.000	752.206	N/A

Remarks

Increase between FY19 to FY10 is to sundown the ATTDs Program.

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Earned Value Mgmt Spt	C/CPAF	Pioneer : Virigina	0.050	0.000		0.000		0.000		-		0.000	0.000	0.050	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603506N / *Surface Ship Torpedo Defense*	**Project (Number/Name)** 0225 / *Surface Ship Torpedo Defense (SSTD)*

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management Support	C/FFP	EG&G : Gaithersburg, Md.	2.846	0.000		0.000		0.000		-		0.000	0.000	2.846	Continuing
DAWDF	Various	Not Specified : Not Specified	0.237	0.000		0.000		0.000		-		0.000	0.000	0.237	Continuing
Program Management Support	C/CPAF	Tech-Marine : Washington, DC	9.930	0.000		0.000		0.000		-		0.000	0.000	9.930	Continuing
Travel	Various	PMS 415 : Not Specified	1.144	0.100	Sep 2018	0.100	Sep 2019	0.100	Sep 2020	-		0.100	0.000	1.444	Continuing
Program Management Support	C/CPFF	SPA : Alexandria, VA	0.575	0.000		0.000		0.000		-		0.000	0.000	0.575	Continuing
Program Management Support	C/CPAF	Booz Allen : Washington, DC	12.973	2.400	Feb 2018	1.900	Feb 2019	2.000	Feb 2020	-		2.000	0.000	19.273	-
Program Management Support	C/CPAF	Alion : Washington, DC	0.400	0.000		0.000		0.000		-		0.000	0.000	0.400	-
		Subtotal	28.155	2.500		2.000		2.100		-		2.100	0.000	34.755	N/A

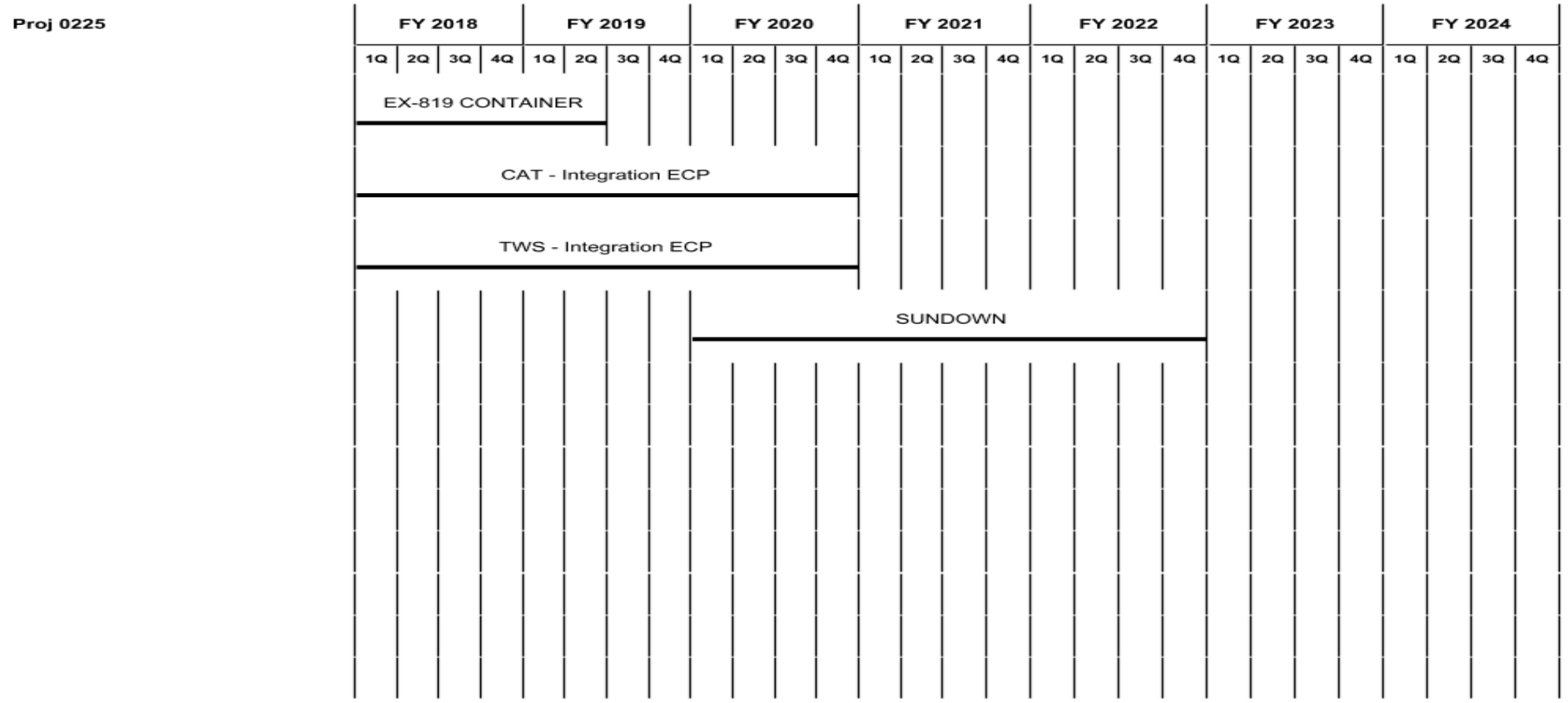
Remarks

Increase between FY19 to FY10 is to sundown the ATTDs Program.

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	749.538	14.523		7.100		15.800		-		15.800	0.000	786.961	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603506N / *Surface Ship Torpedo Defense*	**Project (Number/Name)** 0225 / *Surface Ship Torpedo Defense (SSTD)*



2020PB - 0603506N - 0225

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603506N / *Surface Ship Torpedo Defense*	**Project (Number/Name)** 0225 / *Surface Ship Torpedo Defense (SSTD)*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 0225				
EX-819 CONTAINER	1	2018	2	2019
CAT - Integration ECP	1	2018	4	2020
TWS - Integration ECP	1	2018	4	2020
SUNDOWN	1	2020	4	2022

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603506N / *Surface Ship Torpedo Defense*	Project (Number/Name) 9999 / *Congressional Adds*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
9999: *Congressional Adds*	0.000	9.651	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	9.651
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Surface Ship Torpedo Defense (SSTD) program provides a detect-to-engage layered torpedo defense capability. The four major efforts that comprise SSTD are the AN/SLQ-25 (NIXIE) system, Torpedo Warning System (TWS), the Countermeasure Anti-Torpedo (CAT) and Acoustic Device Countermeasure (Surface ADC MK2). CAT and TWS are development programs. The CAT program develops a canisterized Anti-Torpedo Torpedo (ATT). The TWS program develops the required torpedo detection, classification and localization (TDCL) ship systems to employ CAT. The TWS and CAT systems make up the Anti-Torpedo Torpedo Defense System (ATTDS).

The ATTDS provides a hard kill torpedo defense capability on High Value Units (HVU's). The program has developed and fielded five ATTDS Engineering Design Model (EDM) systems on CVNs. Each EDM system is one TWS with a CAT load out of a maximum of eight CATs. The AN/SLQ-25 (NIXIE) is a towed acoustic and non-acoustic countermeasure system. The AN/SLQ-25 program develops countermeasure technologies and capabilities to improve ship survivability against future torpedo threats.

Research and development of new technologies and capabilities developed under the Future Naval Capabilities (FNC), Small Business and Innovative Research (SBIR), and other Research, Development, Test & Evaluation (RDT&E) initiatives. New and emerging hardware and software are evaluated in representative acoustic environments, against projected threats through both digital and hardware-in-the-loop simulations, to determine their effectiveness and impact on improving ship survivability. The technology is then incorporated into the appropriate product line.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019
Congressional Add: Program Increase	9.651	0.000
FY 2018 Accomplishments: - Continued engineering changes on both CAT and TWS Systems. - Software support resolution on both CAT and TWS Systems. - Procurement of Integration Hardware for the five CVNs Equipped with the SALVO Capable Systems. - Conduct Theater Anti Submarine Warfare (TASW) Concept of Operations (CONOPS) Integration. - Conduct study on harvesting ATTDS Technology for cruiser (CG Class) and destroyer (DDG 51 Class) ships. - Tested ATTDS in the TASW Environment. - Test SSTD Initiatives in a TASW Environment.		
FY 2019 Plans: N/A		
Congressional Adds Subtotals	9.651	0.000

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603506N / *Surface Ship Torpedo Defense*	**Project (Number/Name)** 9999 / *Congressional Adds*

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

CAT Program: The Program completed a Systems Requirements Review (SRR) and Preliminary Design Review (PDR) on the Engineering Development Model (EDM) design. ARL Penn State (ARL/PSU) has completed a Technical Data Package (TDP) that can be used in the future system builds. CAT system SALVO Software has been tested and is currently in fleet use. Funding in FY19 is for EDM support and ATT post deployment EDM maintenance.

TWS Program: Development and production of the new sensors was conducted by ULTRA/3Phoenix. Five complete sensor sets have been delivered. Ready-stowage racks, and fire control systems have been developed by Pacific Engineering Incorporated (PEI) and In-Depth Engineering, respectively. System integration supported fabrication and fielding of the five complete systems. TWS SALVO software has been tested and is currently in fleet use. Funding in FY19 is for EDM support and TWS post deployment software and hardware engineering review.

E. Performance Metrics

Torpedo Effectiveness for the CAT
Torpedo Reliability and Availability for the CAT
Torpedo Detection Classification and Localization (TDCL)
False Alert Rate TDCL probability of correct classification
TWS System Reliability and Availability

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603506N / *Surface Ship Torpedo Defense*	**Project (Number/Name)** 9999 / *Congressional Adds*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
CAT/TWS Engineering/ Software Support for SALVO Integration	C/CPFF	ARL/PSU : State College, PA	0.000	1.700	Dec 2018	0.000		0.000		-		0.000	0.000	1.700	-
CAT/TWS Engineering/ Software Support for SALVO Integration	C/CPFF	ULTRA : Braintree, MA	0.000	4.700	Dec 2018	0.000		0.000		-		0.000	0.000	4.700	-
CAT/TWS Engineering/ Software Support for SALVO Integration	WR	NEWPORT : Newport, RI	0.000	1.000	Dec 2018	0.000		0.000		-		0.000	0.000	1.000	-
CAT/TWS Engineering/ Software Support for SALVO Integration	WR	KEYPORT : Keyport, WA	0.000	1.151	Dec 2018	0.000		0.000		-		0.000	0.000	1.151	-
CAT/TWS Engineering/ Software Support for SALVO Integration	WR	INDIAN HEAD : Indian Head, MD	0.000	0.400	Dec 2018	0.000		0.000		-		0.000	0.000	0.400	-
ATTDS Technology Harvesting Integration on Hardware	TBD	TBD : TBD	0.000	0.700	Sep 2018	0.000		0.000		-		0.000	0.000	0.700	-
		Subtotal	0.000	9.651		0.000		0.000		-		0.000	0.000	9.651	N/A

	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	9.651		0.000		0.000		-		0.000	0.000	9.651	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603506N / *Surface Ship Torpedo Defense*	**Project (Number/Name)** 9999 / *Congressional Adds*

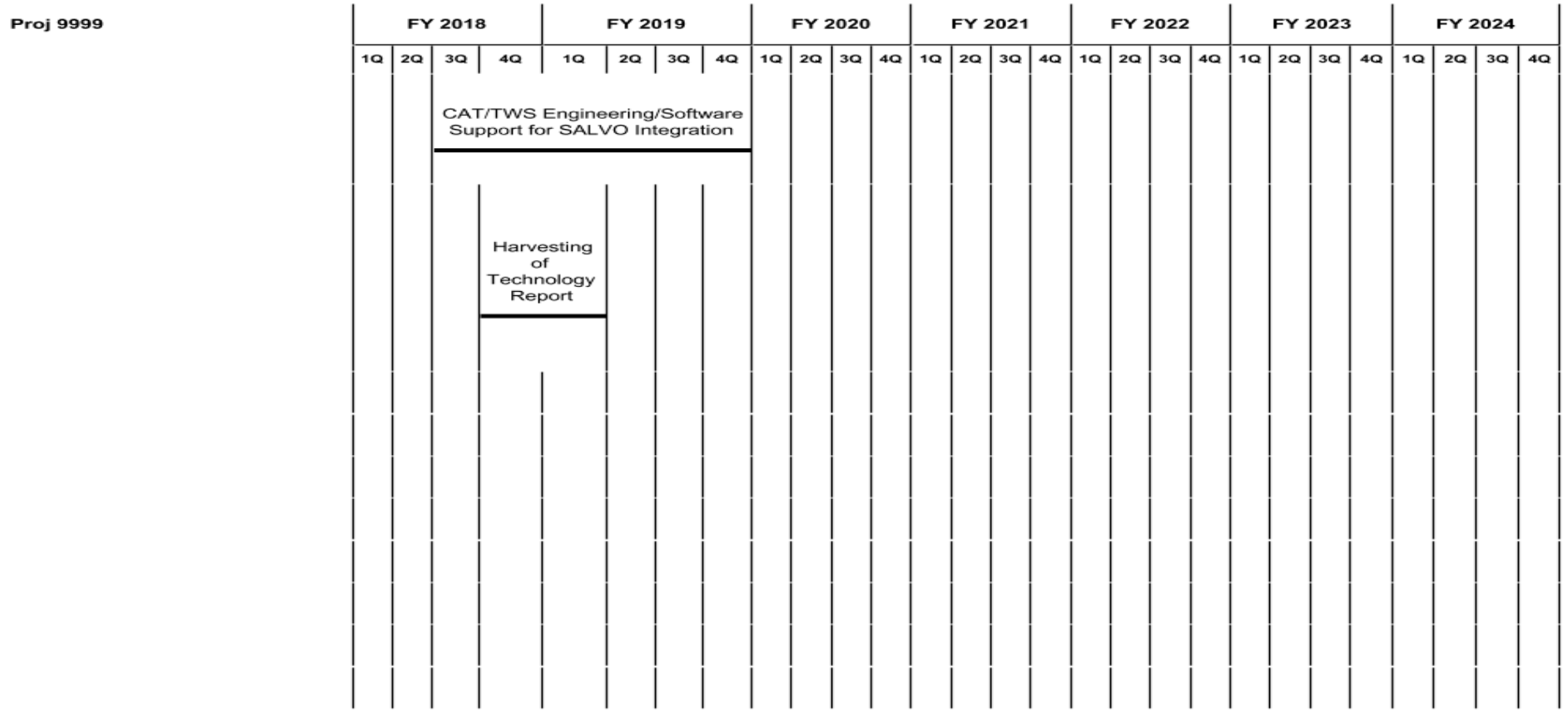


Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603506N / *Surface Ship Torpedo Defense*	**Project (Number/Name)** 9999 / *Congressional Adds*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 9999				
CAT/TWS Engineering/Software Support for SALVO Integration	3	2018	4	2019
Harvesting of Technology	4	2018	1	2019

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy											Date: March 2019	
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0603512N *I Carrier Systems Development*							
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
Total Program Element	69.160	9.184	5.440	4.997	-	4.997	5.658	5.719	5.702	5.814	Continuing	Continuing
3216: *Tactical Support Center-Integration*	43.792	7.530	4.248	4.295	-	4.295	4.436	4.529	4.613	4.704	Continuing	Continuing
4005: *In-Service Carrier Systems Development*	25.368	1.654	1.192	0.702	-	0.702	1.222	1.190	1.089	1.110	Continuing	Continuing

A. Mission Description and Budget Item Justification

The FY 2020 funding request was reduced by $0.315 million to account for the availability of prior year execution balances.

This Program Element (PE) addresses all technology areas associated with Carrier systems development.

PROJECT 3216: The AN/SQQ-34 Aircraft Carrier Tactical Support Center (CV-TSC) program delivers Anti-Submarine Warfare (ASW) and Surface Warfare (SUW) combat capability to the Aircraft Carrier. The program provides incremental development to deliver frequent capability updates to the Fleet, developing, testing, certifying, and fielding system upgrades and cyber-security patches. The program maintains interoperability with current and future interfaces; supports mission data exchange; improves track/sensor processing and analysis techniques; improves mission planning; improves data recording, reconstruction, and distribution; improves embedded simulation and training capabilities and implements cyber-security measures to effectively employ overall CVN self-defense capabilities. CV-TSC integrates sensor data from Off-Board Aircraft, Organic Platform Sensors, Link-16 Track Data, Ship Self Defense System (SSDS) Track Data, Global Command and Control System (GCCS) Over-the-Horizon Track Data, and Environmental and Threat Databases to assess the threat and assist the Tactical Action Officer (TAO) and Composite Warfare Commander (CWC) to effectively employ overall CVN self-defense capabilities. CV-TSC generates real-time ASW/SUW information and recommendations, tactical planning and employment of ASW/SUW assets, ASW/SUW sensor data processing and analysis, and distribution of tactically significant data. Aircraft supported include: MH-60R/S, P-8, MQ-4C Triton, and future ASW/SUW aircraft.

Changes to the SSDS configurations/variants have driven changes to the previous CV-TSC Fleet Capability Release (FCR) nomenclature/numbering. There are now two different SSDS configuration/variants. The first is non-Product Line Architecture (non-PLA) and the second is Product Line Architecture (PLA) configuration/variant. To address these two different configurations/variants, the CV-TSC FCR nomenclature has been modified. FCR-3 is split into two FCRs, FCR-3 and FCR-4. FCR-3 supports SSDS PLA and FCR-4 supports SSDS non-PLA. What was previously shown as FCR-4 is now renamed to FCR-5, which reflects a planned SSDS configuration/variant reduction to a single configuration.

PROJECT 4005: The In-Service Carrier Systems Development Demonstration and Validation program exploits available technologies to deliver an affordable, robust, operator-friendly automation control environment for Navy Aircraft Carrier shipboard equipment. The program provides the system architecture, requirements/specification development, technology selection, software development (including software baseline), as well as land-based and shipboard testing of new technologies to improve shipboard operations and to reduce workload, manpower requirements, and Total Ownership Costs (TOC).

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0603512N *I Carrier Systems Development*

B. Program Change Summary ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	9.296	5.440	5.401	-	5.401
Current President's Budget	9.184	5.440	4.997	-	4.997
Total Adjustments	-0.112	0.000	-0.404	-	-0.404
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.112	0.000			
• Program Adjustments	0.000	0.000	-0.315	-	-0.315
• Rate/Misc Adjustments	0.000	0.000	-0.089	-	-0.089

Change Summary Explanation

- FY 2020 decrease of $-0.404M included: $-0.315M to account for the availability of prior year execution balances, and $-0.089M for various rate adjustments.

SCHEDULE - PROJECT 3216: Nomenclature changes were driven by CV-TSC dependencies on being aligned with the SSDS program. Changes to the SSDS configurations/variants have driven changes to the previous CV-TSC FCR nomenclature/numbering. The CV-TSC FCR-3 and FCR-4 (previously part of FCR-3) schedule changes reflect the parallel development of both FCR-3 Product Line Architecture (PLA) and FCR-4 Non-PLA. The CV-TSC FCR-5 (previously FCR-4) schedule change reflects when the program transitions to a single architecture (PLA). The CV-TSC Independent Verification & Validation (IV&V) schedule changes reflect the required time to complete integration, testing and certification (lesson learned from FCR-1/2).

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603512N / *Carrier Systems Development*	Project (Number/Name) 3216 / *Tactical Support Center-Integration*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
3216: *Tactical Support Center-Integration*	43.792	7.530	4.248	4.295	-	4.295	4.436	4.529	4.613	4.704	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The CV-TSC project delivers ASW and SUW combat capability to the Aircraft Carrier. CV-TSC integrates sensor data from Off-Board Aircraft, Organic Platform Sensors, Link-16 Track Data, SSDS Track Data, Global Command and Control System (GCCS) Over-the-Horizon Track Data, and Environmental and Threat Databases to assess the threat and assist the TAO and CWC to effectively employ overall CVN self-defense capabilities. CV-TSC generates real-time ASW/SUW information and recommendations, tactical planning and employment of ASW/SUW assets, ASW/SUW sensor data processing and analysis, and distribution of tactically significant data. Aircraft supported include: MH-60R/S, P-8, MQ-4C Triton, and future ASW/SUW assets. System development is accomplished through the following initiatives:

1) Maintaining interoperability with the local CVN warfare systems through current and future interfaces;
2) Continuing to support mission data exchange and tactical control with current and future ASW/SUW assets and their mission systems;
3) Improving track and sensor processing and analysis techniques as new track and sensor data becomes available;
4) Improving mission planning support for the ASW/SUW missions conducted from the CVN;
5) Improving data recording, reconstruct, and distribution to meet the decreasing timelines associated with getting tactically significant data to other end users both on and off platform;
6) Improving embedded simulation and training capabilities to enable operator proficiencies; and
7) Implementing cyber-security measures.

This Project also provided development of Boundary Defense Capability (Cybersecurity) capabilities (funded from FY 2016 through FY 2018). The purpose of this effort was to define and develop enterprise Hull Mechanical & Electrical (HM&E) System cybersecurity solutions that would provide: protections from cyber-attacks such as boundary defense capabilities that will protect threats entering and leaving HM&E systems, physical protections, message authentication and encryption methods; Detection solutions for system anomalies and attacks at the boundaries, on hosts, networks and backplanes; and provide for operator awareness (e.g. malware detection, file integrity verification, etc.); Reaction solutions that will enable operator and system responses to an attacks; and Recovery methods that will enable for a system to quickly get back to a good known state. Planning will also commence for the integration of cyber solutions into specific HM&E control systems (e.g. Machinery Control, Steering Control, etc.).

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: CV-TSC Development / Integration / Test / Certification	4.157	4.248	4.295	0.000	4.295
Articles:	-	-	-	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603512N / *Carrier Systems Development*	**Project (Number/Name)** 3216 / *Tactical Support Center-Integration*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Description: CV-TSC's evolutionary acquisition approach to developing, testing, certifying, and fielding system upgrades and cyber-security patches is implemented through phased Fleet Capability Releases (FCR). Changes to the SSDS configurations/variants have driven changes to the previous CV-TSC Fleet Capability Release (FCR) nomenclature/numbering. There are now two different SSDS configuration/variants. The first is non-Product Line Architecture (non-PLA) and the second is Product Line Architecture (PLA) configuration/ variant. To address these two different configurations/variants, the CV-TSC FCR nomenclature has been modified. FCR-3 is split into two FCRs, FCR-3 and FCR-4. FCR-3 supports SSDS PLA, and FCR-4 supports SSDS non-PLA. What was previously shown as FCR-4 is now renamed to FCR-5, which reflects a planned SSDS configuration/variant reduction to a single configuration. ***FY 2019 Plans:*** - Complete the development phase for FCR-3/4 (previously shown as FCR-3). - Initiate the requirements definition phase and development efforts for FCR-5 (previously shown as FCR-4). - Initiate certifications required for fielding, to include IA Accreditation, ISNS and CANES Certifications, PEO IWS Element Certification, and CST Certification for FCR-3/4 (previously shown as FCR-3). - Complete the Transition Information Assurance (IA) Accreditation to Risk Management Framework (RMF). Prioritize capability improvements to Public Key Enforcement (PKE) compliance, interoperability with multiple variants of SSDS PLA, and the Common Data Link System (CDLS) multilink. - Update Technical Review Action Plan (TRAP). ***FY 2020 Base Plans:*** - Complete certifications required for fielding, to include IA Accreditation, ISNS and CANES Certifications, PEO IWS Element Certification, and CST Certification for FCR-3/4 (previously shown as FCR-3). - Complete requirements definition phase for FCR-5 (previously shown as FCR-4). - Continue development effort for FCR-5 (previously shown as FCR-4). - Provide support for a third software baseline. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:***					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603512N / *Carrier Systems Development*	**Project (Number/Name)** 3216 / *Tactical Support Center-Integration*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
The increase from FY 2019 to FY 2020 ($+0.047M) is in line with inflation associated with the RDT&EN appropriation.					
Title: NAVSEA Boundary Defense Capability (Cybersecurity) ***Articles:*** ***Description:*** The purpose of this effort is to define and develop enterprise Hull Mechanical & Electrical (HM&E) System cybersecurity solutions that will provide: protections from cyber-attacks such as boundary defense capabilities that will protect threats entering and leaving HM&E systems, physical protections, message authentication and encryption methods; Detection solutions for system anomalies and attacks at the boundaries, on hosts, networks and backplanes; and provide for operator awareness (e.g. malware detection, file integrity verification, etc.); Reaction solutions that will enable operator and system responses to an attacks; and Recovery methods that will enable for a system to quickly get back to a good known state. Planning will also commence for the integration of cyber solutions into specific HM&E control systems (e.g. Machinery Control, Steering Control, etc.). The development of a cyber-resilient HM&E architecture will include the integration of cybersecurity solutions and system engineering processes to individual HM&E Systems and their Components to ensure a consistent cyber security posture across the entire HM&E Enclave. Development of enterprise HM&E risk management processes will occur, to include the following: a vulnerability assessment and management process across the HM&E Enclave and a methodology to support the execution of the Risk Management Framework and Cybersafe Assessments. ***FY 2019 Plans:*** N/A ***FY 2020 Base Plans:*** N/A ***FY 2020 OCO Plans:*** N/A	3.373 -	0.000 -	0.000 -	0.000 -	0.000 -
Accomplishments/Planned Programs Subtotals	7.530	4.248	4.295	0.000	4.295

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603512N / *Carrier Systems Development*	**Project (Number/Name)** 3216 / *Tactical Support Center-Integration*

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• OPN/2176: *Undersea Warfare Support Equipment (N98/CV-TSC only)*	0.338	0.334	0.343	-	0.343	0.353	0.359	0.367	0.374	Continuing	Continuing

Remarks

D. Acquisition Strategy

CV-TSC Development/Integration:
- CV-TSC utilizes an incremental development approach that aims to deliver frequent capability updates to the Fleet. This approach allows required capability to be delivered to address emerging Fleet needs and provides frequent opportunities to ensure interoperability is synchronized with the Ship Self Defense System (SSDS) Advanced Capability Builds (ACBs). The acquisition strategy places heavy emphasis on the use of open architecture best practices to ensure ease of upgrades and to make developed products available to other platforms.

NAVSEA Boundary Defense Capability (Cybersecurity):
- Investigate, demonstrate, and implement multi-application, cross-platform cybersecurity solutions for HM&E control system enclaves, followed by engineering for CVN 68 Class integration. Execute non-recurring engineering efforts for HM&E Control Systems. Perform engineering and planning for Boundary Defense Capability Temporary Alterations.

E. Performance Metrics

CV-TSC Development/Integration:
- Achieve Configuration Control Board (CCB) certification for installation of CV-TSC Build 8.0 software version.
- Achieve Platform Information Technology (PIT) Information Assurance (IA) accreditation of CV-TSC Build 8.0 software version.
- Achieve Consolidate Afloat Network Enterprise System (CANES) interoperability certification of CV-TSC Build 8.0 software version.
- Achieve element certification of CV-TSC Build 8.0 software version.
- Achieve Combat System test certification of CV-TSC Build 8.0 software version.

NAVSEA Boundary Defense Capability (Cybersecurity):
- Define and develop cross-platform control system cybersecurity requirements.
- Define and develop cross-platform control system cybersecurity risk management processes.
- Define and develop a set of cross-platform control system cybersecurity boundary defense solutions.
- Define and develop a set of cross-platform, centralized, systems-level cybersecurity solutions.
- Define and develop a set of cross-platform, element-level cybersecurity protections.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603512N / *Carrier Systems Development*	Project (Number/Name) 3216 / *Tactical Support Center-Integration*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
CV-TSC Engineering / H/W & S/W Devel / Integration	WR	NAWC/Pax River : MD	0.975	0.140	Nov 2017	0.135	Dec 2018	0.138	Nov 2019	-		0.138	Continuing	Continuing	Continuing
CV-TSC Engineering / H/W & S/W Devel / Integration	WR	NRL : DC	0.325	0.000		0.000		0.000		-		0.000	0.000	0.325	-
CV-TSC Engineering / H/W & S/W Devel / Integration	WR	NSWC/Carderock : MD	2.650	0.000		0.000		0.000		-		0.000	0.000	2.650	-
CV-TSC Engineering / H/W & S/W Devel / Integration	WR	NSWC/Dahlgren : VA	0.100	0.000		0.000		0.000		-		0.000	0.000	0.100	-
CV-TSC Engineering / H/W & S/W Devel / Integration	WR	NUWC/Keyport : WA	23.018	2.766	Oct 2017	2.693	Nov 2018	2.662	Nov 2019	-		2.662	Continuing	Continuing	Continuing
CV-TSC Engineering / H/W & S/W Devel / Integration	C/CPFF	Adaptive Methods : VA	3.107	0.695	Dec 2017	0.400	Dec 2018	0.408	Dec 2019	-		0.408	Continuing	Continuing	Continuing
CV-TSC Engineering / H/W & S/W Devel / Integration	C/CPFF	JHU/APL : MD	0.250	0.000		0.000		0.000		-		0.000	0.000	0.250	-
CV-TSC Engineering / H/W & S/W Devel / Integration	WR	SPAWAR : CA	4.160	0.000		0.000		0.000		-		0.000	0.000	4.160	-
CV-TSC Engineering / H/W & S/W Development	C/CPFF	VAR* : VAR*	1.288	0.095	Dec 2017	0.503	Dec 2018	0.556	Dec 2019	-		0.556	Continuing	Continuing	Continuing
Boundary Defense Capability Design/ Development	WR	NSWC/Philadelphia : PA	2.526	1.520	Dec 2017	0.000		0.000		-		0.000	0.000	4.046	-
Boundary Defense Capability Design/ Development	C/CPFF	VAR* : VAR*	2.642	1.853	Jan 2018	0.000		0.000		-		0.000	0.000	4.495	-
		Subtotal	41.041	7.069		3.731		3.764		-		3.764	Continuing	Continuing	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603512N / *Carrier Systems Development*	Project (Number/Name) 3216 / *Tactical Support Center-Integration*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract

Remarks

* Consists of multiple performing activities with funding for each not greater than $1M per year.

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
CV-TSC Test and Certification	WR	NUWC//Keyport : WA	2.105	0.225	Oct 2017	0.314	Nov 2018	0.324	Nov 2019	-		0.324	Continuing	Continuing	Continuing
CV-TSC Test and Certification	WR	NUWC/Newport : RI	0.125	0.000		0.000		0.000		-		0.000	0.000	0.125	-
		Subtotal	2.230	0.225		0.314		0.324		-		0.324	Continuing	Continuing	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
CV-TSC Program Management Support	C/CPAF	BAE Systems : MD	0.411	0.000		0.000		0.000		-		0.000	0.000	0.411	-
CV-TSC Program Management Support	C/CPIF	CGI Federal : VA	0.110	0.157	Nov 2017	0.144	Dec 2018	0.147	Dec 2019	-		0.147	Continuing	Continuing	Continuing
CV-TSC Program Management Support	C/CPFF	CACI : VA	0.000	0.055	Jan 2018	0.039	Dec 2018	0.040	Dec 2019	-		0.040	Continuing	Continuing	Continuing
CV-TSC Travel	Allot	NAVSEA PEO iWS5 : DC	0.000	0.024	Jan 2018	0.020	Jan 2019	0.020	Dec 2019	-		0.020	Continuing	Continuing	Continuing
		Subtotal	0.521	0.236		0.203		0.207		-		0.207	Continuing	Continuing	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	43.792	7.530		4.248		4.295		-		4.295	Continuing	Continuing	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603512N / *Carrier Systems Development*	Project (Number/Name) 3216 / *Tactical Support Center-Integration*	

	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603512N / *Carrier Systems Development*	**Project (Number/Name)** 3216 / *Tactical Support Center-Integration*

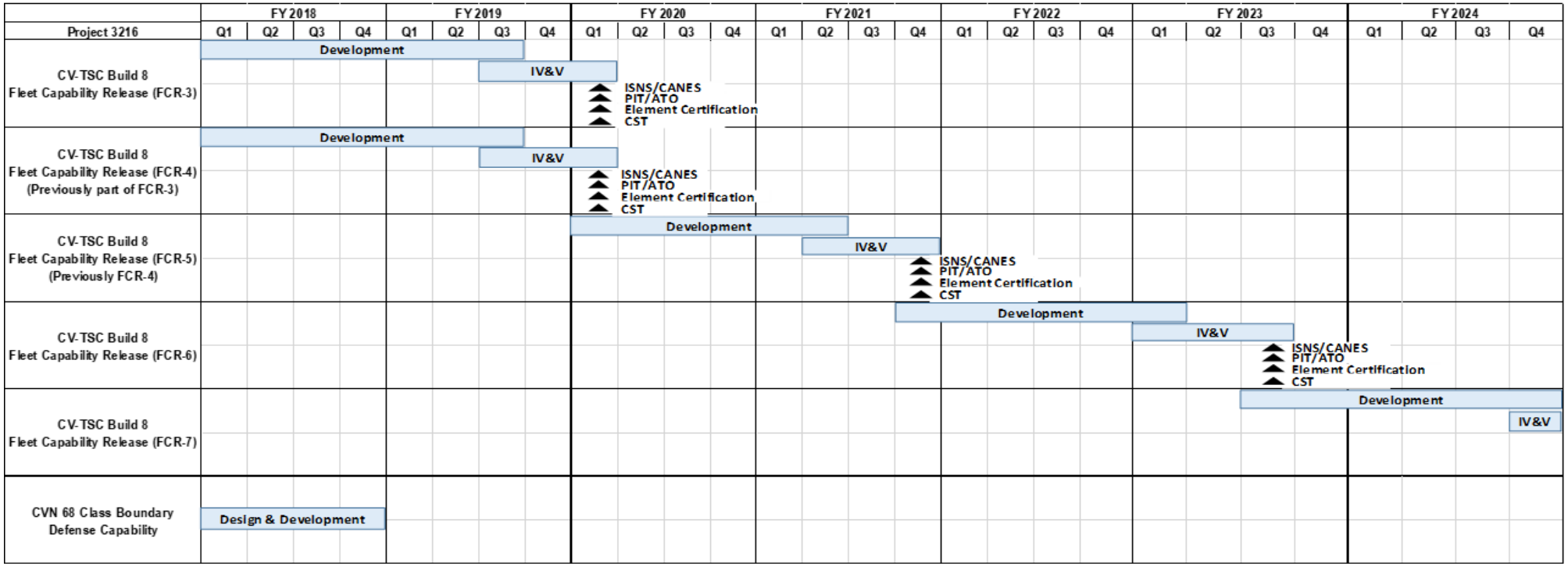


Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603512N / *Carrier Systems Development*	**Project (Number/Name)** 3216 / *Tactical Support Center-Integration*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
CV-TSC Build 8 FCR-3				
CV-TSC Build 8 FCR-3 Development	1	2018	3	2019
CV-TSC Build 8 FCR-3 IV&V	3	2019	1	2020
CV-TSC Build 8 FCR-3 PIT/ATO	1	2020	1	2020
CV-TSC Build 8 FCR-3 ISNS / CANES Certification	1	2020	1	2020
CV-TSC Build 8 FCR-3 Element Certification	1	2020	1	2020
CV-TSC Build 8 FCR-3 Combat System Test (CST)	1	2020	1	2020
CV-TSC Build 8 FCR-4 (previously part of FCR-3)				
CV-TSC Build 8 FCR-4 Development	1	2018	3	2019
CV-TSC Build 8 FCR-4 IV&V	3	2019	1	2020
CV-TSC Build 8 FCR-4 PIT/ATO	1	2020	1	2020
CV-TSC Build 8 FCR-4 ISNS / CANES Certification	1	2020	1	2020
CV-TSC Build 8 FCR-4 Element Certification	1	2020	1	2020
CV-TSC Build 8 FCR-4 Combat System Test (CST)	1	2020	1	2020
CV-TSC Build 8 FCR-5 (previously FCR-4)				
CV-TSC Build 8 FCR-5 Development	1	2020	2	2021
CV-TSC Build 8 FCR-5 IV&V	2	2021	4	2021
CV-TSC Build 8 FCR-5 PIT/ATO	4	2021	4	2021
CV-TSC Build 8 FCR-5 ISNS / CANES Certification	4	2021	4	2021
CV-TSC Build 8 FCR-5 Element Certification	4	2021	4	2021
CV-TSC Build 8 FCR-5 Combat System Test (CST)	4	2021	4	2021
CV-TSC Build 8 FCR-6				

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603512N / *Carrier Systems Development*	**Project (Number/Name)** 3216 / *Tactical Support Center-Integration*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
CV-TSC Build 8 FCR-6 Development	4	2021	1	2023
CV-TSC Build 8 FCR-6 IV&V	1	2023	3	2023
CV-TSC Build 8 FCR-6 PIT/ATO	3	2023	3	2023
CV-TSC Build 8 FCR-6 ISNS / CANES Certification	3	2023	3	2023
CV-TSC Build 8 FCR-6 Element Certification	3	2023	3	2023
CV-TSC Build 8 FCR-6 Combat System Test (CST)	3	2023	3	2023
CV-TSC Build 8 FCR-7				
CV-TSC Build 8 FCR-7 Development	3	2023	4	2024
CV-TSC Build 8 FCR-7 IV&V	4	2024	4	2024
CVN 68 Class Boundary Defense Capability				
CVN 68 Class Boundary Defense Capability: CVN 68 Class Boundary Defense Capability Design & Development	1	2018	4	2018

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy				Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603512N / *Carrier Systems Development*	Project (Number/Name) 4005 / *In-Service Carrier Systems Development*		

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
4005: *In-Service Carrier Systems Development*	25.368	1.654	1.192	0.702	-	0.702	1.222	1.190	1.089	1.110	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The In-Service Carrier Systems Demonstration and Validation program exploits available technologies to deliver an affordable, robust, operator-friendly automation control environment for Navy Aircraft Carrier shipboard equipment. The program provides the system architecture, requirements/specification development, technology selection, software development (including software baseline), as well as land-based and shipboard testing of new technologies to improve shipboard operations and to reduce workload, manpower requirements, and Total Ownership Costs as well as addressing equipment obsolescence issues. Initial technologies include the Uninterruptible Power Supply (UPS) Replacements, the Integrated Condition Assessment System, the On-Machine I/O development for LPAPs and LPAP air end redesign, Modular Refrigeration Unit (MRU). Demonstration technologies include Advanced Damage Control System (ADCS) software improvements, Input/Output Controller (IOC) Replacement, Fleet Wireless Personal digital Assistant (PDA), Weapons Elevator Laser Positioning System, Legacy Steering Interface upgrades, Passive countermeasures System (PCMS) alternate measurement capability, Additive Manufacturing efforts, and Weapons Elevators PLC redesign. Wireless systems, smart sensors, lighting systems, knowledge-based systems, automated casualty control, automated technology for workload reduction, linked smart devices, common software tools for interoperability, and self-healing network are technologies being considered for future applications including the following: Integrated Bridge control Data Logger, C4I Network Performance Modeling and Analysis, Network Data Logger Device, Portable Communication System (PCS) proof of concept, Ship Control System (SCS) Onboard trainer, CVN 78 class platform support for Joint Strike Fighter Integration, Development of a Standardized tool to be used to perform structural analyses to assess the adequacy of corroded and degraded structure.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: In-Service Carrier Systems Development	1.654	1.192	0.702	0.000	0.702
Articles:	-	-	-	-	-
FY 2019 Plans: Fiscal Year 2019 plans include continued support to Aircraft Carrier technologies. Modifications, upgrades and development of systems and software will be ongoing in support of In-Service aircraft carrier modernization initiatives and TOC reduction initiatives as well as addressing equipment obsolescence issues.					
FY 2020 Base Plans:					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603512N / *Carrier Systems Development*	**Project (Number/Name)** 4005 / *In-Service Carrier Systems Development*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Fiscal Year 2020 plans include continued support to Aircraft Carrier technologies. Modifications, upgrades and development of systems and software will be ongoing in support of In-Service aircraft carrier modernization initiatives and TOC reduction initiatives as well as addressing equipment obsolescence issues. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Decrease from FY19 to FY20 reflects completion of LPAP efforts in FY19. Additionally, the FY 2020 funding request was reduced by $(0.315) million to account for the availability of prior year execution balances.					
Accomplishments/Planned Programs Subtotals	1.654	1.192	0.702	0.000	0.702

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Investigate, demonstrate, and implement available technologies to deliver a robust, operator-friendly automation control environment for Navy Aircraft Carrier shipboard equipment to reduce workload, manpower requirements, and Total Ownership Costs (TOC).

E. Performance Metrics

Successfully complete Ship Control System Governor Software Development, AC Plant Model Capacity Optimization, Uninterruptible Power Supply (UPS) Replacements, Advanced Damage Control System (ADCS) Software Improvements, Automatic Fire Sensing and Suppression System/Flooding and Casualty Control Software (AFSSS/FCCS) Software Development Test, Input/Output Controller (IOC) replacement demonstration, Tank Preservation models, Weapons Elevator Laser Positioning demonstration, Legacy Steering Interface Upgrades, CVN Integrated Topside Design (ITD) location option evaluation tool development, Antenna to Antenna coupling analysis tool development, Universal Portable Command and Control Unit (PCCU) development, Ship Control System (SCS) Trainer, Integrated Bridge Control Data Logger, Weapons Elevator Control Accumulator Replacement,C4I Network Performance Requirements Modeling and Analysis, On-Machine I/O development for LPAPs and LPAP air end redesign, and Modular Refrigeration Unit (MRU) development.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603512N / *Carrier Systems Development*	Project (Number/Name) 4005 / *In-Service Carrier Systems Development*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Ship Integration	WR	NAVSEA : Phil	2.863	0.727	Nov 2017	0.537	Nov 2018	0.227	Nov 2019	-		0.227	0.000	4.354	-
Ship Integration	WR	NAVSEA : Dahlgren	0.197	0.000		0.000		0.000		-		0.000	0.000	0.197	-
Ship Integration	WR	NAVSEA : Carderock	0.225	0.100	Nov 2017	0.100	Nov 2018	0.050	Nov 2019	-		0.050	0.000	0.475	-
		Subtotal	3.285	0.827		0.637		0.277		-		0.277	0.000	5.026	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Software Development	WR	NAVSEA : Phil	8.332	0.054	Nov 2017	0.050	Nov 2018	0.050	Nov 2019	-		0.050	0.000	8.486	-
Program Management Support	WR	NAVSEA : Phil	3.277	0.150	Nov 2017	0.100	Nov 2018	0.050	Nov 2019	-		0.050	0.000	3.577	-
Training Development	WR	NAVSEA : Phil	1.365	0.050	Nov 2017	0.050	Nov 2018	0.050	Nov 2019	-		0.050	0.000	1.515	-
Integrated Logistics Support	WR	NAVSEA : Phil	1.654	0.100	Nov 2017	0.085	Nov 2018	0.050	Nov 2019	-		0.050	0.000	1.889	-
Software Development	WR	NAVSEA : Dahlgren	0.308	0.000		0.000		0.000		-		0.000	0.000	0.308	-
Program Management Support	WR	NAVSEA : Dahlgren	0.317	0.000		0.000		0.000		-		0.000	0.000	0.317	-
Program Management Support	WR	NAVSEA : Carderock	0.100	0.050	Nov 2017	0.050	Nov 2018	0.050	Nov 2019	-		0.050	0.000	0.250	-
		Subtotal	15.353	0.404		0.335		0.250		-		0.250	0.000	16.342	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Developmental Test & Evaluation	WR	SPAWAR : Atlantic	0.214	0.000		0.000		0.000		-		0.000	0.000	0.214	-
Developmental Test & Evaluation	WR	NAVSEA : Carderock	0.225	0.000		0.000		0.000		-		0.000	0.000	0.225	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603512N / *Carrier Systems Development*	Project (Number/Name) 4005 / *In-Service Carrier Systems Development*	

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Developmental Test & Evaluation	WR	NAVSEA : Phil	6.022	0.423	Nov 2017	0.220	Nov 2018	0.175	Nov 2019	-		0.175	Continuing	Continuing	Continuing
Developmental Test & Evaluation	WR	NAVSEA : Dahlgren	0.261	0.000		0.000		0.000		-		0.000	0.000	0.261	-
		Subtotal	6.722	0.423		0.220		0.175		-		0.175	Continuing	Continuing	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
DAWF	Various	Various : Various	0.008	0.000		0.000		0.000		-		0.000	0.000	0.008	-
		Subtotal	0.008	0.000		0.000		0.000		-		0.000	0.000	0.008	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	25.368	1.654		1.192		0.702		-		0.702	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603512N / *Carrier Systems Development*	**Project (Number/Name)** 4005 / *In-Service Carrier Systems Development*

In-Service Carrier Systems Development

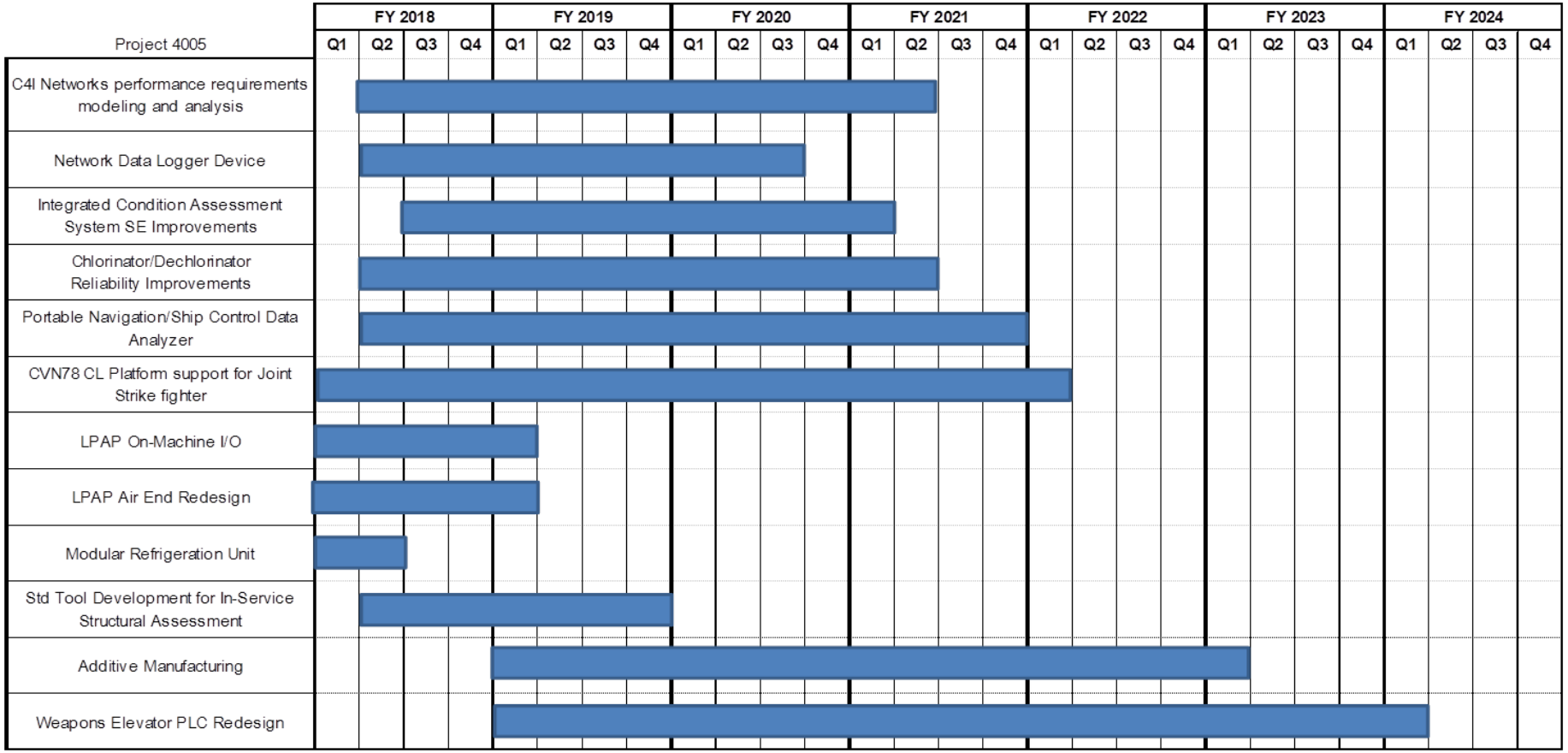


Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603512N / *Carrier Systems Development*	**Project (Number/Name)** 4005 / *In-Service Carrier Systems Development*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 4005				
C4I Networks performance requirements modeling and analysis: C4I Networks performance requirements modeling and analysis	2	2018	2	2021
Network Data Logger Device: Network Data Logger Device	2	2018	3	2020
Integrated Condition Assessment System SE Improvements: Integrated Condition Assessment System SE Improvements	3	2018	1	2021
Chlorinator/Dechlorinator Reliability Improvements: Chlorinator/Dechlorinator Reliability Improvements	2	2018	2	2021
Portable Navigation/Ship Control Data Analyzer: Portable Navigation/Ship Control Data Analyzer	2	2018	4	2021
CVN78 CL Platform support for Joint Strike Fighter: CVN78 CL Platform support for Joint Strike fighter	1	2018	1	2022
LPAP On-Machine I/O: LPAP On-Machine I/O	1	2018	1	2019
LPAP Air End Redesign: LPAP Air End Redesign	1	2018	1	2019
Modular Refrigeration Unit: Modular Refrigeration Unit	1	2018	2	2018
Std Tool Development for In-Service Structural Assessment: Std Tool Development for In-Service Structural Assessment and risk definition	2	2018	4	2019
Additive Manufacturing: Additive Manufacturing	1	2019	1	2023
Weapons Elevator PLC Redesign: Weapons Elevator PLC Redesign	1	2019	1	2024

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy											Date: March 2019	
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0603542N *I Radiological Control*							
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
Total Program Element	5.118	0.716	0.740	0.689	-	0.689	0.778	0.788	0.785	0.800	Continuing	Continuing
1830: *RADIAC Development*	5.118	0.716	0.740	0.689	-	0.689	0.778	0.788	0.785	0.800	Continuing	Continuing

A. Mission Description and Budget Item Justification

The FY 2020 funding request was reduced by $0.044M to account for the availability of prior year execution balances.

Mission Description: The Radiation Detection, Indication and Computation (RADIAC) Program is responsible for providing radiation monitoring instruments that detect and measure ionizing radiation. These instruments are used on all Navy, Coast Guard and Military Sealift Command vessels, and at every Navy shore installation, in order to ensure the safety of personnel, continuity of operations in radiological contingencies, and protection of the environment.

Justification: Title 10 of the Code of Federal Regulations, Part 20 (10 CFR 20) requires RADIAC instruments be used to ensure the safety of personnel who work with or who are exposed to radioactive materials in their jobs. Additionally, the Navy's mission requires personnel and ships to have the ability to operate in radiological environments and the ability to identify and interdict radiological Weapons of Mass Destruction (WMD). Navy programs that require RADIAC instruments for Occupational Safety & Health (OSH) under the provisions of 10 CFR 20 include Naval Nuclear Propulsion, Nuclear Weapons, Medical, and Radiological Affairs Support. Non-OSH programs include Radiological Defense, Consequence Management, Training, Technical (RADIAC calibration, shielding evaluation, research, etc.) and Radiological Search (maritime interdiction and radiological search missions to locate or intercept WMD).

This budget item develops, tests and evaluates new, highly reliable, more easily calibrated, easy to care and maintain, light weight and modern RADIAC instruments in order to improve the effectiveness of radiation safety, to make instruments simpler to use, and to reduce life cycle costs. The ultimate goal is to replace old, bulky, costly to maintain and repair, unreliable and obsolete instrumentation with multifunction equipment that can be automatically calibrated at greatly reduced cost.

This budget item also provides for improvement to nuclear weapons intrinsic radiation (gamma and neutron) shielding calculations, mixed field (neutron and gamma) dosimetry, and in neutron measurement. The objective is to develop less costly and more effective integral shielding for better personnel protection and safety. Improvement in personnel dosimetry and neutron measurement is also a major emphasis.

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy					Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*			R-1 Program Element (Number/Name) PE 0603542N *I Radiological Control*		
B. Program Change Summary ($ in Millions)	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**
Previous President's Budget	0.745	0.740	0.746	-	0.746
Current President's Budget	0.716	0.740	0.689	-	0.689
Total Adjustments	-0.029	0.000	-0.057	-	-0.057
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.029	0.000			
• Program Adjustments	0.000	0.000	-0.044	-	-0.044
• Rate/Misc Adjustments	0.000	0.000	-0.013	-	-0.013

Change Summary Explanation

The FY 2020 funding request was reduced by $0.044M to account for the availability of prior year execution balances and reduced by 0.013M for Navy Working Capital Fund rate changes.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy											Date: March 2019	
Appropriation/Budget Activity 1319 / 4					R-1 Program Element (Number/Name) PE 0603542N / *Radiological Control*				Project (Number/Name) 1830 / *RADIAC Development*			
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
1830: *RADIAC Development*	5.118	0.716	0.740	0.689	-	0.689	0.778	0.788	0.785	0.800	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Mission: The Radiation Detection, Indication and Computation (RADIAC) Program is responsible for providing radiation monitoring instruments that detect and measure radiation in accordance with the provisions of Title 10 of the Code of Federal Regulations (10 CFR). These instruments are used on all vessels afloat and at every shore installation in order to ensure the safety of personnel and the environment. RADIACs are also required after an act of terrorism or war that involves nuclear material in order to enable continuation of warfighting ability.

Justification: Many RADIAC instruments and dosimetry systems are decades old and approaching the end of their useful lives. In some cases the equipment and replacement parts are no longer manufactured, making the equipment logistically unsupportable. In other cases increasing failure rates due to age make replacements an economic efficiency
improvement. In all cases a technology refresh will make both economic sense in terms of lowering the total ownership costs, and will also provide increased operational capabilities.

Naval Nuclear Propulsion Program (NNPP): Instruments are developed to support the safe operation and maintenance of nuclear powered vessels and at nuclear maintenance facilities.

Non-NNPP: Instruments are developed to support other than NNPP end users, such as Explosive Ordnance Disposal, Nuclear Weapons, Medical, Industrial Radiography, Radiological Defense and Training.

Visit, Board, Search & Seizure (VBSS): The Navy has been tasked to intercept and board vessels at sea to search for nuclear or radiological materials that could be used for terrorist attacks. These instruments would have different characteristics than those used for NNPP and non-NNPP purposes and prototypes must be developed and/or tested and evaluated.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**
Title: Primary Dosimetry	0.070	0.015	0.070	0.000	0.070
Articles:	2	50	-	-	-
Description: The need for primary dosimetry is inherent due to the Navy's operation of nuclear reactors and their emission of ionizing radiation. Title 10 of the Code of Federal Regulations, Part 20.1502, states "Each licensee shall monitor exposures to radiation and radioactive material at levels sufficient to demonstrate compliance with the occupational dose limits." A primary dosimeter must pass accreditation proficiency testing,					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603542N / *Radiological Control*	**Project (Number/Name)** 1830 / *RADIAC Development*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
allowing the reading obtained to become a part of an individual's permanent health record. This permanent record is used to protect the individual radiation worker's health, and also the Navy from future liability. The Navy's current primary device is the DT-702/PD, a Thermo Luminescence Dosimeter (TLD). Existing TLD and newer technologies, such as Optically Stimulated Luminescence (OSL), must be continually researched to determine on-going performance parameters, cost to field and cost to maintain, since the current system is approaching the end of its useful life and will soon need to be replaced. ***FY 2019 Plans:*** NSWCCD submitted a requirements letter for the new dosimetry system and provided a Test Plan to Naval Sea Systems Command (NAVSEA 04ND) to perform ANSI N13.11 standard proficiency testing, including neutron radiation tests, on the passive-active systems and neutron-capable Beryllium Oxide (BeO) Optically-Stimulated Luminescence (OSL) dosimeters. NSWCCD will submit the results from the radiological testing to NAVSEA 04ND in a Technical Memorandum. NSWCCD established a Cooperative Research And Development Agreement (CRADA) with Landauer to further develop the new passive-active system, Verifii, as a candidate for the replacement of the DT-702/PD system. ***FY 2020 Base Plans:*** NSWCCD, in conjunction with Naval Dosimetry Center (NDC), will submit a Test Plan to Naval Sea Systems Command (NAVSEA 04ND) and perform testing on the neutron Beryllium Oxide (BeO) Optically-Stimulated Luminescence (OSL) dosimeters under normal environmental conditions, in accordance with the American ANSI N13.11 guidance. NSWCCD will submit the results from the environmental testing to NAVSEA 04ND in a Technical Memorandum. NSWCCD will continue market research for test and evaluation of new or improved technology applicable to primary dosimetry. CRADA actions will proceed to develop a dosimetry system that is competitive for procurement and suitable for US Navy deployment. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:***					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603542N / *Radiological Control*	**Project (Number/Name)** 1830 / *RADIAC Development*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
In FY19 OSL dosimeters were procured but not evaluated due to a diversion of funds to capital improvements of lab equipment. The increase FY19 to FY20 is for the labor to perform the testing and evaluation of the dosimeters.					
Title: Secondary Dosimetry	0.416	0.275	0.131	0.000	0.131
Articles:	-	1	1	-	1
Description: A secondary dosimeter provides an accurate, real-time readout of the radiation exposure being obtained in operational environments, and is utilized in conjunction with a primary dosimeter. The primary dosimeter does not provide real-time exposure information, so the secondary dosimeter is worn for that purpose. The Navy's secondary dosimeter is the Mk2 Electronic Personal Dosimeter (EPD). Research is required to find a secondary dosimeter that can measure the type of radiation encountered with pulsed X-ray machines, and to see if this new capability can be incorporated into one device.					
FY 2019 Plans: NSWCCD completed the first year of the procurement action to acquire a Maintenance and Calibration (MAC) cabinet irradiator system for the IM-276/PD and IM-276A/PD. NSWCCD will oversee the development of the design of the MAC.					
NSWCCD completed investigation into the logistics infrastructure capabilities of new systems and provided an assessment in a Technical Memorandum to Naval Sea Systems Command (NAVSEA 04ND) detailing the areas of improvement possible for the Navy's current system.					
FY 2020 Base Plans: NSWCCD will perform acceptance testing of the MAC procured in FY2019.					
NSWCCD will procure the second Maintenance and calibration (MAC) cabinet irradiator system for the IM-276/PD and IM-276A/PD.					
NSWCCD will finalize development and testing of the two MACs and provide a Technical Memorandum to Naval Sea Systems Command (NAVSEA 04ND) on its findings and the capability of the systems to provide					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603542N / *Radiological Control*	**Project (Number/Name)** 1830 / *RADIAC Development*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
maintenance and calibration productivity for the planned procurement of 95,000 of the IM-276/PD and IM-276A/PD. NSWCCD will complete investigation into the logistics infrastructure capabilities of new systems and provide an assessment detailing the possible areas of improvement for the Navy's system in a Technical Memorandum to Naval Sea Systems Command (NAVSEA 04ND). ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Article procurements in FY18 and FY19, none in FY20. FY20 is labor for the testing and evaluation of the procured Articles.					
Title: Visit, Board, Search & Seizure	0.080	0.015	0.063	0.000	0.063
Articles:	6	-	5	-	5
Description: The Visit, Board, Search & Seizure (VBSS) mission of the Navy is the requirement to be able to board ships and be able to detect and identify potential radiological or nuclear Weapons of Mass Destruction (WMD). Such a sensitive mission requires leading edge technology and capabilities to ensure success. The AN/PDX-1 RADIAC Set was fielded in response to a Joint Urgent Operational Needs Statement to meet this requirement. It contains three instruments that serve different purposes: (1) a Handheld Radiation Monitor (HRM)that searches for radiological materials; (2) a Radioisotope Identifier (RID) that identifies the type of radiological material located; and (3) a Personal Radiation Detector (PRD) that displays the radiological dose the VBSS team members may be receiving so that they can be aware if they are being exposed to dangerous levels of radioactivity during the mission. Current technology dictates that the sensitivity of the detectors is directly proportional to the size of the detector element; i.e., the larger the detector, the more sensitive and capable it is. However, in VBSS there must be a tradeoff between size/weight and capability, since it is difficult and hazardous for boarding parties to carry a backpack-sized detector, along with their weapons and other gear, up a rope ladder to board a vessel on the high seas. This will be a continuing effort to find smaller, lighter instruments with enhanced sensitivity, reach-back capability, and other enhancements to provide the Navy the best and most cost effective equipment possible for this mission. ***FY 2019 Plans:***					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603542N / *Radiological Control*	**Project (Number/Name)** 1830 / *RADIAC Development*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
NSWCCD continued evaluation of the HRMs for manufacture specifications to evaluate their capabilities. NSWCCD will complete test and evaluation of the commercial units, summarize the results and submit the findings in a Technical Memorandum to NAVSEA 04ND. ***FY 2020 Base Plans:*** NSWCCD will continue market and technical research on commercially available RIDs. Any new or updated information will be appended to the latest Technical Report. NSWCCD will perform a comprehensive review of all VBSS test and evaluation findings to date and continue to request feedback from end-users of the AN/PDX-1 kit regarding performance of the components. Outstanding issues will be cross-referenced with updated information from industry and other technical contacts in order to assess new commercial solutions. NSWCCD will submit a Technical Memorandum to Naval Sea Systems Command (NAVSEA 04ND), summarizing all test and evaluation efforts, as well as any recommendations for incorporating newly developed commercial solutions into the AN/PDX-1 kits. Information from the summary will be used to guide plans for further testing of commercial equipment that would meet VBSS requirements. A specification and procurement package will be developed to solicit a combination of new RIDs, as well as PRDs and HRMs. NSWCCD will solicit and award contracts to buy three new commercial RIDs. The Test Plan will be developed and submitted to Naval Sea Systems Command (NAVSEA 04ND) in order that evaluation of the new RIDs can begin upon delivery. NSWCCD will complete test and evaluation of the RIDs, summarize the results and submit the findings in a Technical Report to NAVSEA 04ND. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** The increase in FY20 from FY19 is to procure test Articles for components of the AN/PDX-1 RADIAC Set to test and evaluate newer technology as potential replacements of equipment used for the Navy's VBSS mission.					
Title: Radiological Detection System	0.150	0.270	0.150	0.000	0.150
Articles:	-	10	-	-	-
Description: The Radiological Detection System (RDS) is a survey meter and its associated probes (alpha, beta, gamma, and neutron) used in a wide variety of applications, and the necessary ancillary equipment such as cases, cables and technical manuals. This type of survey meter system is the single most prevalent RADIAC instrument in the Navy inventory, utilized for every Navy end use but predominantly in the Naval Nuclear					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603542N / *Radiological Control*	**Project (Number/Name)** 1830 / *RADIAC Development*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Propulsion Program (NNPP) and Radiological Defense (RD) end uses. The Joint Product Leader in Radiological Nuclear Defense(JPdl-RND) is currently developing the RDS for use by all the Services. This joint effort will lower the procurement cost for all and just as significantly, for the first time enable joint interoperability in the Radiological Defense arena. The Navy's current version of this instrument is the IM-260/PD Multi-Function RADIAC (MFR), which is 30 years old and nearing the end of its useful life. Army and Marine Corps use the AN/ PDR-75 system and the Air Force the ADM-300, which are both also decades old and obsolescent. The NNPP end use is unique amongst the Services, since only the Navy operates nuclear reactors, and while the RDS solution should prove to be sufficient for all the Services for most of their respective applications, Navy must test and evaluate the proposed RDS to ensure the performance and specifications of a Joint solution will be sufficient to meet the requirements of the NNPP application. ***FY 2019 Plans:*** NSWCCD tested the system to accuracy, energy response, response time and angular response requirements using organic capabilities that test across the necessary photon energy range using both machine (X-ray) and material (radioactive material) sources of radiation. Data from the testing will be provided to JPdL-RND as objective quality evidence of the system's ability to meet the requirements of the technical specification. ***FY 2020 Base Plans:*** NSWCCD will continue to remain abreast of the latest advances in the RDS system. NSWCCD will complete investigation into the logistics infrastructure capabilities of the new systems and provide an assessment in a Technical Memorandum to Naval Sea Systems Command (NAVSEA 04ND) as the Navy prepares to move into the procurement phase. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Procured Low Rate Initial Production units for test and evaluation in FY19. The decrease in FY19 to FY20 is because no further Articles will be procured in FY20; remaining funding is labor for testing and evaluation of the products to ensure they meet Naval Nuclear Propulsion Program requirements.					
Title: Laboratory Test Equipment	0.000	0.165	0.275	0.000	0.275
Articles:	-	1	2	-	2

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603542N / *Radiological Control*	**Project (Number/Name)** 1830 / *RADIAC Development*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Description: Laboratory Test Equipment (Lab TE) will be used to test and evaluate radiation detectors and dosimetry devices. The primary end user will be the Naval Surface Warfare Center Carderock Division (NSWCCD) and the Naval Dosimetry Center (NDC). The beta irradiators will be used throughout the development and procurement of the Navy's new primary dosimetry system to evaluate system performance. Handheld radiation detection equipment from the Radiological Detection System (RDS) can also be evaluated using the beta irradiators. The upgraded Ortec equipment will be used to analyze the new accident dosimeter after exposure to a criticality event. The upgraded Ortec will be used during the product evaluation phase of the accident dosimeter program. ***FY 2019 Plans:*** NSWCCD will initiate a procurement action for the upgrade of an existing BSS-Beta Irradiator to be utilized in the testing of primary and secondary dosimetry. ***FY 2020 Base Plans:*** NSWCCD initiated procurement of a beta irradiator to support existing requirements for primary and secondary dosimetry. NSWCCD will also upgrade an existing ORTEC Spectroscopy system along with associated software to be utilized in testing and evaluating Accident Dosimetry. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Procurement of laboratory equipment with widely varying costs in FY19 and FY20.					
Accomplishments/Planned Programs Subtotals	0.716	0.740	0.689	0.000	0.689

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• OPN 2920: *RADIAC*	10.718	8.175	6.482	-	6.482	8.272	8.158	7.856	8.015	Continuing	Continuing

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603542N / *Radiological Control*	**Project (Number/Name)** 1830 / *RADIAC Development*

D. Acquisition Strategy

Development efforts are focused on evaluation, modification (as required to meet operational requirements) and adaptation of commercial-off-the-shelf (COTS) technology in order to minimize total ownership costs. To the maximum extent possible new contracts are targeted for fixed price efforts to control development cost.

E. Performance Metrics

Program Reviews

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603542N / *Radiological Control*	Project (Number/Name) 1830 / *RADIAC Development*	

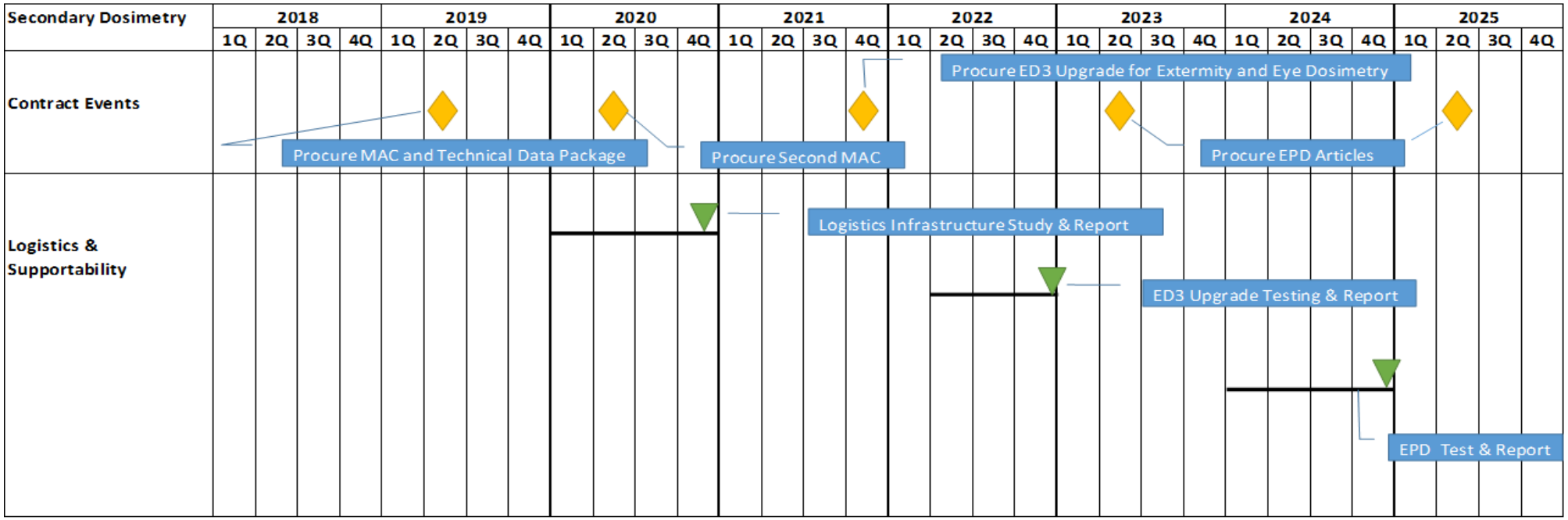
Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Test & Evaluation	WR	NSWCCD : West Bethesda, MD	4.551	0.364	Nov 2017	0.087	Jan 2019	0.420	Nov 2019	-		0.420	Continuing	Continuing	Continuing
Primary Dosimetry	C/FFP	NSWCCD : West Bethesda, MD	0.285	0.030	Jul 2018	0.003	Mar 2019	0.000		-		0.000	0.000	0.318	0.288
Secondary Dosimetry	C/FFP	NSWCCD : West Bethesda, MD	0.162	0.276	Feb 2019	0.250	Nov 2019	0.000		-		0.000	0.000	0.688	0.162
VBSS	C/FFP	NSWCCD : West Bethesda, MD	0.120	0.046	Aug 2018	0.000		0.067	Aug 2020	-		0.067	0.000	0.233	0.246
Radiological Detection System	C/FFP	NSWCCD : West Bethesda, MD	0.000	0.000		0.235	Sep 2019	0.000		-		0.000	0.000	0.235	0.063
Laboratory Test Equipment	C/FFP	NSWCCD : West Bethesda, MD	0.000	0.000		0.165	Mar 2019	0.202	Mar 2020	-		0.202	0.000	0.367	-
		Subtotal	5.118	0.716		0.740		0.689		-		0.689	Continuing	Continuing	N/A

	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	5.118	0.716		0.740		0.689		-		0.689	Continuing	Continuing	N/A

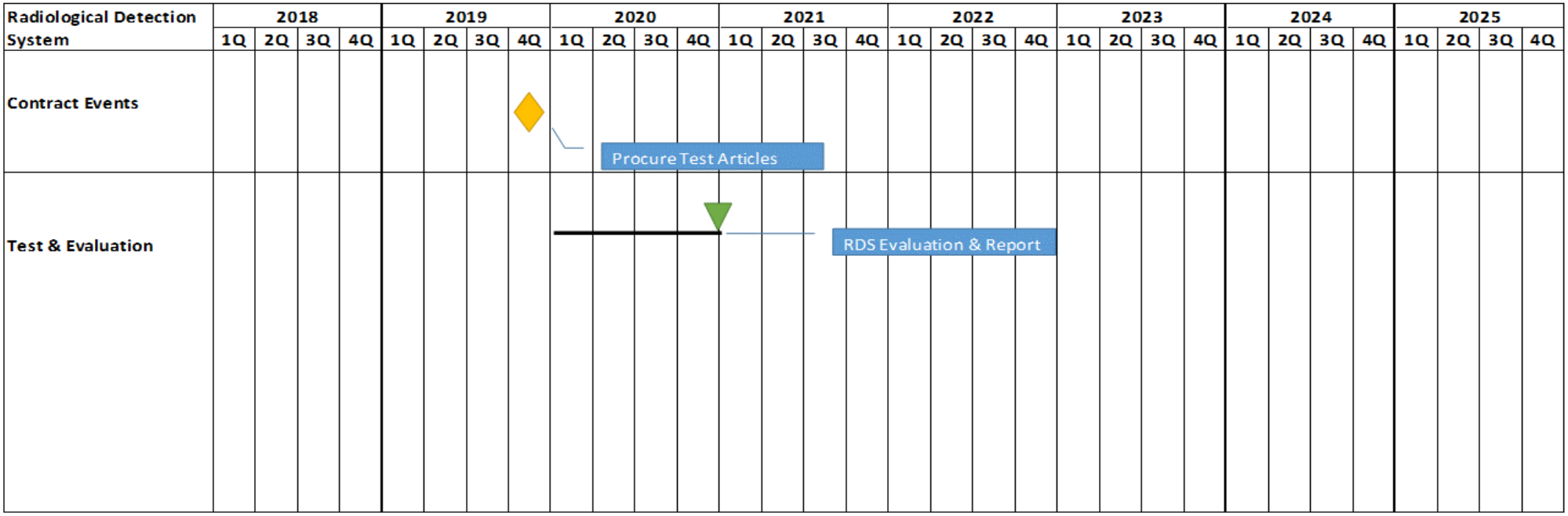
Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603542N / *Radiological Control*	**Project (Number/Name)** 1830 / *RADIAC Development*



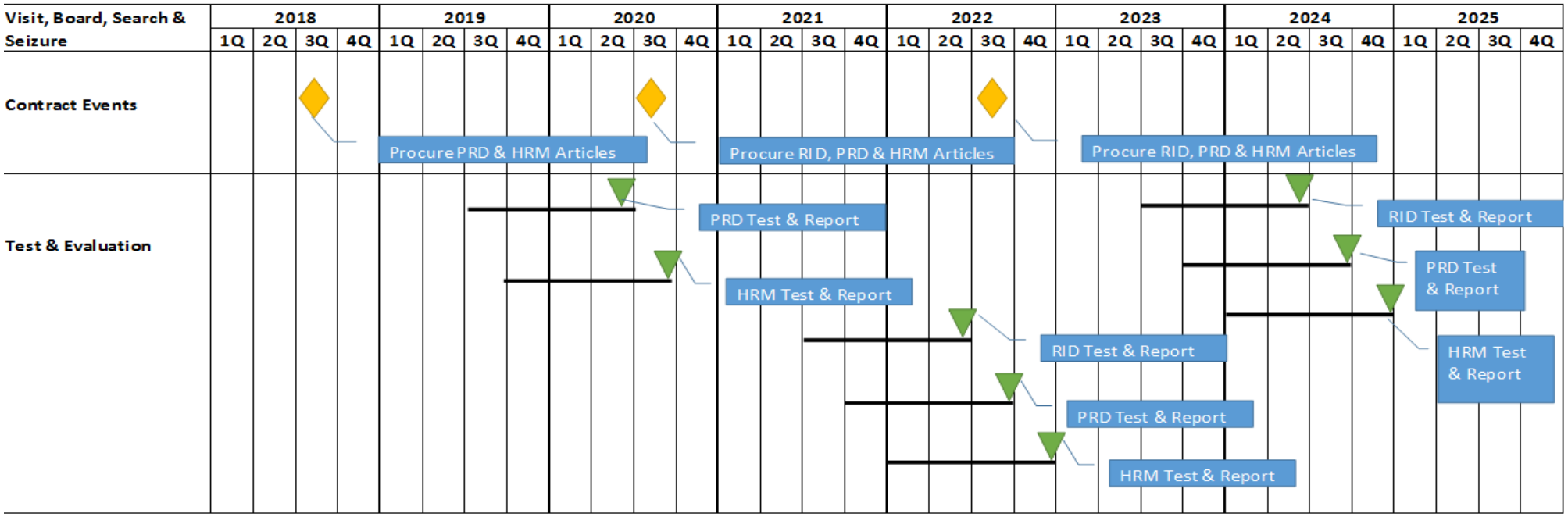
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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603542N / *Radiological Control*	**Project (Number/Name)** 1830 / *RADIAC Development*



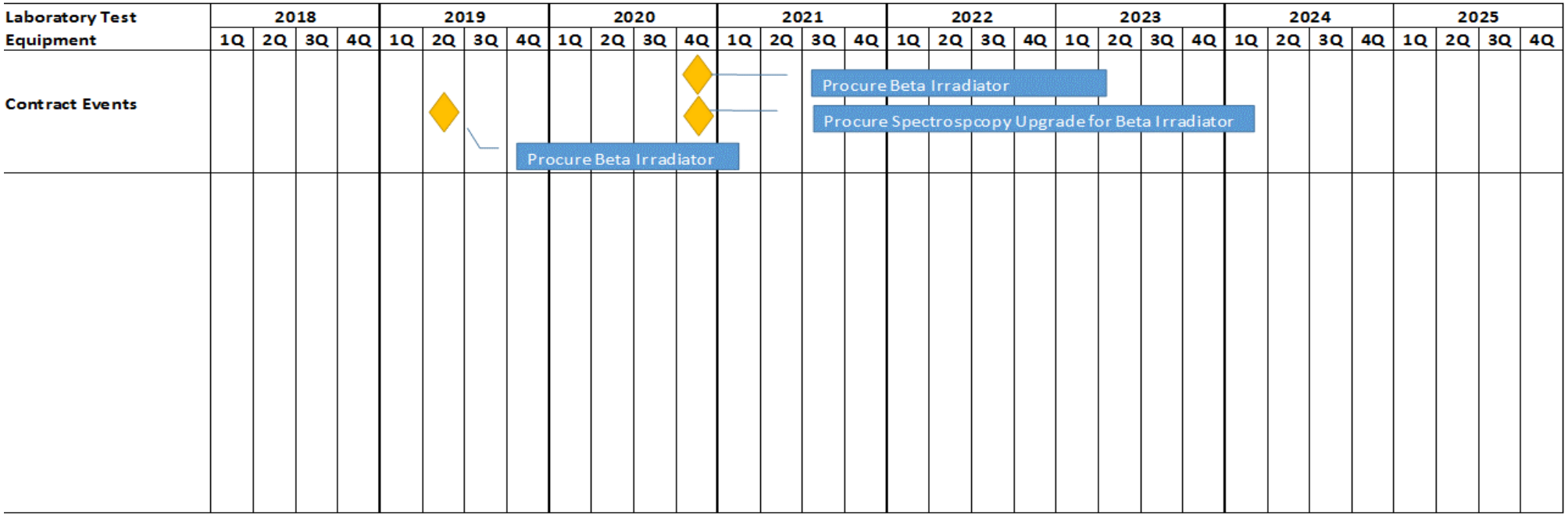
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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603542N / *Radiological Control*	**Project (Number/Name)** 1830 / *RADIAC Development*



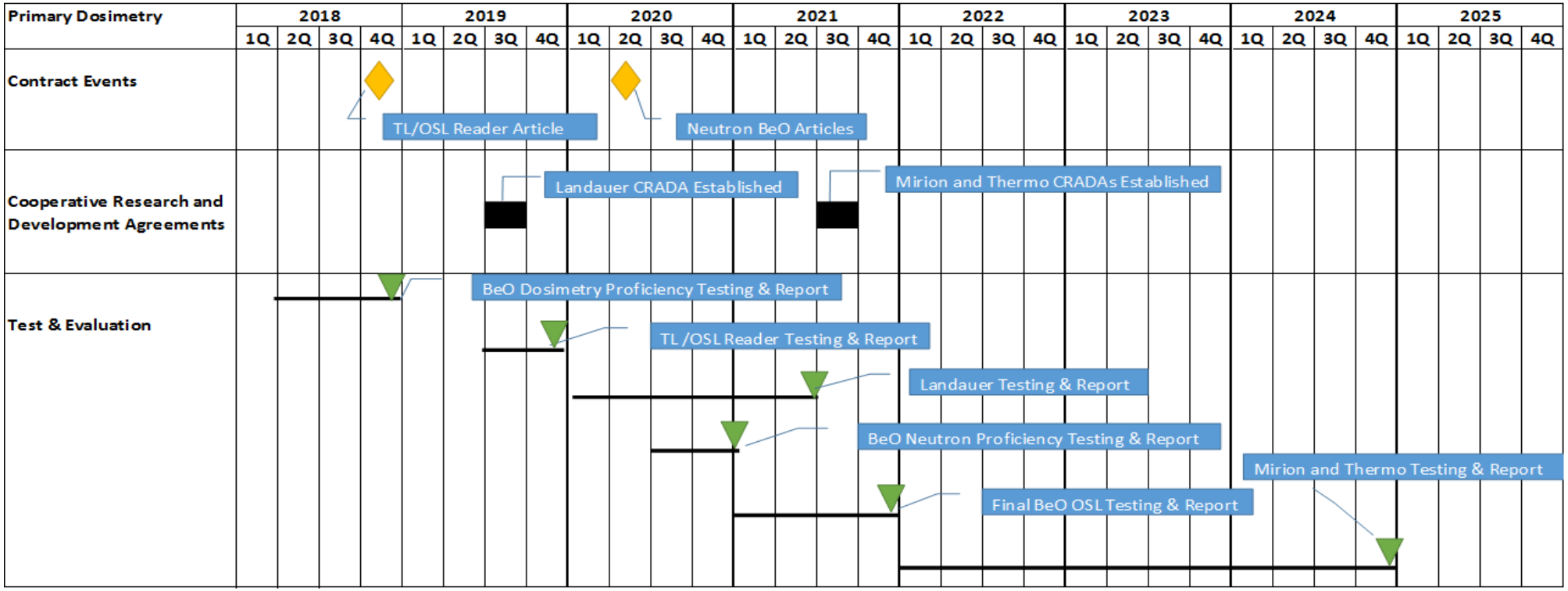
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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603542N / *Radiological Control*	**Project (Number/Name)** 1830 / *RADIAC Development*



20202PB - 0603542N - 1830

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603542N / *Radiological Control*	**Project (Number/Name)** 1830 / *RADIAC Development*



20202PB - 0603542N - 1830

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603542N / *Radiological Control*	**Project (Number/Name)** 1830 / *RADIAC Development*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Primary Dosimetry				
Test & Evaluation: Beryllium Oxide (BeO) Dosimetry Proficiency Test & Report	2	2018	4	2018
Test & Evaluation: Thermoluminescent Optically Stimulated Luminescence Dosimetery Reader Test & Report	3	2019	4	2019
Test & Evaluation: BeO Neutron Proficiency Test & Report	3	2020	4	2020
Test & Evaluation: Compilation Test & Report of BeO Reader and Neutron Dosimeter	1	2021	4	2021
Test & Evaluation: Cooperative Research and Development Agreements: Establish CRADA With Landauer	3	2019	3	2019
Test & Evaluation: Cooperative Research and Development Agreements: Establish CRADA With Mirion and Thermo	3	2021	3	2021
Contract Events: Procure Thermoluminescent Optically Stimulated Luminesence Dosimeter Reader Article	4	2018	4	2018
Contract Events: Procure Neutron Beryllium Oxide Dosimeter Articles	2	2020	2	2020
Secondary Dosimetry				
Test & Evaluation: Logistics Infrastructure Study and Report	1	2020	4	2020
Test & Evaluation: ED3 Test & Report	2	2022	4	2022
Test & Evaluation: EPD Test & Report	1	2024	4	2024
Contract Events: Procure Maintenance & Calibration System (MAC) 1 and Technical Data Package	2	2019	2	2019
Contract Events: Procure Maintenance & Calibration System (MAC) 2	2	2020	2	2020
Contract Events: Procure Extremity Dosimeter (ED3) Articles	4	2021	4	2021
Contract Events: Procure Electronic Personal Dosimeter (EPD) Articles Batch 1	2	2023	2	2023
Radiological Detection System				
Test & Evaluation: Test to Meet Navy Specifications	1	2020	4	2020

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603542N / *Radiological Control*	**Project (Number/Name)** 1830 / *RADIAC Development*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Contract Events: Procure LRIP Units	4	2019	4	2019
Visit, Board, Search & Seizure				
Test & Evaluation: Test & Report on PRD Batch 1	3	2019	2	2020
Test & Evaluation: Test & Report on HRM Batch 1	4	2019	3	2020
Test & Evaluation: Test & Report on RID Batch 2	3	2021	2	2022
Test & Evaluation: Test & Report on PRD Batch 2	4	2021	3	2022
Test & Evaluation: Test & Report on HRM Batch 2	1	2022	4	2022
Test & Evaluation: Test & Report on RID Batch 3	3	2023	2	2024
Test & Evaluation: Test & Report on PRD Batch 3	4	2023	3	2024
Test & Evaluation: Test & Report on HRM Batch 3	1	2024	4	2024
Contract Events: Procure PRD & HRM Articles Batch 1	3	2018	3	2018
Contract Events: Procure RID, PRD & HRM Articles Batch 2	3	2020	3	2020
Contract Events: Procure RID, PRD & HRM Articles Batch 3	3	2022	3	2022
Laboratory Test Equipment				
Procure Beta Irradiator	2	2019	2	2019
Procure Beta Irradiator Upgrade	4	2020	4	2020
Procure Ortec Spectroscopy Upgrade	4	2020	4	2020

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy											Date: March 2019	
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0603553N *I Surface ASW*							
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
Total Program Element	186.900	1.092	1.122	1.137	-	1.137	1.157	1.184	1.209	1.233	Continuing	Continuing
1704: *Undersea Warfare*	186.900	1.092	1.122	1.137	-	1.137	1.157	1.184	1.209	1.233	Continuing	Continuing

A. Mission Description and Budget Item Justification

The Rest-of-the-World (ROW) continues to produce quieter, more lethal submarine technologies. Adaptable commercial technologies are readily available to the ROW navies. These trends increase the threats to U.S. surface combatants, thus requiring a focused effort to identify the most promising Anti-Submarine Warfare (ASW) technologies through a process of discovery, assessment, experimentation, and analysis.

The objective of this Program Element (PE) is to pursue the development of technologies with the goal of improving ASW effectiveness to the point of rendering the enemy submarine irrelevant against US and coalition forces. Studies, experiments and/or technology developments under this PE will seek to improve the ability of surface combatants to detect, classify, localize, and track submerged contacts and detect and defend against modern torpedoes. To achieve these objectives, it is essential to develop new ASW technologies. The product of these efforts will be provided to the Advanced Capability Build (ACB) program supporting the continuing improvement of the AN/SQQ-89(V) Surface Ship Undersea Warfare (USW) Combat System.

B. Program Change Summary ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	1.136	1.122	1.145	-	1.145
Current President's Budget	1.092	1.122	1.137	-	1.137
Total Adjustments	-0.044	0.000	-0.008	-	-0.008
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.044	0.000			
• Program Adjustments	0.000	0.000	-0.008	-	-0.008
• Rate/Misc Adjustments	0.000	0.000	0.000	-	0.000

Change Summary Explanation

FUNDING:

- FY 2018 decrease of $-0.044M reflects a Small Business Innovative Research (SBIR) transfer.
- FY 2020 decrease of $-0.008M reflects Contractor Services Reform reduction.

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0603553N *I Surface ASW*

- FY 2019 to FY 2020 Increase/Decrease Statement: FY 2019 ($1.122M) to FY 2020 ($1.137M) increase ($+0.015M) is in line with inflation associated with the RDT&EN appropriation.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603553N / *Surface ASW*	Project (Number/Name) 1704 / *Undersea Warfare*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
1704: *Undersea Warfare*	186.900	1.092	1.122	1.137	-	1.137	1.157	1.184	1.209	1.233	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Rest-of-the-World (ROW) continues to produce quieter, more lethal submarine technologies. Adaptable commercial technologies are readily available to the ROW navies. These trends increase the threats to U.S. surface combatants, thus requiring a focused effort to identify the most promising Anti-Submarine Warfare (ASW) technologies through a process of discovery, assessment, experimentation, and analysis.

This Project will pursue the development of technologies with the goal of improving ASW effectiveness to the point of rendering the enemy submarine irrelevant against U.S. and coalition forces. Studies, experiments and/or technology developments under this project will seek to improve the ability of surface combatants to detect, classify, localize, and track submerged contacts and detect and defend against modern torpedoes. To achieve these objectives, it is essential to develop new ASW technologies. The product of these efforts will be provided to the ACB program supporting the continuing improvement of the AN/SQQ-89(V) Surface Ship USW Combat System.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: ASW Concept Development/Studies	1.092	1.122	1.137	0.000	1.137
Articles:	-	-	-	-	-
FY 2019 Plans: - Award new development contract via BAA solicitation process in support of AN/SQQ-89(V) Surface Ship USW Combat System Fleet requirements. - Initiate capability development and submit to the AN/SQQ-89(V) Surface Ship USW ACB program from Step 1 (algorithm/technology assessment by peer review panel of Subject Matter Experts (SME)) and Step 2 (algorithm/technology testing with open and closed data sets to refine capabilities prior to integration) testing. Capabilities will support color-map improvements for Torpedo Defense (TD) and ASW, and development of a statistical model of Continuous Active Sonar (CAS) as compared to Pulsed Active Sonar (PAS) waveform performance to provide testable hypotheses for any data collection. The model will inform updates to Concept of Employment (CONEMP)for the operator and theoretical basis to compare different proposed CAS waveform modifications. Effort also includes developing Passive Augmented Doppler Matched Active Processing (DMAP) which associates active TD clusters with passive tracks to provide earlier and single-ping classifications.					
FY 2020 Base Plans:					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603553N / *Surface ASW*	**Project (Number/Name)** 1704 / *Undersea Warfare*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
- Continue development efforts supporting color-map improvements for TD and ASW, and development of a statistical model of CAS as compared to PAS waveform performance to provide testable hypotheses for any data collection. - Continue developing Passive Augmented DMAP, which associates active TD clusters with passive tracks to provide earlier and single-ping classifications. - Submit technology to Step 3 for laboratory testing and eventual delivery to operational use via ACB-21. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** The increase from FY 2019 to FY 2020 ($+0.015M) is in line with inflation associated with the RDT&EN appropriation.					
Accomplishments/Planned Programs Subtotals	1.092	1.122	1.137	0.000	1.137

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• RDTEN/0205620N/1916: *Surface ASW System Improvement*	28.410	26.321	29.572	-	29.572	29.323	29.876	30.474	31.080	Continuing	Continuing
• OPN/2136: *AN/SQQ-89 Surf ASW Cmbt Sys*	100.222	114.344	125.237	-	125.237	127.182	132.416	135.022	137.721	Continuing	Continuing

Remarks

D. Acquisition Strategy

Use competitively awarded contracts from Broad Agency Announcement (BAA) solicitations.

E. Performance Metrics

Investigate promising ASW technologies via the four step ACB spiral development/improvement process.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603553N / *Surface ASW*	Project (Number/Name) 1704 / *Undersea Warfare*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Technology Development	C/CPFF	AAC : NY	1.134	0.000		0.000		0.000		-		0.000	0.000	1.134	-
Technology Development	C/CPFF	Adaptive Methods : VA	3.788	0.000		0.000		0.000		-		0.000	0.000	3.788	-
Technology Development	C/CPFF	Alion Sciences : VA	8.000	0.000		0.000		0.000		-		0.000	0.000	8.000	-
Technology Development	C/CPAF	EG&G : VA	2.050	0.000		0.000		0.000		-		0.000	0.000	2.050	-
Technology Development	C/CPFF	In-Depth Engineering : VA	3.635	0.000		0.000		0.000		-		0.000	0.000	3.635	-
Technology Development	C/CPFF	JHU/APL : MD	25.333	0.000		0.000		0.000		-		0.000	0.000	25.333	-
Technology Development	C/CPFF	L-3 Communications : VA	3.000	0.000		0.000		0.000		-		0.000	0.000	3.000	-
Technology Development	C/CPFF	Lockheed Martin - ISS : NY	7.110	0.000		0.000		0.000		-		0.000	0.000	7.110	-
Technology Development	WR	NSWC/Carderock : MD	3.201	0.000		0.000		0.000		-		0.000	0.000	3.201	-
Technology Development	WR	NUWC/Keyport : WA	0.790	0.000		0.000		0.000		-		0.000	0.000	0.790	-
Technology Development	WR	NUWC/Newport : RI	33.260	0.000		0.000		0.000		-		0.000	0.000	33.260	-
Technology Development	C/CPFF	Northrop Grumman : VA	4.684	0.000		0.000		0.000		-		0.000	0.000	4.684	-
Technology Development	C/CPFF	UT/ARL : TX	4.908	0.000		0.000		0.000		-		0.000	0.000	4.908	-
Technology Development	C/CPFF	VAR : VAR*	4.694	0.000		0.000		0.000		-		0.000	0.000	4.694	-
Technology Development	WR	NFESC/PH : CA	5.350	0.000		0.000		0.000		-		0.000	0.000	5.350	-
Technology Development	MIPR	SSGC : MS	3.253	0.000		0.000		0.000		-		0.000	0.000	3.253	-
Detection/Classification Algorithms (LRS)	WR	NAWC/Pax River : MD	2.400	0.000		0.000		0.000		-		0.000	0.000	2.400	-
Detection/Classification Algorithms (LRS)	C/CPFF	VAR : VAR*	8.600	0.000		0.000		0.000		-		0.000	0.000	8.600	-
Technology Development (LRS)	WR	NRL : DC	2.500	0.000		0.000		0.000		-		0.000	0.000	2.500	-
Technology Development (LRS)	C/CPFF	VAR : VAR*	14.950	0.000		0.000		0.000		-		0.000	0.000	14.950	-
		Subtotal	142.640	0.000		0.000		0.000		-		0.000	0.000	142.640	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603553N / *Surface ASW*	Project (Number/Name) 1704 / *Undersea Warfare*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract

Remarks

*Consists of multiple performing activities with funding for each not greater than $1M per year.

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
At-Sea Test/Experiment	WR	ONR : VA	5.500	0.000		0.000		0.000		-		0.000	0.000	5.500	-
Developmental Test & Evaluation	C/CPFF	AAC : NY	1.067	0.000		0.000		0.000		-		0.000	0.000	1.067	-
Developmental Test & Evaluation	C/CPFF	ALION : IL	0.749	0.000		0.000		0.000		-		0.000	0.000	0.749	-
Developmental Test & Evaluation	C/CPFF	Applied Physical Sciences : CT	0.749	0.401	Jan 2018	0.301	Dec 2018	0.307	Dec 2019	-		0.307	Continuing	Continuing	Continuing
Developmental Test & Evaluation	C/CPFF	JHU/APL : MD	2.735	0.000		0.000		0.000		-		0.000	0.000	2.735	-
Developmental Test & Evaluation	WR	NRL : DC	0.537	0.000		0.000		0.000		-		0.000	0.000	0.537	-
Developmental Test & Evaluation	WR	NSMA : VA	0.907	0.000		0.000		0.000		-		0.000	0.000	0.907	-
Developmental Test & Evaluation	WR	NSWC/Carderock : MD	1.172	0.000		0.000		0.000		-		0.000	0.000	1.172	-
Developmental Test & Evaluation	WR	NUWC/Newport : RI	11.453	0.157	Jan 2018	0.045	Jan 2019	0.045	Nov 2019	-		0.045	Continuing	Continuing	Continuing
Developmental Test & Evaluation	WR	SPAWAR : CA	0.277	0.000		0.000		0.000		-		0.000	0.000	0.277	-
Developmental Test & Evaluation	C/CPFF	UT/ARL : TX	1.844	0.000		0.000		0.000		-		0.000	0.000	1.844	-
Developmental Test & Evaluation	C/CPFF	VAR : VAR*	5.394	0.033	Feb 2018	0.276	Dec 2018	0.275	Dec 2019	-		0.275	Continuing	Continuing	Continuing
Enhanced Data Collection	C/CPFF	JHU/APL : MD	4.462	0.000		0.000		0.000		-		0.000	0.000	4.462	-
Enhanced Data Collection	C/CPFF	UT/ARL : TX	2.000	0.000		0.000		0.000		-		0.000	0.000	2.000	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603553N / *Surface ASW*	Project (Number/Name) 1704 / *Undersea Warfare*	

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
		Subtotal	38.846	0.591		0.622		0.627		-		0.627	Continuing	Continuing	N/A

Remarks

*Consists of multiple performing activities with funding for each not greater than $1M per year.

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management Support	C/CPAF	BAE Systems : MD	4.824	0.000		0.000		0.000		-		0.000	0.000	4.824	-
Program Management Support	C/CPIF	CGI Federal : VA	0.240	0.501	Jan 2018	0.500	Dec 2018	0.510	Dec 2019	-		0.510	Continuing	Continuing	Continuing
Travel	Allot	NAVSEA PEO IWS 5 : DC	0.300	0.000		0.000		0.000		-		0.000	0.000	0.300	-
Travel (LRS)	Allot	ONR : DC	0.050	0.000		0.000		0.000		-		0.000	0.000	0.050	-
		Subtotal	5.414	0.501		0.500		0.510		-		0.510	Continuing	Continuing	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	186.900	1.092		1.122		1.137		-		1.137	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603553N / *Surface ASW*	**Project (Number/Name)** 1704 / *Undersea Warfare*

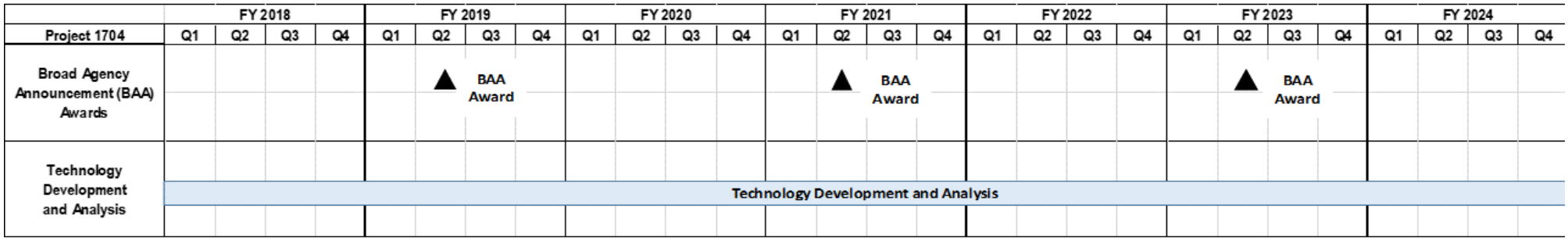


Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603553N / *Surface ASW*	**Project (Number/Name)** 1704 / *Undersea Warfare*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 1704.L24				
Broad Agency Announcement (BAA) Awards: BAA Award - 2019	2	2019	2	2019
Broad Agency Announcement (BAA) Awards: BAA Award - 2021	2	2021	2	2021
Broad Agency Announcement (BAA) Awards: BAA Award - 2023	2	2023	2	2023
Technology Development and Analysis: Technology Development and Analysis	1	2018	4	2024

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy											Date: March 2019	
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0603561N *I Advanced Submarine System Development*							
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
Total Program Element	1,029.545	91.927	105.809	148.756	-	148.756	166.138	150.126	169.750	185.054	Continuing	Continuing
0223: *Sub Combat System Improvement (ADV)*	526.594	39.648	45.898	51.151	-	51.151	53.935	55.734	57.763	58.817	Continuing	Continuing
2033: *Adv Submarine Systems Development*	499.151	34.513	30.615	34.857	-	34.857	27.781	26.653	23.002	23.933	Continuing	Continuing
2096: *Payload Delivery Development*	3.800	4.738	10.969	13.936	-	13.936	12.424	10.007	13.747	14.015	Continuing	Continuing
3391: *SSN/SSGN Survivability Program*	0.000	8.203	8.327	10.123	-	10.123	11.522	12.027	11.573	12.825	Continuing	Continuing
9710: *Advanced Submarine Technology Development*	0.000	0.000	0.000	38.689	-	38.689	60.476	45.705	63.665	75.464	Continuing	Continuing
9999: *Congressional Adds*	0.000	4.825	10.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	14.825

Note

Project 9710 was previously funded in FY 2019 under Program Element 0604250D8Z (Advanced Innovative Technologies) Project 250 (Advanced Innovative Technologies). This is a Navy new start.

A. Mission Description and Budget Item Justification

The FY 2020 funding request was reduced by $3.000M to account for the availability of prior year execution balances.

This Program Element (PE) supports innovative research and development in submarine Hull, Mechanical and Electrical (HM&E) and combat systems technologies and the subsequent evaluation, demonstration, and validation for submarine platforms. It will increase the submarine technology base and provide subsystem design options not currently feasible. The program element also supports programs transitioning from Science and Technology (S&T), Defense Advanced Research Projects Agency (DARPA), Independent Research and Development, and Small Business Innovation Research (SBIR) projects.

PROJECT 0223: The Submarine Combat System Improvement (Advanced) (Non-ACAT) Project researches, develops, and tests new sonar, combat system, imaging, and electronic warfare software and develops, tests, and prototypes new sonar arrays for Program Executive Office Submarine (PEO SUB) programs, delivering about thirty (30) new capabilities every other year. This Project supports Navy Submarine Acoustic Superiority and Technology Insertion Initiatives through the application of advanced development and testing of sensors and sensor processing systems supporting tactical control systems improvements. Improvements are supportive of A Cooperative Strategy for 21st Century Sea Power and the Chief of Naval Operations (CNO) Design for Maintaining Maritime Superiority; addressing all components to include Strengthen Naval Power At and From Sea, Achieve High Velocity Learning, Strengthen Our Navy Team for the Future, and Expand and Strengthen Our Network

of Partners. This Project addresses threats posed by China, Russia, Iran, Korea and Terrorism (CRIKT), improved lethality of U.S. Submarine Forces and 3rd Offset Capabilities in the Unmanned and Automated Systems domains.

Project 0223 is comprised of four (4) major efforts: Advanced Processing Builds (APB), Flank Array Demonstration (FAD), Advanced Sensors, and Large Vertical Array (LVA).

APB develops, tests and transitions capabilities for:
- APB Acoustics, transitioning to AN/BQQ-10
- APB Tactical Control, transitioning to AN/BYG-1
- APB Imaging, transitioning to AN/BVY-1
- APB Electronic Warfare (EW), transitioning to AN/BLQ-10

Flank Array Demonstration (FAD) conducts testing and analysis on the existing Large Vertical Array (LVA) and supports maintenance and correction of identified problems on the array.

Advanced Sensors develops new technologies for Hull Mounted and Towed Arrays. Hull Mounted improvements support submarine applications only. Towed array improvements are shared to support surface and surveillance applications, as well.

Large Vertical Array (LVA) leverages demonstrated FAD developments to conduct critical testing and analysis needed to improve array performance and develop sensor employment tactics. It will introduce new electronic hardware and new software applications to enhance array and signal processing performance. These improvements will be incorporated in future LVA builds for VIRGINIA class SSNs and OHIO and COLUMBIA classes of SSBNs.

PROJECT 2033: The Advanced Submarine Systems Development (ASSD) Program is a non-acquisition program that develops and matures technologies for successful integration into future and modernized submarine classes, thus lowering acquisition and life cycle program costs while improving mission capability. ASSD transitions Hull, Mechanical, and Electrical (HM&E) technologies and future naval concepts from Science & Technology (S&T) and Research and Development (R&D) to operational platforms; performs tests and demonstrates submarine design and naval architecture products destined for integration into future submarine classes or backfit into existing fleet assets; develops, initially integrates, and does test validation of leading payload concepts for submarine integration in support of the Design for Undersea Warfare; and operates unique R&D experimentation, modeling, testing and simulation facilities to enhance submarine stealth, maneuverability, capability, and affordability. The program also supports Small Business Innovation Research (SBIR), Small Business Technology Transfer (STTR), Office of Naval Research (ONR), Defense Advanced Research Projects Agency (DARPA) programs, and near and mid-term technology insertion to achieve future submarine class total ownership cost reductions, and influence future submarine concept designs and core technologies. Experimentation and demonstration is conducted in a joint warfighting context with other services, (i.e. the U.S. Marines, U.S. Army, and the U.S. Air Force), to enable early assessment of warfighting capabilities, and to contribute to smarter technology selection decisions for potential incremental development. This program also supports Information Exchange Programs and joint Project Agreements (PA) with the United Kingdom, Canada, Australia and other international partners.

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0603561N *I Advanced Submarine System Development*

Project 2033 is comprised of three budget categories: Strategic Capability Infrastructure, Long Range R&D Investment, Rapid Prototyping.

The major developmental efforts include:

Strategic Capability Infrastructure
- Large Scale Vehicle (LSV)
- Intermediate Scale Measurement System (ISMS)

Long Range R&D Investment
- Advanced Submarine Control (Secondary Propulsion System)
- Advanced Material Propeller (AMP) Technology
- Innovation Technology Transition (SBIRs/STTRs)
- Next Generation Attack Submarine (SSN(X)) Technologies
- Next Generation (NG) Thrust
- Submarine Signature Management/Acoustic Superiority
- Advanced Hull Coatings
- Next Generation Towed Array Reliability
- Support of ONR Future Naval Capability (FNC) new starts
- Hydraulic Elimination through Electrification

Rapid Prototyping
- Common Unmanned Aerial Vehicle (UAS) Comms
- Fleet Module Autonomous Underwater Vehicle (FMAUV)
- Li-Ion Battery FMAUV Submarine Integration
- Clandestine Delivered Mine (CDM)
- Advanced Weapons Enhanced by Submarine UAS against Mobile targets (AWESUM)/Blackwing Unmanned Aerial System (UAS)
- Submarine Payload Integration
- Electronic Warfare/Intelligence Surveillance and Reconnaissance (EW/ISR) Unmanned Underwater Vehicle (UUV) Payload
- Submarine Launch Decoy

PROJECT 2096: Payload Delivery Development, consists of two (2) sub-projects:

- Payload Handling System (PHS)
- 3" Sub Launched Unmanned "K" Aerial System (SL-UKAS)

Payload Delivery Development is a non-acquisition program that supports innovative research and development efforts to enable integration of deployable and/or retrievable undersea vehicles, payload concepts, and offboard systems through design, manufacture, test/demonstration, evaluation, and validation for submarine

platforms. In addition to technology development, the program will support engineering and integration of new and existing technologies to enable rapid prototyping and fielding of capabilities which will inform and provide solutions to urgent war-fighter needs. Experimentation will be conducted with the Fleet (i.e., Commander, Naval Submarine Forces (COMSUBFOR), Unmanned Undersea Vehicle Squadron One (UUVRON ONE), etc., enabling an agile environment through at-sea demonstrations, which will provide Fleet and acquisition stakeholders with relevant payload employment data to inform Concepts of Operations (CONOPs) and fielding decisions. The program will furthermore support transition of high-interest systems and/or payloads from research and development to Programs of Record (PoRs), as appropriate.

PROJECT 3391: In 2013, OPNAV N97 established SSN/SSGN Survivability Program (S3P) as a separate project area within ASSD to assure SSN/SSGN survivability and the ability of submarines to complete their joint warfighting missions even if covert mobility is compromised. FY18 is the first year of S3P execution as Project 3391 under ASSD with level funding across the FYDP. PBR 19 proposes technology projects that would help pace world-wide technology advances and red investments so as to track and assess US undersea superiority technology insertion plans and their impact on SSN/SSGN survivability.

PROJECT 9710: This program was previously funded in FY 2019 by the Office of the Secretary of Defense (OSD) Strategic Capabilities Office (SCO) under Program Element 0604250D8Z (Advanced Innovative Technologies) Project 250 (Advanced Innovative Technologies) and consists of two (2) sub-projects:

- Project 1
- New Payload Launcher Device (PLD)

Project 1 leverages a separately funded advanced demonstration initiative that launches an existing payload (Payload 1) from U.S. Submarine classes. The payload and ship system integration are managed by separate programs, with further details classified. By leveraging the successful demonstration system, engineering and design work commences rapidly, as it is largely a spiral design upgrade to the demonstration capability and has planning and integration work on which to build. In FY2020 begin initial developmental engineering and design work, award the development contract and conduct the PDR.

In FY2020 a New PLD will be developed to eject payloads out of current submarine ejection systems. The current device lacks the energetic capacity to support the weight and scope of desired larger payloads (Project 1 and others). Rapid development of the new device allows for early integration and testing support for these future payloads, avoiding later costs and redesign of the payload systems. FY2020 efforts include development through preliminary design review (PDR) and critical design review (CDR).

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0603561N *I Advanced Submarine System Development*

B. Program Change Summary ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	100.955	109.086	113.460	-	113.460
Current President's Budget	91.927	105.809	148.756	-	148.756
Total Adjustments	-9.028	-3.277	35.296	-	35.296
• Congressional General Reductions	-	-0.070			
• Congressional Directed Reductions	-	-13.207			
• Congressional Rescissions	-	-			
• Congressional Adds	-	10.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-0.300	0.000			
• SBIR/STTR Transfer	-2.245	0.000			
• Program Adjustments	0.000	0.000	36.291	-	36.291
• Rate/Misc Adjustments	0.000	0.000	-0.995	-	-0.995
• Congressional General Reductions Adjustments	-0.483	-	-	-	-
• Congressional Directed Reductions Adjustments	-11.000	-	-	-	-
• Congressional Add Adjustments	5.000	-	-	-	-

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2018	FY 2019
Project: 9999: *Congressional Adds*		
Congressional Add: *Littoral Water Threats*	4.825	5.000
Congressional Add: *Lightweight Composite Research*	0.000	5.000
Congressional Add Subtotals for Project: 9999	4.825	10.000
Congressional Add Totals for all Projects	4.825	10.000

Change Summary Explanation

FUNDING CHANGES AT THE OVERALL PE LEVEL:

- FY 2018 decrease of $-9.028M included: $-0.483M for Congressional General Reductions; $-11.000M for Congressional Directed Reductions; $+5.000M for a Littoral Water Threats Congressional Add; $-0.300M for Reprogramming; and $-2.245M for Small Business Innovative Research (SBIR) transfer.
- FY 2019 decrease of $-3.277M included: $-0.070M for Congressional General Reductions; $-13.207M for Congressional Directed Reductions; $+5.000M for Littoral Water Threats Congressional Add; $+5.000M for Lightweight Composite Research Congressional Add.

- FY 2020 overall increase of $+35.296M included: $+2.000M for Project 0223 Large Vertical Array (LVA); $-3.000M reduction to Project 2033 to account for the availability of prior year execution balances; $+5.688M for realignment of funding into Project 2033; $-8.600M realignment of funding out of Project 2096; $+1.770M for realignment of funding into Project 3391; $+38.689M for realignment of funding into PE for Project 9710; and $-0.995M for various rate adjustments.

PROJECT 0223:

FUNDING: The FY 2019 ($45.898M) to FY 2020 ($51.151M) budget increase ($+5.253M) was driven by the addition of $+2.000M for LVA development, $+3.200M for Advanced Sensor development, and $+1.078M for APB development, with a decrease of $-0.950M for Flank Array Demonstration (FAD). Details on each program's budget increase/decrease from FY 2019 to FY 2020 are as follows:

APB - FY 2019 to FY 2020 increase ($+1.003M) is driven by the initiation of new studies on the use of Machine Learning, Artificial Intelligence (AI), and Big Data Analytics, as required to identify system performance improvements and 3rd Offset (automation) capabilities not currently achievable with legacy technology, develop new automation tools and processing for Unmanned Vehicles and vulnerabilities to CRIKT, and essential to the forward plan for APB-21 to pace emerging threats.

FAD - FY 2019 to FY 2020 decrease ($-0.950M) is in accordance with original program plans. Efforts in FY 2020 will be limited to the maintenance, troubleshooting and repair of faulty or failed array inboard/outboard components.

Advanced Sensors - FY 2019 to FY 2020 increase ($+3.200M) is required for fabrication and testing of a full length Open Architecture Telemetry (OAT) Advanced Development Model (ADM) and testing of active and passive sensor design concept panel for the new Bow Conformal Array (BCA) and initial detailed design efforts. Additional BCA testing is necessary to validate studies conducted in FY 2018 and FY 2019 and to collect data that will be used to improve the acoustic performance of the BCA ADM. BCA ADM detail design will commence in FY 2020.

LVA - New requirement in FY 2020 ($+2.000M). An advanced LVA development program is required to pace the threat of evolutionary quieting of adversary submarines. This effort will begin with at-sea testing and analyses in FY 2020 then ramp up over the FYDP to develop sensor and processing hardware improvements, and signal processing and tactics for each planned submarine platform.

SCHEDULE: APB-19 development and testing was accelerated by six (6) months to accommodate changes in PEO SUB production programs, availability of development facilities, and recent implementation of a conveyor-type development approach. This acceleration will enable a regular every-other year cadence of 1Q at-sea testing and 2Q transition to production for future APBs.

PROJECT 2033:

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0603561N *I Advanced Submarine System Development*

FY 2018: Increase in the Strategic R&D infrastructure due to obsolescence and tracking range upgrades for LSV-2. This includes installation of new steering and diving prototype funded by FY16 congressional add. Decrease in long-range R&D is due to completion of procurement of long-lead materials (hull treatment) for the SSN-790 demonstration.

FY 2019: Increase in Strategic R&D infrastructure due to obsolescence and tracking range upgrades for LSV-2 at ARD Bayview. Conduct design and approval process for replacement Inverter and Converter modules, procure materials and construct prototype units, test units, and revise design as necessary to prepare for full-ship-set production.

The FY 2019 funding request was previously reduced by $2.100 million to account for the availability of prior year execution balances.

The FY 2020 funding request was reduced by $-3.000M to account for the availability of prior year execution balances.

PROJECT 2096:

FY 2018: Congressionally directed program adjustment; Decrease of $11M.

FY 2018 to FY 2019: PHS increased funding from FY18 to FY19 is required for Long Lead Time Material (LLTM) procurement in order to maintain schedule for installation and testing onboard an SSGN. Additional increased funding includes component prototype development and testing, and design and engineering team support.

PROJECT 3391:

Established in FY18. SSN/SSGN Survivability Program (S3P) previously funded under Project 2033 through FY17.

PROJECT 9710:

Project 1 and New Payload Launcher Device (PLD) program was previously funded in FY 2019 by the Office of the Secretary of Defense (OSD) Strategic Capabilities Office (SCO) under Program Element 0604250D8Z (Advanced Innovative Technologies) Project 250 (Advanced Innovative Technologies) ($ +38.689M).

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603561N / *Advanced Submarine System Development*	Project (Number/Name) 0223 / *Sub Combat System Improvement (ADV)*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
0223: *Sub Combat System Improvement (ADV)*	526.594	39.648	45.898	51.151	-	51.151	53.935	55.734	57.763	58.817	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Submarine Combat System Improvement (Advanced) (Non-ACAT) Project addresses technology challenges to improve tactical control in littoral and open ocean environments for a variety of operational missions including peacetime engagement, surveillance, battle space preparation, deterrence, regional sea denial, precision strike, task group support, and ground warfare support. These technologies, developed by Navy technology bases, the private sector, ONR, FNC, and DARPA are then transitioned. Prototype hardware/software systems are developed to demonstrate technologically promising system concepts in laboratory and at-sea submarine environments. The Advanced Sensor development program develops and tests new sensors and demonstrates large array configurations. Current efforts are directed at Towed Array sensor technologies, telemetry, and architecture, to improve reliability and performance while decreasing program life cycle costs. For large array configurations, Conformal Acoustic Velocity Sonar (CAVES), Wide Aperture Array (WAA), Large Vertical Aperture (LVA) and Large Flank Array (LFA) technologies are also being pursued. The focus of sensor processing technology efforts through the APB program will address improvements in imaging, tactical control, Electronic Warfare (EW) and acoustics, including detection, localization, classification, ranging, tracking, situational awareness, tactical decision aides, command decision support tools and displays and other functions essential to mission success. APB will also develop capabilities related to Unmanned Aerial and Undersea Vehicles and automated technologies specific to CRIKT. Technologies and/or capabilities developed under this Project will be shared, as applicable to reduce costs and optimize reuse, with development programs for surface ship sonar, Advanced Capability Build (ACB) and surveillance platforms, Advanced Surveillance Build (ASB). ACB and APB are managed under a common development process titled AxB. While each platform retains its uniqueness and focus in functional domains essential to mission success, a premium is placed on development of common capabilities and modular architecture technologies to maximize commonality and cost effectiveness.

This Project will also participate in, and take advantage of, the Tactical Advancements for the Next Generation (TANG) initiative that utilizes Commercial Industrial Design Thinking methodologies to engage the Fleet in generating innovative improvement concepts for Submarine and Surface systems.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Advanced Processing Build (APB)	33.873	40.773	41.776	0.000	41.776
Articles:	-	-	-	-	-
Description: APB is a four Step process: Step 1 - algorithm/technology assessment by peer review panels of Subject Matter Experts (SME) to down-select technologies and assist developers with technical guidance. Step 2 - algorithm/technology testing with open and closed data sets to further down-select and refine capabilities prior to integration and testing.					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603561N / *Advanced Submarine System Development*	**Project (Number/Name)** 0223 / *Sub Combat System Improvement (ADV)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Step 3 - land-based system-level testing stimulated by the Submarine Multi-Mission Team Trainer (SMMTT), in a realistic tactical environment. Step 4 - at-sea testing on an operational submarine. APB requirements are generated by the Submarine Tactical Requirements Group (STRG), a group of senior post command officers chaired by the Flag Officer, Director of Undersea Warfare Development Center (UWDC). Requirements are vetted by COMSUBPAC and COMSUBFOR, then provided as direction by CNO, N97. PEO SUB provides Milestone Decision Authority (MDA) oversight and approval. Beginning in FY17, Steps 1 and 2 are conducted in a pipeline style, parallel to system integration and production. This makes Steps 1 and 2 independent of any particular Build (e.g APB-17) and allows for development of longer lead technologies. The content of a specific APB build (every two years on the odd year) is then determined through a series of discussions with the Fleet/STRG aimed at selecting the most relevant and mature technologies available in the APB pipeline. Integration at the String and System level is performed followed by Steps 3 and 4, as applicable, and transitioned to production. ***FY 2019 Plans:*** - Continue advanced concepts, data collection and analysis for EW APB. - Establish EW APB land-based development environment. Expect to design and procure signal processors, tuners, high speed data recorders, and advanced simulation and simulation equipment. The development environment should be able to simulate or ingest real world radar data. - Initiate industry participation in EW development. Accept industry innovations for testing at land-based facilities. - Develop improved EW direction finding, environmental assessment, and detection algorithms. Initiate studies for electronic attack. - Continue development of a Sonar Tactical Decision Aid (STDA) common to submarine, surface, and surveillance applications. Begin to export basic development products to Surface and Surveillance programs. - Initiate development of automated technologies specific to CRIKT, targeting particular vulnerabilities. - Integrate APB-19 capabilities and initiate Step-3 land based testing. - Continue Step 1 and Step 2 development and testing of concepts, algorithms, and technologies in response to Fleet requirements consistent with the multi-year capability development road map developed in FY 2018. - Collaborate with the Submarine Tactical Requirements Group (STRG) and Information Warfighting Development Center (IWDC) to select candidate imaging, acoustic, tactical control and EW capabilities for APB-21.					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603561N / *Advanced Submarine System Development*	**Project (Number/Name)** 0223 / *Sub Combat System Improvement (ADV)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
- Refine candidate APB-21 capabilities and begin integration into the prior production baseline. ***FY 2020 Base Plans:*** - Continue refining and integration of candidate capabilities for inclusion in APB-21. - Conduct Step-3 land-based testing of APB-21. - Conduct Step-4 at-sea test of APB-19. Analyze results to inform improvements, tactics and training. - Begin developing and testing new EW capabilities in the land-based development environment established in FY 2019. - Initiate development of electronic attack capabilities. - Continue development of a STDA common to submarine, surface, and surveillance applications. Continue to export development products to Surface programs. - Initiate studies on the use of Machine Learning, Artificial Intelligence (AI), and Big Data Analytics. Seek system performance improvements and 3rd Offset (automation) capabilities not currently achievable with legacy technology. - Continue development of automated technologies specific to CRIKT, targeting particular vulnerabilities. - Continue Step 1 and Step 2 development and testing of concepts, algorithms, and technologies in response to Fleet requirements consistent with the multi-year capability development road map developed in FY 2018. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** FY 2019 to FY 2020 increase ($+1.003M) is driven by the initiation of new studies on the use of Machine Learning, Artificial Intelligence (AI), and Big Data Analytics, as required to identify system performance improvements and 3rd Offset (automation) capabilities not currently achievable with legacy technology, develop new automation tools and processing for Unmanned Vehicles and vulnerabilities to CRIKT, and essential to the forward plan for APB-21 to pace emerging threats.					
Title: Flank Array Demonstration (FAD)	1.975	1.325	0.375	0.000	0.375
Articles:	-	-	-	-	-
FY 2019 Plans: - Conduct LVA2 at-sea tests and analyses. Provide on-site support for the maintenance, troubleshooting and repair of faulty or failed array inboard/outboard components. Document troubleshooting and repair findings					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603561N / *Advanced Submarine System Development*	**Project (Number/Name)** 0223 / *Sub Combat System Improvement (ADV)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
for evaluation by engineering team and provide findings/recommendations to the forward and back-fit LVA production programs for Virginia, Ohio and Columbia Class Submarines. ***FY 2020 Base Plans:*** - Provide on-site support for the maintenance, troubleshooting and repair of faulty or failed array inboard/ outboard components. Document troubleshooting and repair findings for evaluation by engineering team and provide findings/recommendations to the forward and back-fit LVA production programs for Virginia, Ohio and Columbia Class Submarines. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** - FY 2019 to FY 2020 decrease ($-0.950M) is in accordance with original program plans. Efforts in FY 2020 will be limited to the maintenance, troubleshooting and repair of faulty or failed array inboard/outboard components.					
Title: Large Vertical Array (LVA) ***Articles:*** ***Description:*** LVA development is a follow-on effort to the exploratory work conducted under the Flank Array Demonstration (FAD) sub-project. ***FY 2019 Plans:*** N/A ***FY 2020 Base Plans:*** - Conduct critical at-sea testing events for LVA2 and SSN 790 and analyze at-sea test results. This testing/ analysis is necessary to integrate enhanced signal processing capability for LVAs and to collect data that will be used to improve LVA tactical performance. These processing upgrades are directly applicable to improving the forward and back-fit LVA production programs for Virginia, Ohio and Columbia Class Submarines. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** - New requirement in FY 2020 ($+2.000M). An advanced LVA development program is required to pace the threat of evolutionary quieting of adversary submarines. This effort will begin with at-sea testing and analysis in	0.000 -	0.000 -	2.000 -	0.000 -	2.000 -

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603561N / *Advanced Submarine System Development*	**Project (Number/Name)** 0223 / *Sub Combat System Improvement (ADV)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
FY 2020 then ramp up over the FYDP to develop sensor and processing hardware improvements, and signal processing and tactics for each planned submarine platform.					
Title: Advanced Sensors	3.800	3.800	7.000	0.000	7.000
Articles:	-	-	-	-	-
FY 2019 Plans: - Complete Open Architecture Telemetry (OAT) component development, system architecture, and associated ICDs. Conduct array environmental, calibration, and Lake Pend Oreille (LPO) testing of FY 2019 array modules. - Begin procurement and fabrication of full length OAT array Advance Development Model (ADM). - Continue development of the High Speed Signal Path. - Continue development of active and passive sensor concepts to support performance requirements for BCA. Complete test panel design and procurement of material.					
FY 2020 Base Plans: - Complete OAT development, and fabricate a full length OAT array ADM for testing of active and passive sensor design concept panel for the new BCA and initial detailed design efforts at LPO in FY 2021. Additional BCA testing is necessary to validate studies conducted in FY 2018 and FY 2019 and to collect data that will be used to improve the acoustic performance of the BCA ADM. - Complete active and passive studies for BCA. Conduct acoustic test tank and environmental panel testing. - Initiate detailed design of BCA ADM.					
FY 2020 OCO Plans: N/A					
FY 2019 to FY 2020 Increase/Decrease Statement: FY 2019 to FY 2020 increase ($+3.200M) is required for fabrication and testing of a full length Open Architecture Telemetry (OAT) Advanced Development Model (ADM) and testing of active and passive sensor design concept panel for the new Bow Conformal Array (BCA) and initial detailed design efforts. Additional BCA testing is necessary to validate studies conducted in FY 2018 and FY 2019 and to collect data that will be used to improve the acoustic performance of the BCA ADM. BCA ADM detail design will commence in FY 2020.					
Accomplishments/Planned Programs Subtotals	39.648	45.898	51.151	0.000	51.151

C. Other Program Funding Summary ($ in Millions)

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603561N / *Advanced Submarine System Development*	**Project (Number/Name)** 0223 / *Sub Combat System Improvement (ADV)*

C. Other Program Funding Summary ($ in Millions)

Remarks

D. Acquisition Strategy

Use competitively awarded contracts from Broad BAA solicitations and SBIR initiatives. Integration to fielded systems performed under contracts awarded by the recipient production program within PEO SUB.

E. Performance Metrics

- Construct universal test harness of 13 standard modules with electronics and wire and fiber harnesses for Future Towed Arrays.
- Design and fabricate Next Generation TB-29X hydrophone group design based on results from FY 2017 LPO test.
- Perform initial assessments of future hull array active performance requirements for BCA.
- Begin preliminary test panel design and procure materials in support of FY 2020 BCA testing.
- Support troubleshooting/repair of Large Vertical Array (LVA-2) system on the platform.
- Maintain and procure system inboard and outboard spares for LVA 2.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603561N / *Advanced Submarine System Development*	Project (Number/Name) 0223 / *Sub Combat System Improvement (ADV)*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Product Development	C/CPFF	Adaptive Methods : VA	1.675	0.050	May 2018	0.050	Dec 2018	0.300	Dec 2019	-		0.300	Continuing	Continuing	Continuing
Product Development	C/CPFF	Alion Sciences : VA	3.267	0.000		0.000		0.000		-		0.000	0.000	3.267	Continuing
Product Development	C/CPFF	Arete : CA	0.550	0.000		0.000		0.000		-		0.000	0.000	0.550	-
Product Development	C/CPFF	Chesapeake Science (L-3) : MD	7.551	0.000		0.000		0.000		-		0.000	0.000	7.551	Continuing
Product Development	C/CPFF	Electric Boat : ME	1.855	0.000		0.125	Feb 2019	0.000		-		0.000	0.000	1.980	Continuing
Product Development	C/CPFF	General Dynamics : VA	24.031	0.798	Feb 2018	1.811	Dec 2018	1.992	Dec 2019	-		1.992	Continuing	Continuing	Continuing
Product Development	C/CPFF	GA Tech Research Institute : GA	3.076	0.000		0.080	May 2019	0.385	Dec 2019	-		0.385	Continuing	Continuing	Continuing
Product Development	C/CPFF	In Depth Engineering : VA	6.335	0.750	Dec 2017	0.350	Dec 2018	0.950	Dec 2019	-		0.950	Continuing	Continuing	Continuing
Product Development	C/CPFF	JHU/APL : MD	101.896	9.565	Nov 2017	5.983	Dec 2018	10.500	Dec 2019	-		10.500	Continuing	Continuing	Continuing
Product Development	C/CPFF	Lockheed Martin : VA	71.290	9.034	Nov 2017	10.235	Dec 2018	9.419	Dec 2019	-		9.419	Continuing	Continuing	Continuing
Product Development	C/CPFF	Lockheed Martin : NY	9.564	0.500	May 2018	0.000		0.000		-		0.000	0.000	10.064	Continuing
Product Development	C/CPFF	Metron : VA	8.153	0.785	Nov 2017	1.300	Dec 2018	0.750	Dec 2019	-		0.750	Continuing	Continuing	Continuing
Product Development	WR	NSWC/Carderock : MD	29.834	2.008	Oct 2017	2.492	Nov 2018	2.585	Nov 2019	-		2.585	Continuing	Continuing	Continuing
Product Development	WR	NUWC/Newport : RI	101.113	5.312	Oct 2017	9.176	Nov 2018	9.360	Nov 2019	-		9.360	Continuing	Continuing	Continuing
Product Development	C/CPAF	NSMA : VA	12.444	0.650	Jun 2018	0.650	Jan 2019	0.650	Jan 2020	-		0.650	Continuing	Continuing	Continuing
Product Development	WR	ONI : DC	2.295	0.000		0.000		0.000		-		0.000	0.000	2.295	Continuing
Product Development	WR	ONR : VA	2.725	0.000		0.000		0.000		-		0.000	0.000	2.725	Continuing
Product Development	C/CPFF	Progeny : VA	8.274	0.278	May 2018	0.244	Dec 2018	0.650	Dec 2019	-		0.650	Continuing	Continuing	Continuing
Product Development	C/CPFF	PSU/ARL : PA	10.330	0.350	Dec 2017	1.133	Dec 2018	0.650	Dec 2019	-		0.650	Continuing	Continuing	Continuing
Product Development	C/CPFF	SAIC : VA	3.555	0.000		0.000		0.000		-		0.000	0.000	3.555	Continuing
Product Development	C/CPFF	Sedna Digital : VA	13.864	1.536	Jan 2018	1.884	Dec 2018	2.000	Dec 2019	-		2.000	Continuing	Continuing	Continuing
Product Development	WR	SSC/San Diego : CA	1.963	0.000		0.000		0.000		-		0.000	0.000	1.963	Continuing

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603561N / *Advanced Submarine System Development*	**Project (Number/Name)** 0223 / *Sub Combat System Improvement (ADV)*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Product Development	MIPR	U.S. Army Research Lab : MD	1.700	0.000		0.000		0.000		-		0.000	0.000	1.700	Continuing
Product Development	MIPR	U.S. Army/MITRE : NJ	4.595	0.000		0.000		0.000		-		0.000	0.000	4.595	Continuing
Product Development	MIPR	U.S. Hanscom AFB/ MIT Lincoln Labs : MA	19.369	2.409	Jan 2018	1.820	Oct 2018	2.556	Dec 2019	-		2.556	Continuing	Continuing	Continuing
Product Development	C/CPFF	UT/ARL : TX	29.584	2.347	Jan 2018	1.946	Dec 2018	1.985	Dec 2019	-		1.985	Continuing	Continuing	Continuing
Product Development	C/CPFF	VAR : VAR*	25.955	1.788	Dec 2017	4.869	Dec 2018	4.635	Dec 2019	-		4.635	Continuing	Continuing	Continuing
		Subtotal	506.843	38.160		44.148		49.367		-		49.367	Continuing	Continuing	N/A

Remarks

* Consists of multiple performing activities with funding for each not greater than $1M per year.

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management Support	C/CPAF	BAE Systems : MD	12.665	0.000		0.000		0.000		-		0.000	0.000	12.665	Continuing
Program Management Support	C/CPIF	CGI Federal : VA	2.000	1.400	Nov 2017	1.692	Nov 2018	1.726	Dec 2019	-		1.726	Continuing	Continuing	Continuing
Program Management Support	C/CPFF	EG&G (URS) : VA	4.291	0.000		0.000		0.000		-		0.000	0.000	4.291	Continuing
Travel	Allot	NAVSEA PEO IWS5 : DC	0.795	0.088	Jan 2018	0.058	Nov 2018	0.058	Nov 2019	-		0.058	Continuing	Continuing	Continuing
		Subtotal	19.751	1.488		1.750		1.784		-		1.784	Continuing	Continuing	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	526.594	39.648		45.898		51.151		-		51.151	Continuing	Continuing	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603561N / *Advanced Submarine System Development*	Project (Number/Name) 0223 / *Sub Combat System Improvement (ADV)*	

	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603561N / *Advanced Submarine System Development*	**Project (Number/Name)** 0223 / *Sub Combat System Improvement (ADV)*

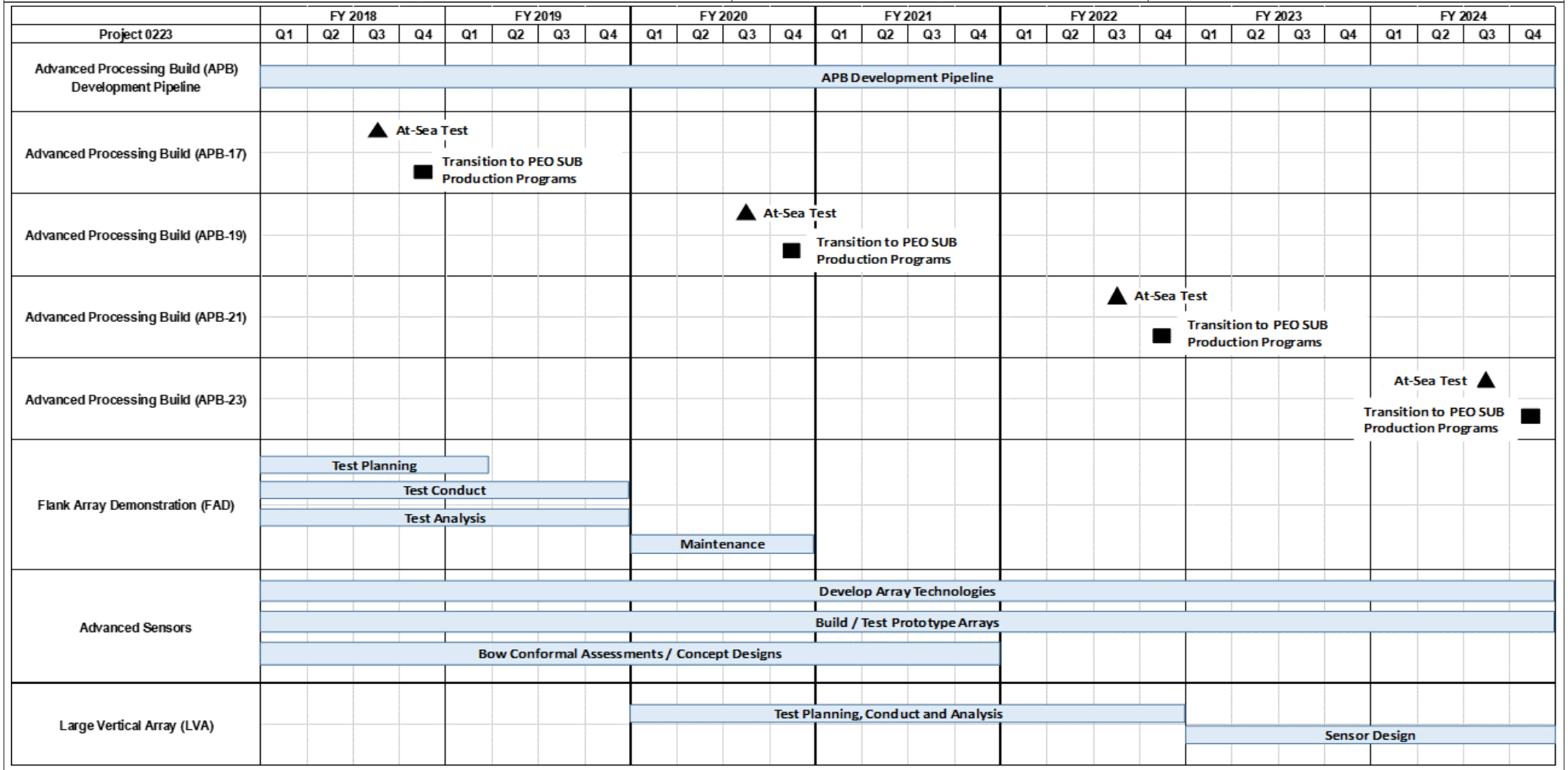


Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603561N / *Advanced Submarine System Development*	**Project (Number/Name)** 0223 / *Sub Combat System Improvement (ADV)*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 0223				
Advanced Processing Build (APB): APB Development Pipeline	1	2018	4	2024
Advanced Processing Build (APB): APB-17: At-Sea Test	3	2018	3	2018
Advanced Processing Build (APB): APB-17: Transition to PEO SUB Production Programs	4	2018	4	2018
Advanced Processing Build (APB): APB-19: At-Sea Test	3	2020	3	2020
Advanced Processing Build (APB): APB-19: Transition to PEO SUB Production Programs	4	2020	4	2020
Advanced Processing Build (APB): APB-21: At-Sea Test	3	2022	3	2022
Advanced Processing Build (APB): APB-21: Transition to PEO SUB Production Programs	4	2022	4	2022
Advanced Processing Build (APB): APB-23: At-Sea Test	3	2024	3	2024
Advanced Processing Build (APB): APB-23: Transition to PEO SUB Production Programs	4	2024	4	2024
Flank Array Demonstration (FAD): Test Planning	1	2018	1	2019
Flank Array Demonstration (FAD): Test Conduct	1	2018	4	2019
Flank Array Demonstration (FAD): Test Analysis	1	2018	4	2019
Flank Array Demonstration (FAD): Maintenance	1	2020	4	2020
Advanced Sensors: Develop Array Technologies	1	2018	4	2024
Advanced Sensors: Build / Test Prototype Arrays	1	2018	4	2024
Advanced Sensors: Bow Conformal Assessments / Concept Designs	1	2018	4	2021
Large Vertical Array (LVA): Test Planning, Conduct and Analysis	1	2020	4	2022
Large Vertical Array (LVA): Sensor Design	1	2023	4	2024

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COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
2033: *Adv Submarine Systems Development*	499.151	34.513	30.615	34.857	-	34.857	27.781	26.653	23.002	23.933	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Advanced Submarine Systems Development (ASSD) is a non-acquisition program that develops/matures and tests advanced technologies for successful integration into current and future submarine classes, lowering the technical/cost risks of integrating new technologies prior to acquisition, and speeding the delivery of capability and lethality into the Fleet. ASSD transitions Hull, Mechanical, and Electrical (HM&E) technologies,and future naval concepts from the Science & Technology (S&T) and Research and Development (R&D) communities through the development, maturation, and integration of technology projects to operational submarine platforms for assessment, testing, and evaluation. Once projects have proven their maturity and promise through at-sea demonstration, they are formally transitioned into acquisition Programs Of Record (PORs). Additionally, ASSD operates and maintains R&D infrastructure assets that are critical to the long-term design, assessment and construction of modern, stealthy submarine platforms.

Project 2033 is comprised of three programmatic budget categories: Strategic Capability R&D Infrastructure, Long Range R&D Investment, and Rapid Technology Development and Ship Integration. Strategic infrastructure investments maintain and operate critical, one-of-a-kind submarine R&D assets that enable the design and manufacture of the stealthiest submarines in the world, without the requirement to develop and test at full scale, which is inordinately expensive and risky. Long-range R&D investment is the maturation and prototyping at full scale of long- range (5-10 years) technologies, to enable their readiness for incorporation into existing and future submarines. The objective is to achieve high
technology readiness (TRL-7) of the targeted technology so that it can be incorporated into the baseline submarine design during the detailed design contract award. Rapid Technology Development and Ship Integration projects are efforts designed to mature higher TRL capabilities and field the particular technology project capability within an 18-30 month window, from program start to submarine at-sea demonstration. Also included in this category are innovative technology transition projects, seedling efforts (<$800K/year) which assess new technology candidates and keep the submarine/ USW technology pipeline primed. All SEA073/ASSD projects are determined by senior USW leadership and N97 sponsor direction.

The Program works with Small Business Innovation Research (SBIR), Small Business Technology Transfer (STTR), Office of Secretary of Defense (OSD), Office of Naval Research (ONR), and Defense Advanced Research Projects Agency (DARPA) organizations to identify and mature technology candidates for integration into current/future submarine classes to provide new/transformational capabilities, while achieving total-ownership cost reductions. Experimentation and demonstration are also conducted in a joint warfighting context with other services, (i.e. Marine Corps, Army, Air Force), to enable early assessment of a new technology's warfighting capabilities, and to inform the Fleet and acquisition community on smarter technology-selection decisions. This Program also supports cooperative R&D through Information/Data Exchange Agreements (IEA/ DEA) and joint Project Arrangements (PA) with Allies such as the United Kingdom and Australia, as well as other international partners, which target core technology maturation, future submarine component concept designs, etc.
Major technology developmental efforts within this budget submission include:

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Strategic Capability R&D Infrastructure (at ARD Bayview, ID)
- Large Scale Vehicle (LSV)
- Intermediate Scale Measurement System (ISMS)

Long Range R&D
- Corrosion Control Technologies
- Advanced Submarine Control/Precision Submarine Maneuvering and Control
- Advanced Material Propeller
- Advanced SSN Technologies
- Next Generation Thrust (future propulsor/shafting technologies)
- Advanced Hull Treatments
- Advanced Signature Management

Rapid Technology Development and Submarine Integration
- Common Unmanned Aerial Vehicle (UAS) Communications
- Fleet Modular Autonomous Undersea Vehicle (FMAUV) Mission Capability (Optical Modem for data transfer)
- Li-Ion Battery/SAFECAP for FMAUV Submarine Integration
- Innovative Technology Transfer

The FY 2020 funding request was reduced by $3.000 million to account for the availability of prior year execution balances (IS 68709). Additionally, FY20 reflects an increase in overall budget due to start of the LSV
Electric Drive recapitalization project within the Strategic R&D Infrastructure pillar, and the addition of the associated funding. Funding in other pillars of project 2033 decreased in FY20 due to the planned transition of several Long Range R&D and Rapid Development projects into cognizant acquisition program offices and the realignment/consolidation of several Rapid Development projects. Noteworthy programmatic budget changes in this year's budget exhibits include: (1) (1) Continued focus on Strategic R&D Infrastructure obsolescence reduction
and sustainability, with LSV Steering and Diving System replacement in FY19,continued targeted sparing and time-phased component replacement, and the initiation in FY20 of LSV Electric Drive system design work and supporting
component procurements. (2) Advanced Material Propeller project began its next phase in FY19, will conduct a sea trial aboard an international partner submarine in FY20, followed by post-trial data analysis. (3) The Precision Submarine Maneuvering and Control (PSMC) project proceeds from Trade Study phase into a Concept Development /Refinement phase to identify potential technologies to improve submarine low speed maneuvering in support of emerging missions/payloads. (4) ONR/073 sponsored Corrosion Control focused projects (Advanced Active Shaft Grounding System (AASGS), Shaft Current Sensor (SCS), and shaft grounding Contact Technology (CT)) will test prototypes on a VA Class and transition to PMS 450 in FY19. Ionic Current Monitoring System will also be tested on a VA Class and transition to PMS450. (5) Next Generation Thrust investments continue along several lines of effort, supporting improvements to VA class and future submarine designs for Propulsors and Integrated Shafting components. (6) UAS Comms project transitioned to PMS 425 and 435 in FY19. (7) SAFECAP completed sea trial and qualification process for submarine use of FMAUV Li-Ion battery system, and transitions to PMS 394 in FY20. Other FMAUV projects (Full Mission Capability/Optical Comms) are re-aligned and consolidated under PMS 394 in FY20. (8) Advanced Signature Management project activity will Transition to S3P (project 3391) in FY20. (9) Under C-Wolf

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JCTD project transitions to PMW 770 in FY20. (10) Long Range Fiber Buoy and SeaBed Warfare projects paused to assess potential consolidation with other efforts within Undersea Enterprise and optimum project management alignment.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Strategic Capability R&D Infrastructure	18.046	17.976	27.590	0.000	27.590
Articles:	-	-	-	-	-
Description: Sustains Navy R&D capability for continued operations of the Large Scale Vehicle (LSV-2) and Intermediate Scale Measurement System (ISMS) test facility in support of VIRGINIA and COLUMBIA Class Programs, numerous other smaller programs, and future submarine technology development. These facilities are a critical enabler supporting the conduct of large scale model experiments and focus on evaluating the stealth, control, affordability, and operational effectiveness of new submarine technologies. The technology validation provided by the model experiments has provided significant cost and schedule savings by allowing prototyping at scale, vice with first-of-hull assets.					
FY 2019 Plans: LSV: Continue sub-system technology refresh. Conduct LSV-2 core ship systems maintenance, maintain crew qualification, ensure compliance with all LSVSAFE and general regulations, maintain and operate acoustic data systems and all required shore support systems. Continue critical COLUMBIA propulsor R&D trials, support advanced acoustic array hardware and systems maintenance. Support ship and system alterations to safely conduct COLUMBIA signature and propulsor trials. Install replacement steering and diving actuator system into LSV2. Continue recapitalization planning, component procurement, risk reduction, and sub-system design and development work for LSV-2 electric drive replacement. ISMS: Continue ongoing system refurbishment and replacement on ISMS. Operate and maintain ISMS acoustic test range underwater and shore-based facilities. Continue support of structural acoustics, target strength and radiated noise measurements in support of PMS 397, ONR, and other Fleet needs.					
FY 2020 Base Plans: LSV: Support advanced acoustic array hardware and systems maintenance. Replace LSV-2 propulsion battery.					

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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Conduct LSV-2 core ship systems maintenance, maintain crew qualification, ensure compliance with all LSVSAFE and general regulations, maintain and operate acoustic data systems and all required shore support systems. Support ship and system alterations to safely conduct COLUMBIA signature and propulsor trials. Complete critical COLUMBIA propulsor R&D trials. Finish design and testing and begin selected procurements of hardware for LSV-2 electric drive replacement. Begin LSV-2 recapitalization process: Initiate procurements for shipset of modernized electric drive module components (inverters and converters). Complete system design for Electronic Drive Control Electronics (EDCE) tech refresh and conduct supporting procurement and manufacturing. Conduct component design and initiate procurement for electric drive shaft bearing, flex coupling, and slip ring data transmission system tech refresh. Continue planning for systems integration and testing. ISMS: Continue ongoing system refurbishment and replacement on ISMS. Operate and maintain ISMS acoustic test range underwater and shore-based facilities. Continue support of structural acoustics, target strength and radiated noise measurements in support of PMS 397, ONR, and other fleet needs. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increase within the Strategic Infrastructure pillar in FY20 reflects an increase in overall budget due to start of the LSV Electric Drive recapitalization project, and the addition of the associated funding completion of LSV Steering and Diving System Recapitalization project. Minor increase within ISMS expenditures to initiate phased, major component replacement effort.					
Title: Long Range R&D	10.399	8.282	6.909	0.000	6.909
Articles:	-	-	-	-	-
Description: Develop advanced technologies and tools to increase current and future submarine capabilities, lower acquisition and life-cycle costs, and enhance survivability. Develop technologies and materials that facilitate new and					

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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
enhanced existing warfighting concepts. The program currently supports development of advanced submarine hull coatings for improved acoustic performance, maintainability, and cost with the objective of near- term implementation on VA and COLUMBIA Class platforms, as well as future submarine classes. The budget line continues to develop technologies for alternative propulsion designs to enhance submarine performance, maneuverability and stealth while reducing submarine acquisition costs. Lastly, this long-range R&D continues to develop and demonstrate technologies for future submarines in areas of hull and platform technologies, propulsors, propellers, corrosion control, ship control, electric actuation, sensors, and other systems which increase near- term capability and provide cost reduction for in-service and future submarine classes. ***FY 2019 Plans:*** CORROSION CONTROL. Complete Corrosion Control TEMPALT installations for ICMS and AASGS on a VA Class Submarine. Perform at-sea demonstrations of all these TEMPALTS. Complete Improved Damping Tile System (IDTS) lab testing/analysis, develop TEMPALT, install sample on submarine, demonstrate the technology at sea and formally qualify the epoxy material as an alternate formulation for submarine use. ADVANCED SUBMARINE CONTROL (ASC). Complete design changes and conduct barge test of the ASC PPM 82 pump jet system. Continue development and testing of ASC technology to assess suitability of a pump-jet for submarine applications. PRECISION SUBMARINE MANEUVERING AND CONTROL (PSMC). Conduct trade studies and explore initial set of concepts for PSMC to provide improved slow speed maneuvering capability throughout the water column, in support of emerging missions and payloads. ADVANCED MATERIAL PROPELLER (AMP). Complete structural acceptance process for the Advanced Material Propeller (AMP), including fatigue testing of Generation 2 composite blades in partner country, data analysis, and finite element analysis. Complete the structural certification and planning for AMP sea trials.					

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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Complete the manufacture and testing of Generation 3 blades and hub, assemble and ship in preparation for at-sea testing. Finalize trial plan priorities and obtain approval from cognizant technical authorities that propeller is acceptable for trial. ADVANCED SSN TECHNOLOGIES. Assess advanced technologies and materials for future submarines and perform studies for improved platform capability and performance in support of the Tactical Submarine Evolution Plan (TSEP). Continue support to SEA05U Submarine Concept Team and assess output of Main Storage Battery study NEXT GENERATION THRUST. Continue design studies and plan small and/or large scale testing of innovative propulsor and shafting technologies. Continue technology development (classified details) for insertion into VA Block VII. Continue evaluation and design of single propulsor concept utilizing new/non-traditional materials. ADVANCED HULL TREATMENTS. Continue industrialization and material assessment to transition advanced coatings technologies from ONR FNC effort. Final tile sizes, coverage and installation methods to be identified through concept designs, with input from NAVSEA shipyard enterprise. Installation planning will include shipping, handling, staging, and application of large tiles during current platform availabilities. Project will also assess material seam configurations and alternate hull paint systems. Finalize industrialization of follow-on ONR advanced treatment, fabrication processes, and down select to a single material candidate to finalize development of a VA Class OPALT package. ADVANCED SIGNATURE MANAGEMENT. Initiate advanced signature management demonstrator development and begin supporting planning and TDP/test plan development. Execute US-Partner scale model EM and full- scale acoustic trails at US range, conduct data analysis and begin TDP development for downstream insertion of technology into VA Class. Transition Advanced Signature Management project activity to S3P (project 3391). RELIABLE TOWED ARRAY. Transition Reliable Towed Array Project to PMS 401 for at-sea testing with VA Class to validate software model performance data. Instrumented array to be subsequently used by PMS401/ NUWC to inform future thin-line towed array design, development and acquisition. ***FY 2020 Base Plans:***					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
ADVANCED SUBMARINE CONTROL (ASC). Conduct analysis of barge test and complete additional system design changes. Perform an in-water system operational pressure test. Continue assessment of ASC/pump-jet technology suitability for submarine applications. PRECISION SUBMARINE MANEUVERING AND CONTROL (PSMC). Further develop PSMC concepts. Down-select based on feasibility, initiate preliminary design, and identify required modeling/simulation tool development in support of performance characterization. AMP. Install and test full-scale AMP propeller on partner submarine and conduct at-sea trial/data collection. Initiate follow-on Project Arrangement for destructive testing and analysis of full-scale propeller data. ADVANCED HULL TREATMENTS. Complete the industrialization of the ONR advanced treatment and perform testing necessary to increase TRL. Complete OPALT and associated technical data package for installation of the ONR advanced treatment test patches on a VA class submarine. Finalize installation approaches with Portsmouth Naval Shipyard and provide installation procedures to shipyard to develop necessary work packages. Perform installation mockup in support of test patch installation. NEXT GENERATION THRUST. Further develop most promising NGT concepts and initiate design tool improvement initiatives. ADVANCED SSN TECHNOLOGIES. Continue assessment of new technologies for future submarines in support of the Tactical Submarine Evolution Plan (TSEP) and conduct studies to assess potential impacts on platform capability. Identify enabling technologies and platform integration barriers. Initiate development on critical, long-lead technologies/materials. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Decrease within Long Range R & D pillar reflects Transition of Advanced Signature Management project into S3P (Project 3391) and transition of SADS/ITDS FNC to PMS 450.					
Title: Rapid Technology Development and Submarine Integration	6.068	4.357	0.358	0.000	0.358
Articles:	-	-	-	-	-

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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Description: Conducts Navy and joint demonstrations of advanced technologies and payloads to assess the operational value of the technologies/systems under consideration, and speed transition of operational capabilities. Objective is to develop, demonstrate, and evaluate technology projects in an 18-30 month period, transitioning successful, high-interest / high-impact systems to the acquisition community and subsequently the fleet. ***FY 2019 Plans:*** FMAUV LITHIUM ION BATTERY CERTIFICATION/SAFECAP. Complete SAFECAP test article fabrication, Battery Casualty Detection System (BCDS) build, and shock testing. Conduct capstone, shore-based battery test. Continue TEMPALT development. Transition SAFECAP to PMS 394 for subsequent at-sea testing in FY20. FMAUV FULL MISSION CAPABILTY. Continue FMAUV Optical Modem development and testing. Transition project to PMS 394 for subsequent at-sea testing in FY20. JOINT CONCEPT TEST DEMONSTRATION (JCTD). Continue planning for follow-on FMAUV Optical Modem demonstration/testing during Under C-WOLF JCTD. Transition Under C-Wolf JCTD project to PMW 770 for FY20 execution. INNOVATIVE TECHNOLOGY TRANSITION. Continued to leverage products and analysis from Small Business (SBIR/STTR), Independent Research and Development (IR&D), and Foreign Comparative Testing efforts to identify/develop innovative submarine and USW technology transition project candidates. FY19 projects include Shaft Laser Peening (Corrosion Control), Undersea Target Recognition (international project arrangement follow-on to LCAC), Towed Array Signal Path (System Reliability Improvement),Special Hull Treatment (SHT) Delamination Detection (detection tools), and Composite Canister System (Payload flexibility). ***FY 2020 Base Plans:*** INNOVATIVE TECHNOLOGY TRANSITION. Continued to leverage products and analysis from Small Business (SBIR/STTR), Independent Research and Development (IR&D), and Foreign Comparative Testing efforts to identify/develop innovative submarine and USW technology transition project candidates. FY20 planned projects include Shaft Laser Peening (Corrosion Control), and Undersea Target Recognition (International					

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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Project Arrangement follow-on to LCAC), Special Hull Treatment (SHT) Delamination Detection (detection tools), and Composite Canister System (Payload flexibility). ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Reduction within Rapid Development due to completion of SAFECAP sea trial, realignment of FMAUV projects to PMS394 and realignment of Under C-wolf JCTD to PMW 770.					
Accomplishments/Planned Programs Subtotals	34.513	30.615	34.857	0.000	34.857

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Non-ACAT program with BA4 R&D investment. Projects transition via formal processes to acquisition programs of record for inclusion into existing ship baselines or initiation as new POR capabilities. Sole source Concept Formulation (CONFORM) contracts with the only two submarine design/construction shipyards, General Dynamics Electric Boat (GDEB) and Huntington Ingalls Industries (HII) Newport News Shipbuilding facilitate this process. Use of topic-specific Broad Agency Announcement (BAA) solicitations to advance submarine advanced technology work. Engagement with industry to build vendor base and support development of R&D products for enhanced submarine capability via competitively awarded Small Business Innovation Research (SBIR) and Broad Agency Agreement (BAA) contracts to support advanced Hull Mechanical & Electrical (HM&E) technology and payload systems. For the period from FY 18- FY 20,073 is utilizing two separate Determination and Findings (D&F's), one with Sandia National Labs to design, build, integrate, and test Battery Casualty Detection Systems (BCDS) and one with Oak Ridge National Laboratory (ORNL) to explore advanced transition technologies relevant to submarine applications for the Navy.

E. Performance Metrics

Sustain critical one-of-a-kind national Research and Development (R&D) hydroacoustic infrastructure, enabling the design and assessment of VIRGINIA Class, COLUMBIA Class, and future submarine class designs.
-Deliver 2-3 Rapid Prototype projects annually to evaluate future submarine technology/payload concepts. Execute projects in established timelines and under cost cap. Target deliverables as tactical TEMPALTs.
Assess as-built VIRGINIA and SSGN submarines for design drivers/design tools, and model validation to define R&D needs for future submarine classes.
-Industrialize future submarine coatings to enable continued acoustic superiority of VA Class design and field as an advanced demonstrator.
-Successfully construct and deliver full-scale advanced material propeller for at-sea testing.
-Develop summary report on modeling approaches, and associated predicted performance, in the area of hull sensors, threat environments, and situational awareness.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
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Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Product Development	C/FFP	DRS Technologies : Milwaukee, WI	0.000	0.000	Nov 2018	1.000	Apr 2019	6.873	Jan 2020	-		6.873	0.000	7.873	-
Product Development	C/FFP	Moog : East Aurora, NY	0.000	0.900	Aug 2018	0.400	Aug 2019	0.000		-		0.000	0.000	1.300	-
Product Development	C/CPFF	Seeman Composite : Gulfport, MS	0.000	0.000	Sep 2018	0.200	Sep 2019	0.000		-		0.000	0.000	0.200	-
Product Development	WR	NSWC Crane : Crane, IN	0.000	0.440	Nov 2018	0.200	Nov 2019	0.000		-		0.000	0.000	0.640	-
Product Development	C/CPFF	Rolls Royce marine : Walpole, MA	0.000	0.000	Sep 2018	0.100	Sep 2019	0.100	Sep 2020	-		0.100	0.000	0.200	-
Product Development	WR	NSWC PHILLY : Philly, PA	0.165	0.000	Nov 2018	0.275	Nov 2019	0.275	Nov 2019	-		0.275	Continuing	Continuing	Continuing
Product Development	WR	NRL : Washington, DC	2.318	0.389	Nov 2018	0.300	Nov 2019	0.000		-		0.000	0.000	3.007	-
Product Development	SS/CPFF	SupShips : Groton, CT	2.958	0.000		0.000		0.000		-		0.000	0.000	2.958	-
Product Development	SS/CPFF	HII : Newport News, VA	13.510	3.554	Apr 2018	3.000	Apr 2019	3.150	Apr 2020	-		3.150	Continuing	Continuing	Continuing
Product Development	SS/CPFF	EB : Groton, CT	74.785	2.901	Apr 2018	3.108	Apr 2019	6.030	Apr 2020	-		6.030	Continuing	Continuing	Continuing
Product Development	WR	NSWC : Carderock, MD	94.918	4.825	Apr 2018	2.730	Apr 2019	3.185	Apr 2020	-		3.185	Continuing	Continuing	Continuing
Product Development	SS/CPFF	ARL/PSU : State College, PA	9.003	0.965	Apr 2018	0.585	Apr 2019	0.597	Apr 2020	-		0.597	Continuing	Continuing	Continuing
Product Development	SS/CPFF	JHU/APL : Laurel, MD	23.197	1.224	Apr 2018	0.250	Apr 2019	0.250	Apr 2020	-		0.250	Continuing	Continuing	Continuing
Product Development	Various	Various : Various	36.210	0.290	Apr 2018	0.296	Apr 2019	0.302	Apr 2020	-		0.302	Continuing	Continuing	Continuing
Product Development	WR	NUWC : Newport, RI	77.953	1.025	Mar 2018	1.830	Mar 2019	1.000	Mar 2020	-		1.000	Continuing	Continuing	Continuing
Product Development	WR	ONR : Arlington, VA	10.224	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Product Development	SS/CPFF	Progeny : Manassas VA	0.695	0.000		0.000	May 2019	0.000		-		0.000	0.000	0.695	-
		Subtotal	345.936	16.513		14.274		21.762		-		21.762	Continuing	Continuing	N/A

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Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract

Remarks

Various/VAR is used to group multiple activities with small funding levels.
Activities will be incrementally funded. The award dates reflect the latest incremental portion funds will obligate.

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Contractor Engineering Support	SS/CPFF	Various : Various	14.956	1.340	Jun 2018	1.350	Mar 2019	1.000	Mar 2020	-		1.000	Continuing	Continuing	Continuing
Government Engineering Support	WR	Various : Various	7.213	0.357	Mar 2018	0.364	Mar 2019	0.371	Mar 2020	-		0.371	Continuing	Continuing	Continuing
Travel	WR	NAVSEA HQ : Not Specified	1.103	0.102	Mar 2018	0.104	Mar 2019	0.106	Mar 2020	-		0.106	Continuing	Continuing	Continuing
Acquisition Workforce	Various	Not Specified : Not Specified	0.293	0.000		0.000	Nov 2018	0.000		-		0.000	0.000	0.293	0.293
		Subtotal	23.565	1.799		1.818		1.477		-		1.477	Continuing	Continuing	N/A

Remarks

Various/VAR is used to group multiple activities with small funding levels.
Activities will be incrementally funded. The award dates reflect the latest incremental portion funds will obligate.

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Developmental Test & Evaluation	C/CPFF	GD IT : Bayview, ID	0.000	1.600	Aug 2018	1.600	Aug 2019	1.000	Aug 2020	-		1.000	0.000	4.200	-
Developmental Test & Evaluation	SS/CPFF	EB : Groton, CT	19.498	5.810	May 2018	5.820	May 2019	4.916	May 2020	-		4.916	Continuing	Continuing	Continuing
Developmental Test & Evaluation	WR	NSWC/PHILLY : PHILLY, PA	9.104	0.240	Dec 2017	0.240	Dec 2018	0.240	Dec 2019	-		0.240	0.000	9.824	9.104

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Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Developmental Test & Evaluation	Various	Various : Various	8.057	0.675	Apr 2018	0.675	Apr 2019	0.689	Apr 2020	-		0.689	0.000	10.096	6.372
Developmental Test & Evaluation	WR	NUWC : Newport, RI	29.910	1.255	Apr 2018	1.050	Apr 2019	0.500	Apr 2020	-		0.500	Continuing	Continuing	Continuing
Developmental Test & Evaluation	WR	NSWC : Carderock, MD	50.637	4.621	Apr 2018	5.138	Apr 2019	4.273	Apr 2020	-		4.273	Continuing	Continuing	Continuing
Developmental Test & Evaluation	SS/CPFF	HII : Newport News, VA	5.794	0.000		0.000	Oct 2018	0.000	Oct 2019	-		0.000	Continuing	Continuing	Continuing
Developmental Test & Evaluation	SS/CPFF	JHU/ARL : Laurel, MD	5.805	2.000	Apr 2018	0.000	Apr 2019	0.000		-		0.000	0.000	7.805	0.305
Developmental Test & Evaluation	SS/CPFF	ARL/PSU : State College, PA	0.845	0.000		0.000	Oct 2018	0.000		-		0.000	0.000	0.845	0.720
		Subtotal	129.650	16.201		14.523		11.618		-		11.618	Continuing	Continuing	N/A

Remarks

Various/VAR is used to group multiple activities with small funding levels.
Activities will be incrementally funded. The award dates reflect the latest incremental portion funds will obligate.

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	499.151	34.513		30.615		34.857		-		34.857	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603561N / *Advanced Submarine System Development*	**Project (Number/Name)** 2033 / *Adv Submarine Systems Development*

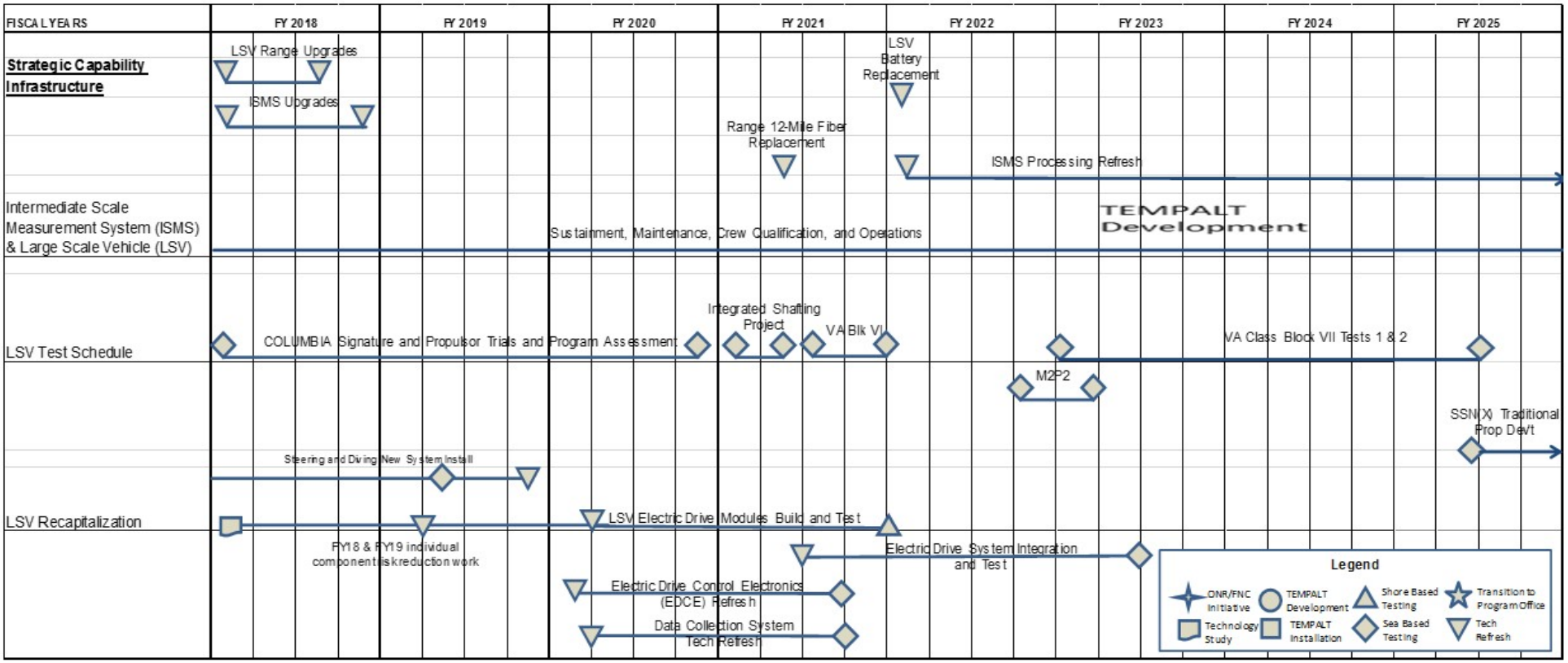


Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603561N / *Advanced Submarine System Development*	**Project (Number/Name)** 2033 / *Adv Submarine Systems Development*

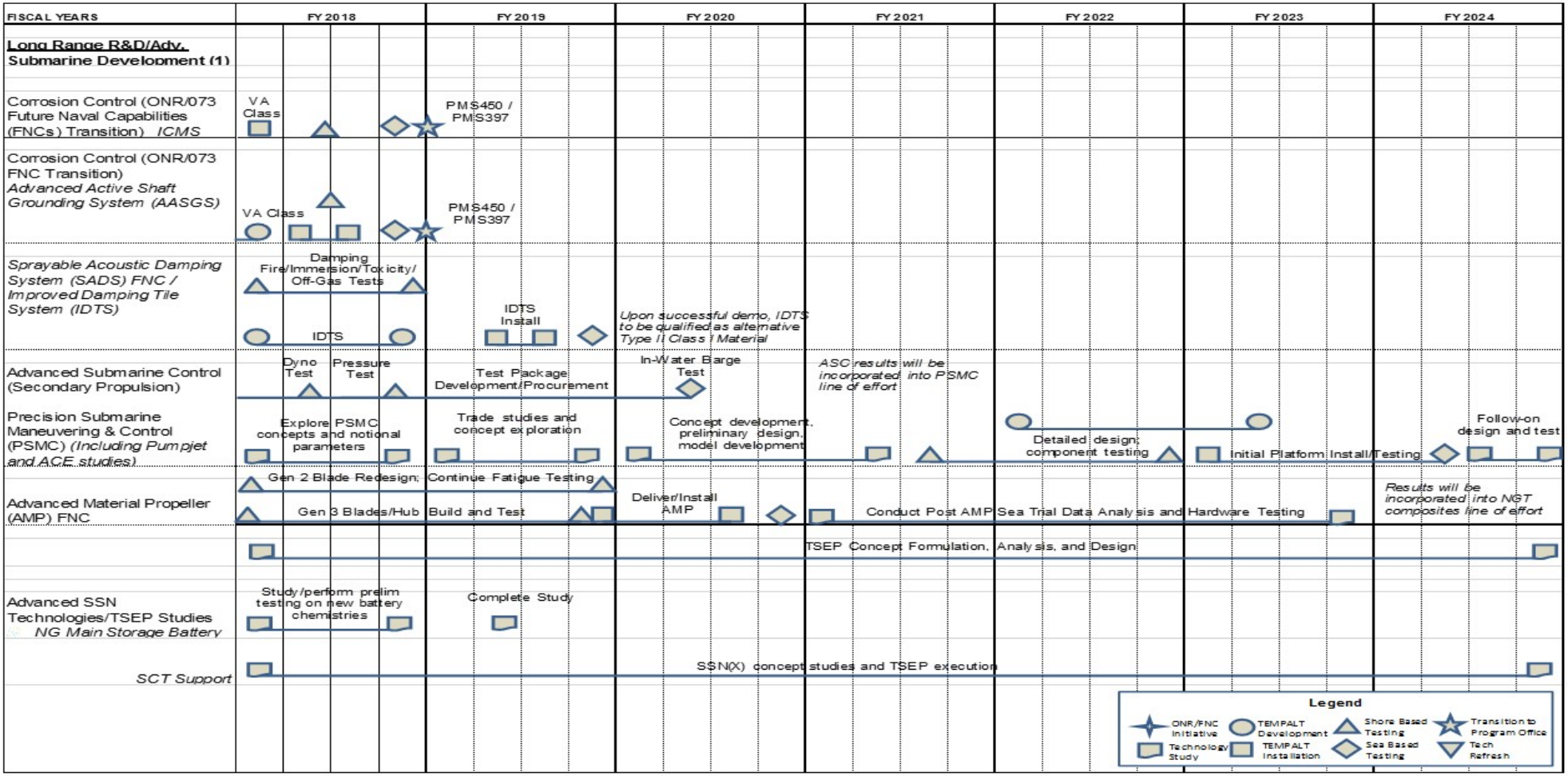


Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603561N / *Advanced Submarine System Development*	**Project (Number/Name)** 2033 / *Adv Submarine Systems Development*

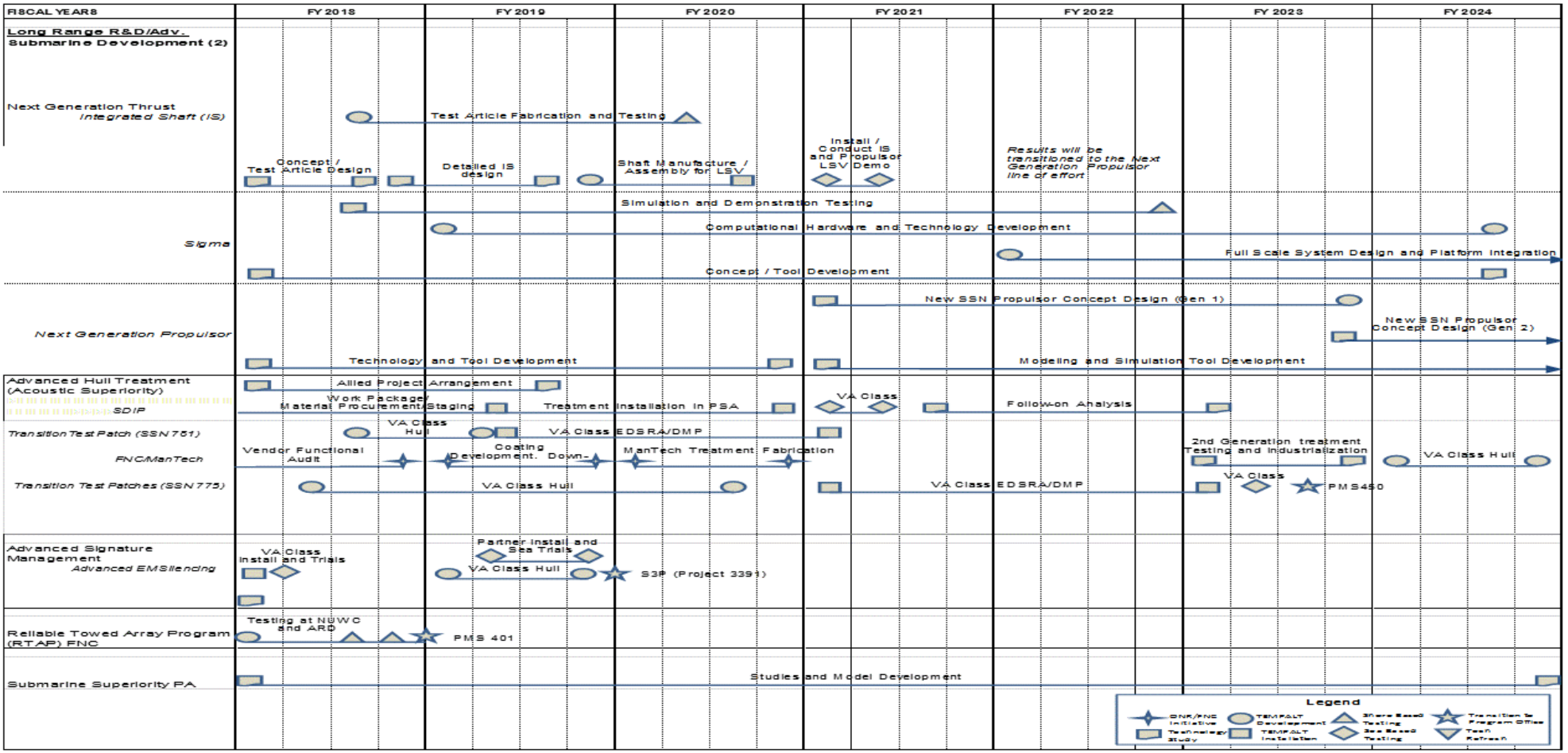


Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603561N / *Advanced Submarine System Development*	**Project (Number/Name)** 2033 / *Adv Submarine Systems Development*

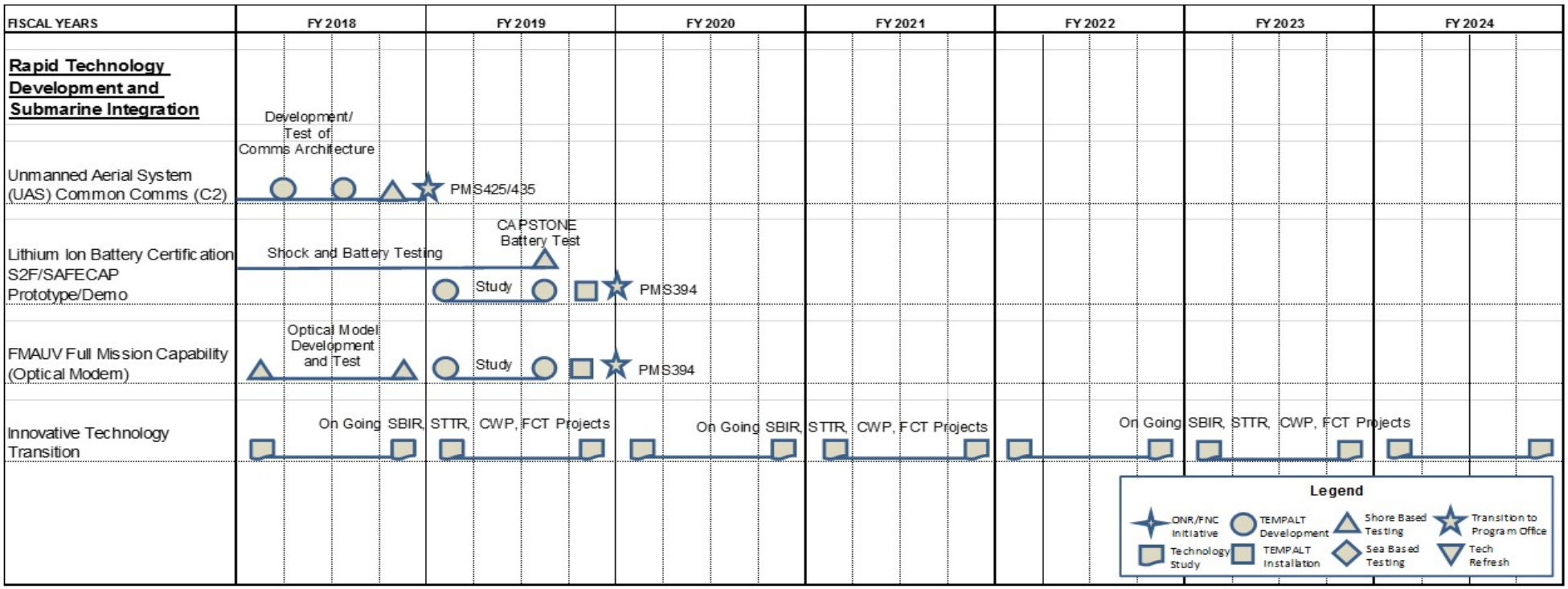


Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603561N / *Advanced Submarine System Development*	**Project (Number/Name)** 2033 / *Adv Submarine Systems Development*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 2033				
Strategic Capability Infrastructure: LSV Test Schedule - Range Upgrade for LSV	1	2018	3	2018
Strategic Capability Infrastructure: ISMS/LSV - ISMS Upgrades	1	2018	4	2018
Strategic Capability Infrastructure: ISMS/LSV - LSV Planned Subsystem Tech Refresh	1	2018	4	2020
Strategic Capability Infrastructure: ISMS/LSV - Range fiberoptic replacement	2	2021	2	2021
Strategic Capability Infrastructure: ISMS/LSV - ISMS Tech Refresh	1	2022	4	2024
Strategic Capability Infrastructure: ISMS /LSV - Sustainment, Maintenance,Crew Qualification and Operations	1	2018	4	2024
Strategic Capability Infrastructure: ISMS /LSV - Battery Replacement	3	2020	3	2020
Strategic Capability Infrastructure: LSV Test Schedule - COLUMBIA Propulsor Testing	1	2018	4	2020
Strategic Capability Infrastructure: LSV Test Schedule - Integrated Shafting	1	2021	2	2021
Strategic Capability Infrastructure: LSV Test Schedule - VA Block VI	3	2021	4	2021
Strategic Capability Infrastructure: LSV Test Schedule - VA Block VII	1	2023	4	2024
Strategic Capability Infrastructure: LSV Test Schedule - M2P2	4	2022	1	2023
Strategic Capability Infrastructure: LSV Test Schedule - LSV Steering and Diving Replacement	1	2018	4	2019
Strategic Capability Infrastructure: LSV Recapitalization - FY18-19 Risk Reduction Tasking & Component Procurement/Build	1	2018	4	2019
Strategic Capability Infrastructure: LSV Recapitalization - Electric Drive Models Build/ Test	2	2020	4	2021
Strategic Capability Infrastructure: LSV Recapitalization - Electric Drive System	2	2021	2	2023
Strategic Capability Infrastructure: LSV Recapitalization - EDCE Refresh	1	2020	3	2020

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603561N / *Advanced Submarine System Development*	**Project (Number/Name)** 2033 / *Adv Submarine Systems Development*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Strategic Capability Infrastructure: LSV Recapitalization - Data Collection System Refresh	2	2020	4	2021
Long Range R&D/Advanced Submarine Development: Corrosion Control - ICMS - Perform shore-based testing and initial shipboard testing. Transition to PMS450 for EM Trial execution	1	2018	1	2019
Long Range R&D/Advanced Submarine Development: Corrosion Control - AASGS - Install SCS and CT TEMPALTs. Conduct shore-based and initial shipboard testing.	1	2018	1	2019
Long Range R&D/Advanced Submarine Development: Corrosion Control - AASGS - Transition to PMS 450 for at-sea EM trial execution.	4	2018	2	2019
Long Range R&D/Advanced Submarine Development: SADS/IDTS - Complete in-lab comparative testing of the legacy & IDTS tiles	1	2018	2	2019
Long Range R&D/Advanced Submarine Development: SADS/IDTS - Conduct TEMPALT install, shipboard at-sea testing and performance analysis	3	2019	1	2020
Long Range R&D/Advanced Submarine Development: Advanced Submarine Control - (ASC) - Conduct dynamometer and design improvement changes	1	2018	4	2018
Long Range R&D/Advanced Submarine Development: Advanced Submarine Control - (ASC) - Conduct in-water barge test and operational pressure test	2	2019	1	2020
Long Range R&D/Advanced Submarine Development: Advanced Submarine Control - (ASC) - Data analysis and suitability assessment	1	2020	4	2020
Long Range R&D/Advanced Submarine Development: Precision Submarine Maneuvering and Control (PSMC) - Explore PSMC capability space and relevant parameters	1	2018	4	2018
Long Range R&D/Advanced Submarine Development: Precision Submarine Maneuvering and Control (PSMC) - Conduct Trade Studies and Concept Exploration	1	2019	4	2019
Long Range R&D/Advanced Submarine Development: Precision Submarine Maneuvering and Control (PSMC) - Concept development, prelim design and model development.	1	2020	2	2021
Long Range R&D/Advanced Submarine Development: Precision Submarine Maneuvering and Control (PSMC) - Conduct component detailed design and testing.	3	2021	4	2022

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603561N / *Advanced Submarine System Development*	**Project (Number/Name)** 2033 / *Adv Submarine Systems Development*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Long Range R&D/Advanced Submarine Development: Precision Submarine Maneuvering and Control (PSMC) - Conduct Initial Platform Introductions and testing	1	2023	2	2024
Long Range R&D/Advanced Submarine Development: Advanced Material Propeller - Redesign manufacture and fatigue test Mod Gen 2 blade	1	2018	4	2019
Long Range R&D/Advanced Submarine Development: Advanced Material Propeller - Manufacture and test Gen 3 blades and hub	1	2018	4	2019
Long Range R&D/Advanced Submarine Development: Advanced Material Propeller (AMP) - Deliver and install AMP propeller	4	2019	3	2020
Long Range R&D/Advanced Submarine Development: Advanced Material Propeller (AMP) - At-sea test on partner submarine	4	2020	4	2020
Long Range R&D/Advanced Submarine Development: Advanced Material Propeller (AMP) - Post-sea trial data analysis and hardware testing	1	2021	4	2023
Long Range R&D/Advanced Submarine Development: SSN(X) - Advanced SSN Technologies/TSEP Studies - TSEP concept formulation, analysis, and design	1	2018	4	2024
Long Range R&D/Advanced Submarine Development: Next Generation Thrust (NGT) - Concept /Test Article design	1	2018	3	2018
Long Range R&D/Advanced Submarine Development: Advanced Hull Coatings - Allied Project Arrangement Coating Development and Modeling	1	2018	3	2019
Long Range R&D/Advanced Submarine Development: Advanced Hull Coatings - Develop SDIP OPALT work package, conduct advanced procurement and material staging.	1	2018	2	2019
Long Range R&D/Advanced Submarine Development: Advanced Hull Coatings - Conduct SDIP OPALT installation follow on at-sea testing and analysis	2	2019	4	2022
Long Range R&D/Advanced Submarine Development: Advanced Hull Coatings - Conduct development, down-selection and collaborative MANTECH industrialization of NG treatment with ONR	1	2018	3	2020
Long Range R&D/Advanced Submarine Development: Advanced Hull Coatings - Develop, install and test NG treatment OPALT on VA class and transition to PMS450	2	2018	1	2023

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603561N / *Advanced Submarine System Development*	**Project (Number/Name)** 2033 / *Adv Submarine Systems Development*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Long Range R&D/Advanced Submarine Development: Advanced Signature Management Conduct TEMPALT development planning/execution in support of US trials & bi-lateral Adv EM Silencing Project Arrang	1	2018	4	2019
Long Range R&D/Advanced Submarine Development: Reliable Towed Array Program - Develop software tools & prototype instrumented array to predict operational loading. Transition to PMS401	1	2018	4	2018
Long Range R&D/Advanced Submarine Development: Submarine Superiority Project Arrangement - Conduct studies and model development	1	2018	4	2024
Rapid Technology Development and Submarine Integration: Common Unmanned Aerial System (UAS) Comms. Antenna development and comm architecture testing. Transition to PMS 425/435	1	2018	4	2018
Rapid Technology Development and Submarine Integration: Lithium Ion Battery Certification/SAFECAP - Complete shore-based testing, develop TEMPALT, and execute at-sea test. Transition to PMS394.	1	2018	4	2019
Rapid Technology Development and Submarine Integration: FMAUV Full Mission Capability - Dev optical modem for data transfer, dev TEMPALT, execute demo with SAFECAP. Transition to PMS394	1	2018	4	2019
Rapid Technology Development and Submarine Integration: Innovative Technology Transition - Conduct assessment of technology initiatives, SBIR transition work & foreign comparative tests	1	2018	4	2024

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603561N / *Advanced Submarine System Development*	Project (Number/Name) 2096 / *Payload Delivery Development*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
2096: *Payload Delivery Development*	3.800	4.738	10.969	13.936	-	13.936	12.424	10.007	13.747	14.015	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Payload Delivery Development is a non-acquisition program used for the integration of large deployable and retrievable payloads with submarines. RDT&EN funding will be used to design, manufacture, and field a prototype payload launch and recovery system utilized with submarine large ocean interfaces to accommodate large diameter payloads and offboard systems. The project enables launch and recovery of these systems from submarines. This will provide the Submarine Force with the capability to launch and recover large payloads and offboard systems of various configurations in support of critical Undersea Warfare (USW) missions, providing battle space awareness and extending war-fighting reach. This capability has been identified as a key enabler for the following critical USW mission areas: Intelligence, Surveillance, and Reconnaissance (ISR), Anti-Submarine Warfare (ASW), Anti-Surface Warfare (ASUW), Naval Special Warfare (NSW), Mine Warfare, Seabed Warfare, Counter- Autonomous Underwater Vehicle (AUV) Warfare, Electromagnetic Maneuver Warfare (EMMW), Deception, and Non-Lethal Sea Control. This capability is paramount to countering anti-access/area denial (A2/AD) threats from emerging world powers and maintaining dominance in the undersea domain. In addition to technology development, the program will support engineering and integration of new and existing technologies to enable rapid prototyping and fielding of capabilities which will inform and provide solutions to urgent war-fighter needs. Experimentation will be conducted with the Fleet (i.e., Commander, Naval Submarine Forces (COMSUBFOR), Unmanned Undersea Vehicle Squadron One (UUVRON ONE), etc.), enabling an agile environment through at-sea demonstrations, which will provide Fleet and acquisition stakeholders with relevant payload employment data to inform Concepts of Operations (CONOPs) and fielding decisions.

Current controls reflect the termination of SL-UKAS by the Navy in FY19 and subsequent funding reduction.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Payload Handling System (PHS)	4.688	10.969	13.936	0.000	13.936
Articles:	-	-	-	-	-
Description: PHS includes the development, integration and demonstration of a single prototype "middle-ware" handling system used to deploy and retrieve large undersea vehicles, payloads, and offboard systems from submarines. Funding will be used to design, manufacture, and field a prototype to facilitate the raising, lowering and articulation of payloads into and out of submarine large ocean interfaces (e.g. missile tubes) to increase war fighting capabilities. PHS will initially be integrated and demonstrated on an SSGN platform to foster and assess early technology (vertical stowage, launch and recovery capability) integration and operational concept/ employment. Subsequently, PHS includes efforts to transfer the technology and final design to industry for future multi-unit procurement and application on future VIRGINIA Class and other submarines.					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603561N / *Advanced Submarine System Development*	**Project (Number/Name)** 2096 / *Payload Delivery Development*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Payloads currently planned for vertical launch, recovery, and stowage include the U.S. Navy's Family of Unmanned Systems up to large size (e.g. SNAKEHEAD) and future block of Shallow Water Combat Submersibles (SWCS) to support Special Operations Forces (SOF) capabilities. The modularity of hosting these payloads within a tube loaded canister allows for the PHS and/or payload(s) to be swapped out with other payloads (e.g. missiles) while forward deployed dependent upon mission tasking of the submarine. Increased funding from FY18 to FY19 is required to maintain schedule for increased Non-Recurring Engineering (NRE) demand associated with Initial Design Review (IDR) and Final Design Review (FDR); including risk reducing component prototype development/testing and material/hardware identification and sourcing. Long lead- time material purchases begin in FY19 and continue into FY20. Planned FY20 efforts include completion of detailed analysis and design for subsystem elements, interface control documentation, drawings, and material purchases. ***FY 2019 Plans:*** Continue NRE to conduct Initial Design Review (IDR), commence detail design efforts including drawing & specification development, and refine material identification & sourcing and initiate purchases. Specific FY19 tasks required for FY20 Final Design Review (FDR) are as follows: - Continue refining System Arrangements, Structural and Shock Modeling Analyses, and Interface Control Document - Continue material research and risk reduction fabrication - Assess fabrication risk - Identify material/hardware to support material purchase - Identify material sourcing (price & availability) - Power Distribution Element (PDE) design development - Hydraulic System Element (HSE) design development - Control & Monitoring Element (CME) design development - Payload Handling Element (PHE) design development - System Schematic and Diagram Development - Complete PHE EDR - Complete Initial Design Review (IDR) - Fabrication Cost Estimate development					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603561N / *Advanced Submarine System Development*	**Project (Number/Name)** 2096 / *Payload Delivery Development*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
- Fabrication and Build Strategy development - Commence Long Lead Time and Other Material Sourcing and Purchasing ***FY 2020 Base Plans:*** Continue NRE to conduct Final Design Review (FDR), complete detail design efforts and Technical Data Package (TDP) review and approval, execute material purchases. - Continue refining System Arrangements, Structural and Shock Modeling Analyses, and Interface Control Document - Power Distribution Element (PDE) design completion - Hydraulic System Element (HSE) design completion - Control & Monitoring Element (CME) design completion - Payload Handling Element (PHE) design completion - System Schematic and Diagram Development - Conduct FDR - Continue Long Lead Time and other material sourcing and purchasing - Conduct Fabrication Readiness Review (FRR) - Start prototype fabrication and assembly ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increase in FY20 budget is required to complete system element designs, conduct a Final Design Review (FDR) and purchase material in conjunction with starting system fabrication.					
Title: 3 Inch Submarine Launched Unmanned K Aerial System	0.050	0.000	0.000	0.000	0.000
Articles:	-	-	-	-	-
Description: The 3" Submarine Launched Unmanned "K" Aerial System (SL-UKAS) project supports the future missions of the VIRGINIA Class Program and its payload module. The project will focus on the overall design, system engineering, prototyping, and testing needed to execute the integration of a "K" payload with a 3" UAS vehicle for rapid deployment with an integrated solution into existing shipboard systems. This system will be integrated and tested at a land based facility by the end of FY19. Technical Data Packages will transition to the Submarine Combat Control System Program Office (PMS 425) at the end of FY19.					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603561N / *Advanced Submarine System Development*	**Project (Number/Name)** 2096 / *Payload Delivery Development*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
The following key activities of the 3" SL-UKAS project support a critical capability for USW missions by providing close in defense for the Submarine Force against adversary systems: 1. Engineering and integration of existing/proven technology and payloads required to provide a much needed capability to maintain dominance in the undersea domain and extend the operational reach of the Submarine Fleet. 2. Testing necessary to prove out the capability and define CONOPs. 3. Development/testing "safe arm mechanism" to safely stow proposed equipment types onboard submarines. ***FY 2019 Plans:*** The Navy terminated the SL-UKAS program in FY 19. This reduction is reflected in the current controls. ***FY 2020 Base Plans:*** The Navy terminated the SL-UKAS program in FY 19 and out years. This reduction is reflected in the current controls. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Decreased funding in FY20 reflects the termination of SL-UKAS in FY19.					
Accomplishments/Planned Programs Subtotals	4.738	10.969	13.936	0.000	13.936

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Project will transition to VIRGINIA class with VPM as a program of record to solicit industry for a block buy of multiple units based upon the prototype design.

E. Performance Metrics

Completion of the Prototype Final Design Review (FDR)
Purchase/receipt of material

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603561N / *Advanced Submarine System Development*	**Project (Number/Name)** 2096 / *Payload Delivery Development*

Start prototype fabrication and assembly

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603561N / *Advanced Submarine System Development*	Project (Number/Name) 2096 / *Payload Delivery Development*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Product Development	WR	NUWC NPT : Newport, RI	0.199	0.606	Oct 2017	1.166	Oct 2018	1.265	Oct 2019	-		1.265	Continuing	Continuing	Continuing
Product Development	WR	NSWC PD : Philadelphia, PA	0.904	1.636	Oct 2017	4.625	Oct 2018	7.440	Oct 2019	-		7.440	Continuing	Continuing	Continuing
Product Development	WR	NUWC KPT : Keyport, WA	1.110	0.955	Oct 2017	2.742	Oct 2018	3.231	Oct 2019	-		3.231	Continuing	Continuing	Continuing
Product Development	WR	PSNS : Bremerton, WA	0.271	0.395	Oct 2017	1.144	Oct 2018	1.276	Oct 2019	-		1.276	Continuing	Continuing	Continuing
Product Development	WR	NSWC CD : West Bethesda, MD	0.300	0.139	Oct 2017	0.875	Oct 2018	0.449	Oct 2019	-		0.449	Continuing	Continuing	Continuing
Product Development	WR	NRL : Washington, DC	0.100	0.155	Oct 2017	0.000	Oct 2018	0.000	Oct 2019	-		0.000	Continuing	Continuing	Continuing
Product Development	FFRDC	ARL/PSU : Arlington, VA	0.075	0.210	Oct 2017	0.000	Oct 2018	0.000	Oct 2019	-		0.000	Continuing	Continuing	Continuing
Product Development	WR	NSWC DD : Dahlgren, VA	0.005	0.021	Oct 2017	0.000	Oct 2018	0.000	Oct 2019	-		0.000	Continuing	Continuing	Continuing
Product Development	C/CPFF	DIUx : Mountain View, CA	0.000	0.050	Nov 2017	0.000	Nov 2018	0.000	Oct 2019	-		0.000	Continuing	Continuing	Continuing
Product Development	WR	PNSY : Portsmouth, NH	0.435	0.162	Oct 2017	0.000	Oct 2018	0.000	Oct 2019	-		0.000	Continuing	Continuing	Continuing
		Subtotal	3.399	4.329		10.552		13.661		-		13.661	Continuing	Continuing	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Travel	Allot	NAVSEA HQ : Washington DC	0.043	0.044	Oct 2017	0.045	Oct 2018	0.046	Oct 2019	-		0.046	Continuing	Continuing	Continuing
Contractor Management Services	C/CPAF	NTT Data : McLean, VA	0.358	0.365	Dec 2017	0.372	Dec 2018	0.229	Dec 2019	-		0.229	Continuing	Continuing	Continuing
		Subtotal	0.401	0.409		0.417		0.275		-		0.275	Continuing	Continuing	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603561N / *Advanced Submarine System Development*	Project (Number/Name) 2096 / *Payload Delivery Development*	

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	3.800	4.738		10.969		13.936		-		13.936	Continuing	Continuing	N/A

Remarks

The Navy terminated the SL-UKAS program in FY 20. This reduction is reflected in the current controls.

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603561N / *Advanced Submarine System Development*	**Project (Number/Name)** 2096 / *Payload Delivery Development*

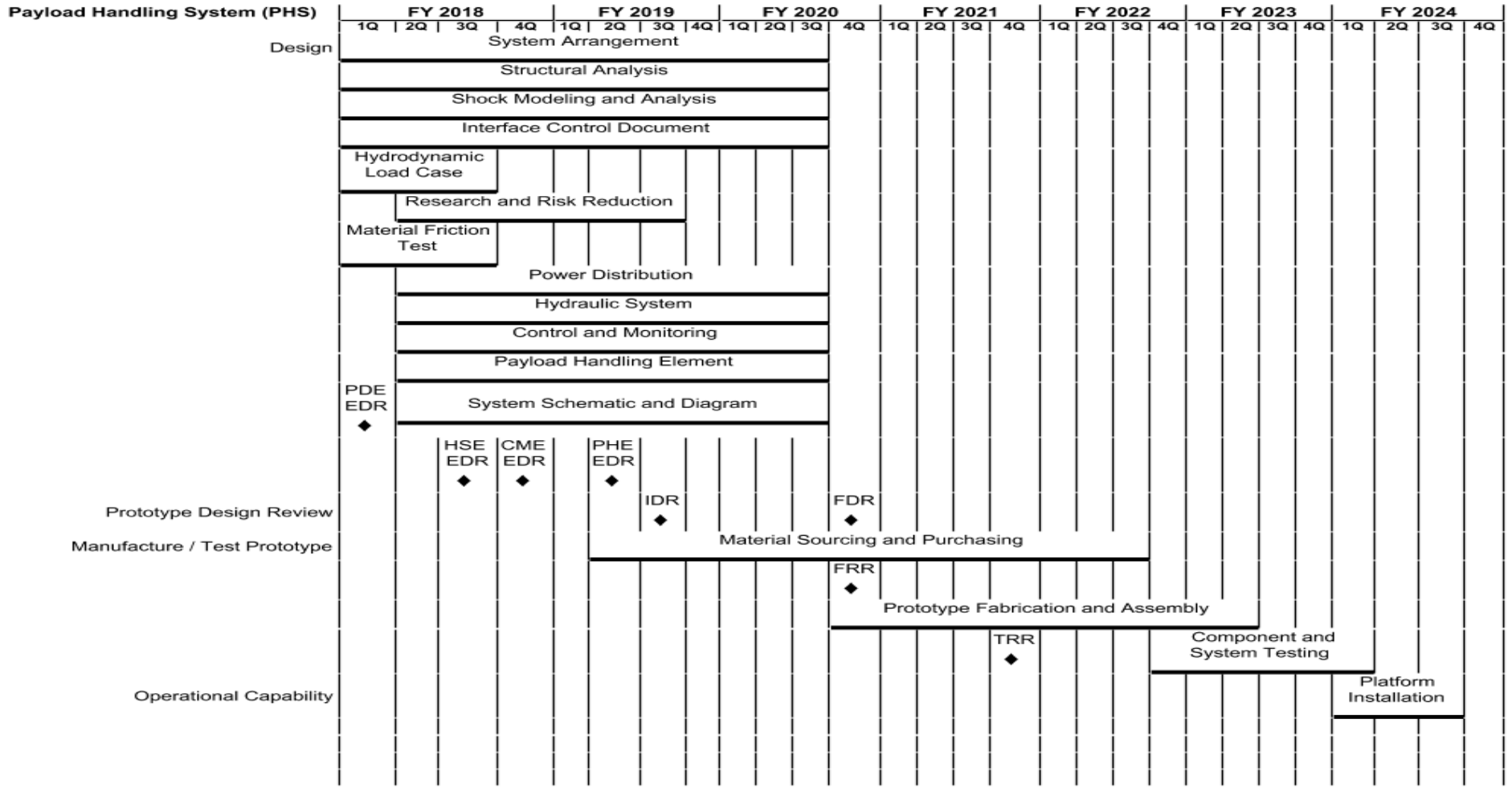
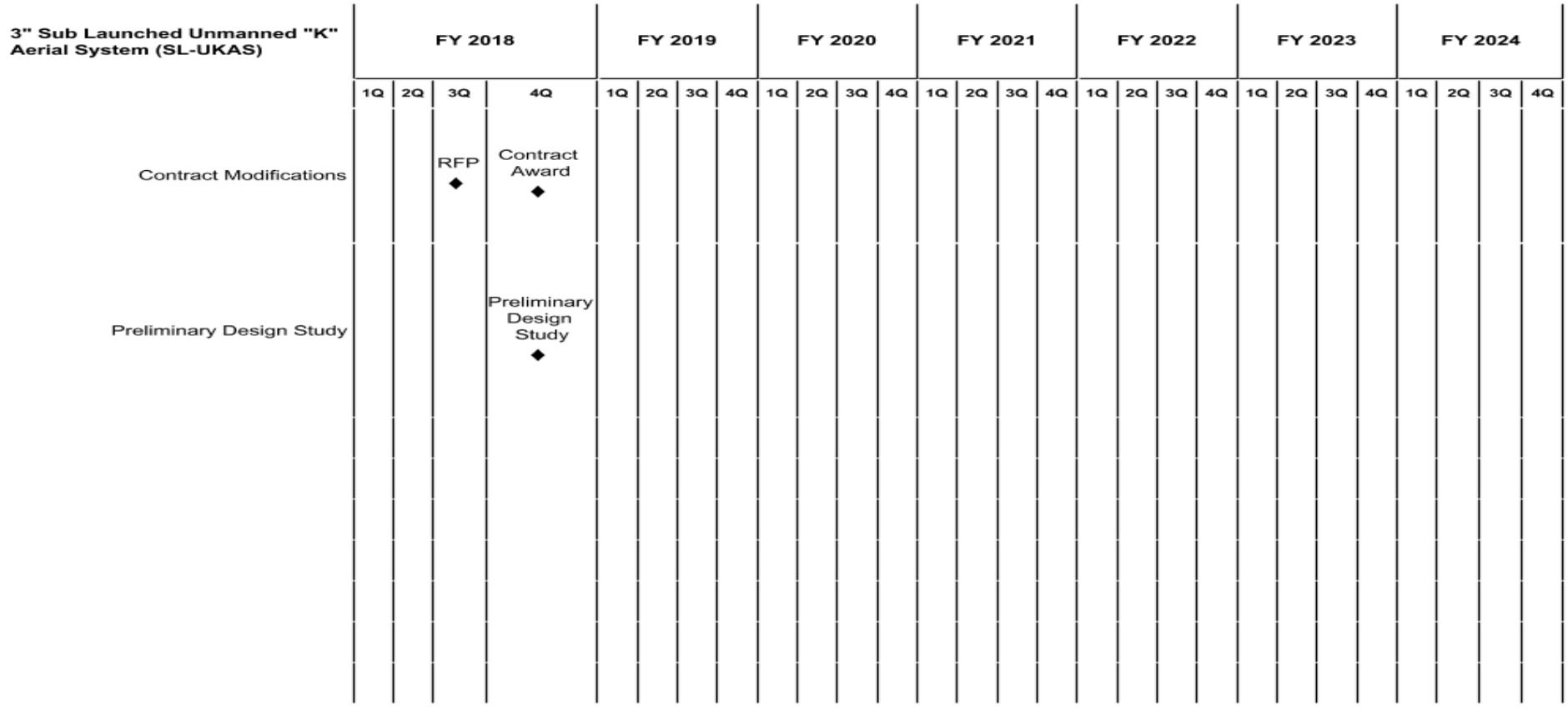


Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603561N / *Advanced Submarine System Development*	**Project (Number/Name)** 2096 / *Payload Delivery Development*

2020PB - 0603561N - 2096

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603561N / *Advanced Submarine System Development*	**Project (Number/Name)** 2096 / *Payload Delivery Development*



2020PB - 0603561N - 2096

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603561N / *Advanced Submarine System Development*	**Project (Number/Name)** 2096 / *Payload Delivery Development*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Payload Handling System (PHS)				
Design: System Arrangement Development	1	2018	3	2020
Design: Structural Analysis	1	2018	3	2020
Design: Shock Modeling and Analysis	1	2018	3	2020
Design: Interface Control Document	1	2018	3	2020
Design: Hydrodynamic Load Case Modeling and Analysis	1	2018	3	2018
Design: Material Research and Risk Reduction Fabrication	2	2018	3	2019
Design: Payload Handling Element Material Friction Test	1	2018	3	2018
Design: Power Distribution Element Design Development	2	2018	3	2020
Design: Hydraulic System Element Design Development	2	2018	3	2020
Design: Control and Monitoring Element Design Development	2	2018	3	2020
Design: Payload Handling Element Design Development	2	2018	3	2020
Design: System Schematic and Diagram Development	2	2018	3	2020
Design: Power Distribution Element Element Design Review (EDR)	1	2018	1	2018
Design: Hydraulic System Element EDR	3	2018	3	2018
Design: Control and Monitoring Element EDR	4	2018	4	2018
Design: Payload Handling Element EDR	2	2019	2	2019
Prototype Design Review: Initial Design Review (IDR)	3	2019	3	2019
Prototype Design Review: Final Design Review (FDR)	4	2020	4	2020
Manufacture / Test Prototype: Long Lead Time and Other Material Sourcing and Purchasing	2	2019	3	2022
Manufacture / Test Prototype: Fabrication Readiness Review (FRR)	4	2020	4	2020

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603561N / *Advanced Submarine System Development*	**Project (Number/Name)** 2096 / *Payload Delivery Development*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Manufacture / Test Prototype: Prototype Fabrication and Assembly	4	2020	2	2023
Manufacture / Test Prototype: Test Readiness Review (TRR)	4	2021	4	2021
Manufacture / Test Prototype: Component and System Testing	4	2022	1	2024
Operational Capability: Platform Installation	1	2024	3	2024
3" Sub Launched Unmanned "K" Aerial System (SL-UKAS)				
Contract Modifications: Request for Proposal (RFP)	3	2018	3	2018
Contract Modifications: Contract Award - Feasibilty Study	4	2018	4	2018
Preliminary Design Study: Preliminary Design Study: Payload Integration Feasibility Study	4	2018	4	2018

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603561N / *Advanced Submarine System Development*	Project (Number/Name) 3391 / *SSN/SSGN Survivability Program*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
3391: *SSN/SSGN Survivability Program*	0.000	8.203	8.327	10.123	-	10.123	11.522	12.027	11.573	12.825	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

In 2013, OPNAV N97 established SSN/SSGN Survivability Program (S3P) as a separate project area within ASSD to assure SSN/SSGN survivability and the ability of submarines to complete their joint warfighting missions even if covert mobility is compromised. The $1.8M budget increase in FY20 will allow S3P to develop specific countermeasure concept systems to address documented gaps in survivability on current submarines.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: SSN/SSGN Survivability Program	8.203	8.327	10.123	0.000	10.123
Articles:	-	-	-	-	-

Description: The details of project activities are SECRET or higher. The SSN/SSGN Survivability Program (S3P) provides Director, Undersea Warfare Division (OPNAV N97) with qualitative and quantitative analysis of potential SSN and SSGN submarine vulnerabilities based on technology threats and operational requirements and recommends countermeasure concepts to mitigate these potential vulnerabilities. S3P informs the entire $10B submarine portfolio with validated analysis which informs risk to submarine survivability and stealth in contested environments. This analysis also informs methods by which stealth can be regained once compromised to execute missions such as weapons employment. S3P conducts technical analysis validated with at-sea testing. The technical analysis is put into an operational context using data from current submarine operations and Fleet war plans. S3P develops technologies and tools to increase the survivability of submarines by recognizing and mitigating sources of acoustic and non-acoustic vulnerabilities that put a submarine at risk when operating in contested waters and the littorals. S3P supports fleet development of Tactics, Techniques, and Procedures (TTPs) that facilitate new or enhance existing warfighting concepts.

FY 2019 Plans:

S3P will continue to address gaps in stealth and survivability for the current and future SSN/SSGN force to include
responding to fleet questions on current tactical vulnerabilities and completion of an annual Operational Survivability

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603561N / *Advanced Submarine System Development*	**Project (Number/Name)** 3391 / *SSN/SSGN Survivability Program*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Assessment. S3P will conduct acoustic, non-acoustic, and non-traditional ASW vulnerability assessment projects, and will conduct sea tests in support of OPNAV N97 Acoustic Superiority. S3P will initiate a process to develop threat based assessments for a new attack submarine to address Tactical Submarine Evolution Plan (TSEP) requirements for the future. Details can be provided in a classified setting. ***FY 2020 Base Plans:*** S3P will continue to address gaps in stealth and survivability for the current SSN/SSGN force to include responding to fleet questions on current tactical vulnerabilities and completion of an annual Operational Survivability Assessment. Continue analytical and technical work on TSEP and future SSN/SSGN survivability design basis. S3P will conduct acoustic, non-acoustic, and non-traditional ASW vulnerability assessment projects, and will conduct sea tests in stealth requirements and countermeasure concepts. Complete two tactical decision concept projects for current fleet operations. Details can be provided in a classified setting. S3P will conduct sea tests with international partners for Advanced Signature Management/Countermeasures development. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increase between FY19 and FY20 reflects transition of Advanced Signature Management project from PE 0603561N / 2033 Advanced Submarine System Development. S3P will conduct at-sea test projects to demonstrate countermeasure concepts for known vulnerabilities.					
Accomplishments/Planned Programs Subtotals	8.203	8.327	10.123	0.000	10.123

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

S3P is a non-acquisition activity which investigates, prioritizes, and validates SSN/SSGN survivability issues for peacetime and all phases of war. S3P also proposes and directs development and validation of countermeasure concepts. S3P works to ensure alignment between OPNAV, NAVSEA, ONI, and the Fleet on survivability

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603561N / *Advanced Submarine System Development*	**Project (Number/Name)** 3391 / *SSN/SSGN Survivability Program*

issues. S3P will develop recommendations for stealth requirements to OPNAV N97 and provide technical basis for Tactics, Techniques, and Procedures developed by the Undersea Warfighting Development Command (UWDC). S3P will operate under OPNAV N97 and Fleet Flag panel (Operations Review Group) oversight. Products and metrics will be evaluated by the Submarine Operations Group and Operations Review Group. S3P will recommend technical requirements on all matters of submarine survivability to OPNAV N97.

E. Performance Metrics

S3P is a non-acquisition activity which investigates, prioritizes, and validates SSN/SSGN survivability issues for peacetime and all phases of war. S3P also proposes and directs development and validation of countermeasure concepts. S3P works to ensure alignment between OPNAV, NAVSEA, ONI, and the Fleet on survivability issues. S3P will develop recommendations for survivability and stealth requirements to OPNAV N97 and provide technical basis for Tactics, Techniques, and Procedures (TTP) developed by the Undersea Warfighting Development.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603561N / *Advanced Submarine System Development*	**Project (Number/Name)** 3391 / *SSN/SSGN Survivability Program*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Product Development	MIPR	CNA: : Alex, VA	0.000	0.562	Jan 2018	0.448	Jan 2019	0.500	Jan 2020	-		0.500	Continuing	Continuing	Continuing
Product Development	SS/CPFF	MIT-LL : Cambridge, MA	0.000	0.200	Oct 2017	0.627	Oct 2018	0.600	Oct 2019	-		0.600	Continuing	Continuing	Continuing
Product Development	SS/CPFF	Raytheon : Portmouth, RI	0.000	0.429	Dec 2018	0.440	Dec 2019	0.450	Sep 2020	-		0.450	Continuing	Continuing	Continuing
Product Development	SS/CPFF	JHU/APL : Laurel, MD	0.000	2.042	Jul 2018	1.737	Jul 2019	1.000	Jul 2020	-		1.000	Continuing	Continuing	Continuing
Product Development	SS/CPFF	UT/ARL : Austin, TX	0.000	0.367	Aug 2018	0.700	Aug 2019	0.800	Aug 2020	-		0.800	Continuing	Continuing	Continuing
Product Development	WR	NUWC : Newport, RI	0.000	0.900	Apr 2018	1.000	Apr 2019	1.000	Apr 2020	-		1.000	Continuing	Continuing	Continuing
Product Development	MIPR	NRL : Washington, DC	0.000	0.090	Dec 2017	0.300	Dec 2018	0.400	Dec 2019	-		0.400	Continuing	Continuing	Continuing
Product Development	C/BA	NSMA : Not Specified	0.000	0.782	Dec 2017	0.900	Dec 2018	0.920	Dec 2019	-		0.920	Continuing	Continuing	Continuing
Product Development	SS/CPFF	Sonalysts : Groton, CT	0.000	0.050	Dec 2018	0.200	Dec 2019	0.350	Sep 2020	-		0.350	Continuing	Continuing	Continuing
Product Development	WR	SPAWAR : Charleston, SC	0.000	0.050	Aug 2018	0.100	Aug 2019	0.050	Aug 2020	-		0.050	Continuing	Continuing	Continuing
		Subtotal	0.000	5.472		6.452		6.070		-		6.070	Continuing	Continuing	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Travel and Corporate	WR	NAVSEA HQ : Not Specified	0.000	0.040	Oct 2017	0.340	Oct 2018	0.360	Oct 2019	-		0.360	Continuing	Continuing	Continuing
		Subtotal	0.000	0.040		0.340		0.360		-		0.360	Continuing	Continuing	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603561N / *Advanced Submarine System Development*	**Project (Number/Name)** 3391 / *SSN/SSGN Survivability Program*

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Developmental Test & Evaluation	WR	NSWC : Carderock, MD	0.000	2.371	Apr 2018	1.205	Apr 2019	3.353	Apr 2020	-		3.353	Continuing	Continuing	Continuing
		Subtotal	0.000	2.371		1.205		3.353		-		3.353	Continuing	Continuing	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Management Services	SS/CPFF	NSMA : Not Specified	0.000	0.320	Dec 2017	0.330	Dec 2018	0.340	Dec 2019	-		0.340	Continuing	Continuing	Continuing
		Subtotal	0.000	0.320		0.330		0.340		-		0.340	Continuing	Continuing	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	8.203		8.327		10.123		-		10.123	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603561N / *Advanced Submarine System Development*	**Project (Number/Name)** 3391 / *SSN/SSGN Survivability Program*

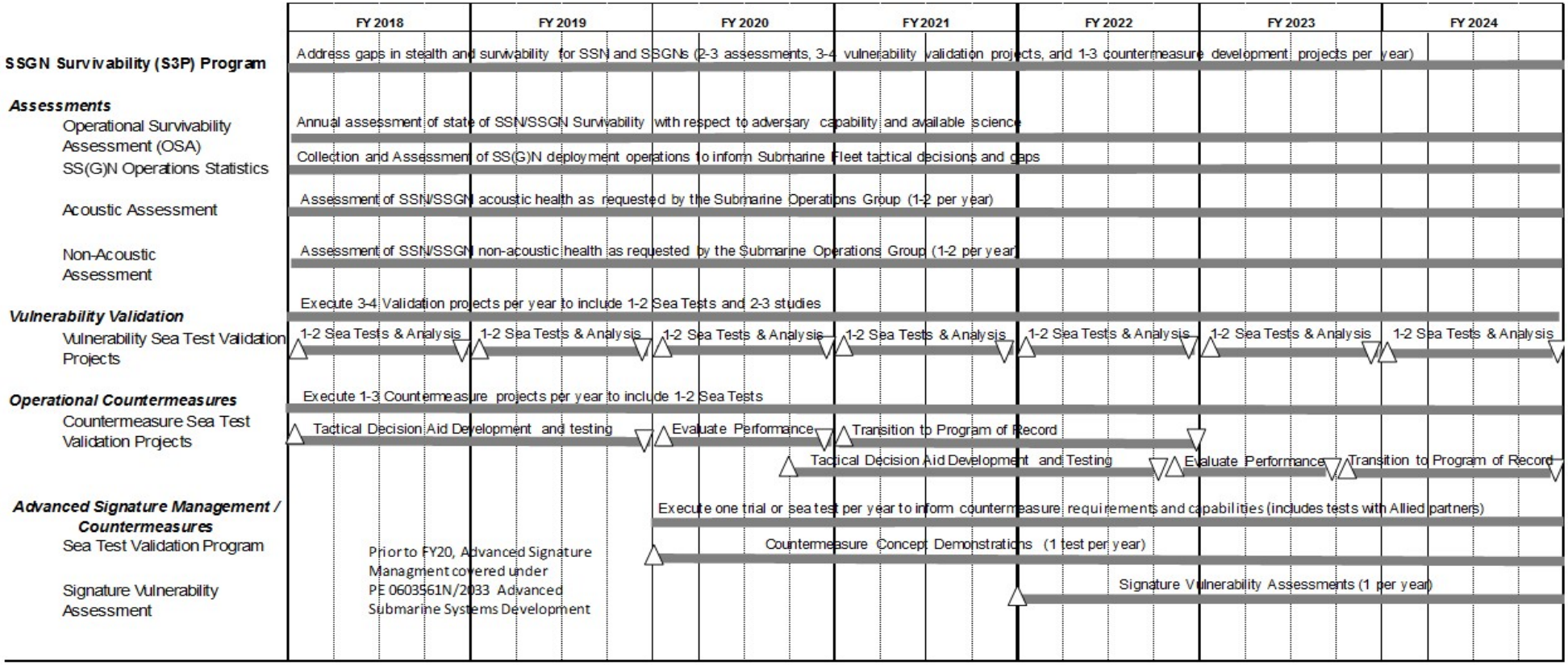


Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603561N / *Advanced Submarine System Development*	**Project (Number/Name)** 3391 / *SSN/SSGN Survivability Program*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Assessments				
Operational Survivability Assessment	1	2018	4	2024
Acoustic Assessment	1	2018	4	2024
Non-Acoustic Assessment	1	2018	4	2024
Vulnerability Validation				
Vulnerability SEA Test Validation Program (1-2 per year)	1	2018	4	2024
Countermeasures				
Countermeasure Validation (2-3 per year)	1	2018	4	2024
Advanced Submarine Signature Management/Countermeasures				
Sea Test Validation Program (1 per year)	1	2020	4	2024
Signature Vulnerability Assessment (1 per year)	1	2022	4	2024

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603561N / *Advanced Submarine System Development*	Project (Number/Name) 9710 / *Advanced Submarine Technology Development*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
9710: *Advanced Submarine Technology Development*	0.000	0.000	0.000	38.689	-	38.689	60.476	45.705	63.665	75.464	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Note

This program was previously funded in FY 2019 under Program Element 0604250D8Z (Advanced Innovative Technologies) Project 250 (Advanced Innovative Technologies). This is a Navy new start.

A. Mission Description and Budget Item Justification

The Advanced Submarine Technology Development effort is responsible for evaluating and transitioning new payload capabilities into the fleet. The integration effort will transition the results of the Office of the Secretary of Defense (OSD) Strategic Capabilities Office (SCO) demonstration program to rapidly integrate a more permanent capability onto additional undersea platforms. Developmental engineering, additional design work, award of the development contract, and conduct of the PDR will take place in FY2020. Currently, there are two major efforts funded for required transition: (1) integration of Project 1 payload and (2) development of a new Payload Launch Device (PLD) to support future submarine launched payloads. Further details can be provided at a higher classification.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: New Payload Launcher Device (PLD)	0.000	0.000	9.790	0.000	9.790
Articles:	-	-	-	-	-
Description: In FY2020 a New Payload Launcher Device (PLD) will be developed to eject payloads out of current submarine ejection systems. The current device lacks the energetic capacity to support the weight and scope of desired larger payloads (Project 1 and others). Rapid development of the new device allows for early integration and testing support for these future payloads, avoiding later costs and redesign of the payload systems. FY2020 efforts include development through preliminary design review (PDR) and critical design review (CDR), and future analysis of other payloads. Further details of this project can be provided at a higher classification.					
FY 2019 Plans: N/A					
FY 2020 Base Plans: - Design and tradeoff analysis - Develop new design and Technical Data Package (TDP)					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603561N / *Advanced Submarine System Development*	**Project (Number/Name)** 9710 / *Advanced Submarine Technology Development*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
- Award New PLD Development Contract - Conduct PDR ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** - FY20 addition begins initial development effort for New Payload Launcher Device (PLD) based on safety interactions from advanced demonstration program.					
Title: Project 1	0.000	0.000	28.899	0.000	28.899
Articles:	-	-	-	-	-
Description: Project 1 leverages a separately funded advanced demonstration initiative that launches an existing payload (Payload 1) from U.S. Submarine classes. The payload and ship system integration are managed by separate programs, with further details classified. The integration effort will transition the results of the Office of the Secretary of Defense (OSD) Strategic Capabilities Office (SCO) demonstration program to rapidly integrate a more permanent capability onto additional undersea platforms. Developmental engineering, additional design work, award of the development contract, and conduct of the PDR will take place in FY2020. ***FY 2019 Plans:*** N/A ***FY 2020 Base Plans:*** - Support advanced demonstration of capability within the fleet - Begin development of Project 1 unique support equipment and design for ship integration and robustness - Initial developmental engineering efforts and reviews - Begin system engineering and design of components - Award Project 1 Development Contract - Conduct PDR ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:***					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603561N / *Advanced Submarine System Development*	**Project (Number/Name)** 9710 / *Advanced Submarine Technology Development*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
- FY20 addition begins transition of the program from OSD SCO Program Element 0604250D8Z (Advanced Innovative Technologies) Project 250 (Advanced Innovative Technologies).					
Accomplishments/Planned Programs Subtotals	0.000	0.000	38.689	0.000	38.689

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• OMN/1D4D: *Weapons Maintenance*	1,229.077	1,310.348	924.069	486.188	1,410.257	990.572	1,227.069	1,257.463	1,281.739	0.000	8,706.525

Remarks

D. Acquisition Strategy

Project 1 systems engineering will build from the demonstration program, allowing for design and testing work to be executed rapidly. The first phase of Project 1 leverages the existing demonstration design for large interface hardware and an already written Shock Qualification Plan to complete a spiral design upgrade of the interface hardware. This hardware is large, manufacturing intensive, and already known to be on the critical path. The demonstration program has proven that contracting for the material and manufacturing of these components all at once saves money and reduces risk. The large metal components can be quickly designed, manufactured, and turned over to begin the process of shock analysis and testing. Systems engineering and design of other components can be executed in parallel and will also begin in FY2020. Contract Award, design work to include PDR will occur in FY2020 and CDR and EDM item procurement are to happen in FY2021 for major components. The ejection system used for demonstration is inadequate for tactical use of this payload, requiring spiral design of several critical components. Contract award and design work through preliminary design review will happen in FY 2020 for these subsystems.

The New Payload Launcher Device (PLD) will develop an ejection system that is safety compliant and that has adequate energy to launch future payloads. An Other Transactional Authority (OTA) contract managed by NUWC Newport will be used to rapidly award the design, build and test the system. Initial design and development, to include preliminary design and critical design reviews, will occur by end of FY2020. Manufacturing of engineering development models and test of these units will occur in FY2021 to support test and final certification. The EDM units will be completed in FY2022 with necessary testing to achieve certification for system safety and operational use by end of FY2022. This timeline supports providing these ejection devices to the development efforts of other payloads for early integration, avoiding redesign and rework costs. Future systems will either be built by Government agencies or contracted through payload manufacturer contracts.

E. Performance Metrics

Progress Reviews
Execution Reporting and Reviews
Milestone Reviews

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603561N / *Advanced Submarine System Development*	Project (Number/Name) 9710 / *Advanced Submarine Technology Development*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
New Payload Launcher Device - Development	TBD	TBD : TBD	0.000	0.000		0.000		7.527	Feb 2020	-		7.527	Continuing	Continuing	Continuing
New Payload Launcher Device - System Engineering	WR	NUWC : Newport, RI	0.000	0.000		0.000		1.882	Dec 2019	-		1.882	Continuing	Continuing	Continuing
Project 1 - Development	TBD	TBD : TBD	0.000	0.000		0.000		21.895	Feb 2020	-		21.895	Continuing	Continuing	Continuing
Project 1 - System Engineering	WR	NUWC : Newport, RI	0.000	0.000		0.000		5.485	Dec 2019	-		5.485	Continuing	Continuing	Continuing
		Subtotal	0.000	0.000		0.000		36.789		-		36.789	Continuing	Continuing	N/A

Remarks

In FY2020 New Payload Launcher Device (PLD) Program begins redesign development effort for new payload launch device based on safety interactions from advanced demonstration program and will develop new design and TDP, award the new PLD development contract and conduct PDR and CDR.
In FY2020 Project 1 begins transition program from separately funded demonstration program and will begin development of unique support equipment and design for ship integration and robustness; award Project 1 Development Contract; begin system engineering and design of components and conduct PDR.

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
New Payload Launcher Device	WR	NUWC : Newport, RI	0.000	0.000		0.000		0.000		-		0.000	0.000	0.000	-
Project 1	WR	NUWC : Newport, RI	0.000	0.000		0.000		0.000		-		0.000	0.000	0.000	-
		Subtotal	0.000	0.000		0.000		0.000		-		0.000	0.000	0.000	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
New Payload Launcher Device - Program Management Support	C/CPAF	BOOZ ALLEN : Washington, D.C.	0.000	0.000		0.000		0.300	Dec 2019	-		0.300	Continuing	Continuing	Continuing

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603561N / *Advanced Submarine System Development*	**Project (Number/Name)** 9710 / *Advanced Submarine Technology Development*

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project 1- Program Management Support	C/CPAF	BOOZ ALLEN : Washington, D.C	0.000	0.000		0.000		1.500	Dec 2019	-		1.500	Continuing	Continuing	Continuing
Travel	WR	NAVSEA : Washington, D.C	0.000	0.000		0.000		0.100	Sep 2020	-		0.100	0.000	0.100	-
		Subtotal	0.000	0.000		0.000		1.900		-		1.900	Continuing	Continuing	N/A

Remarks

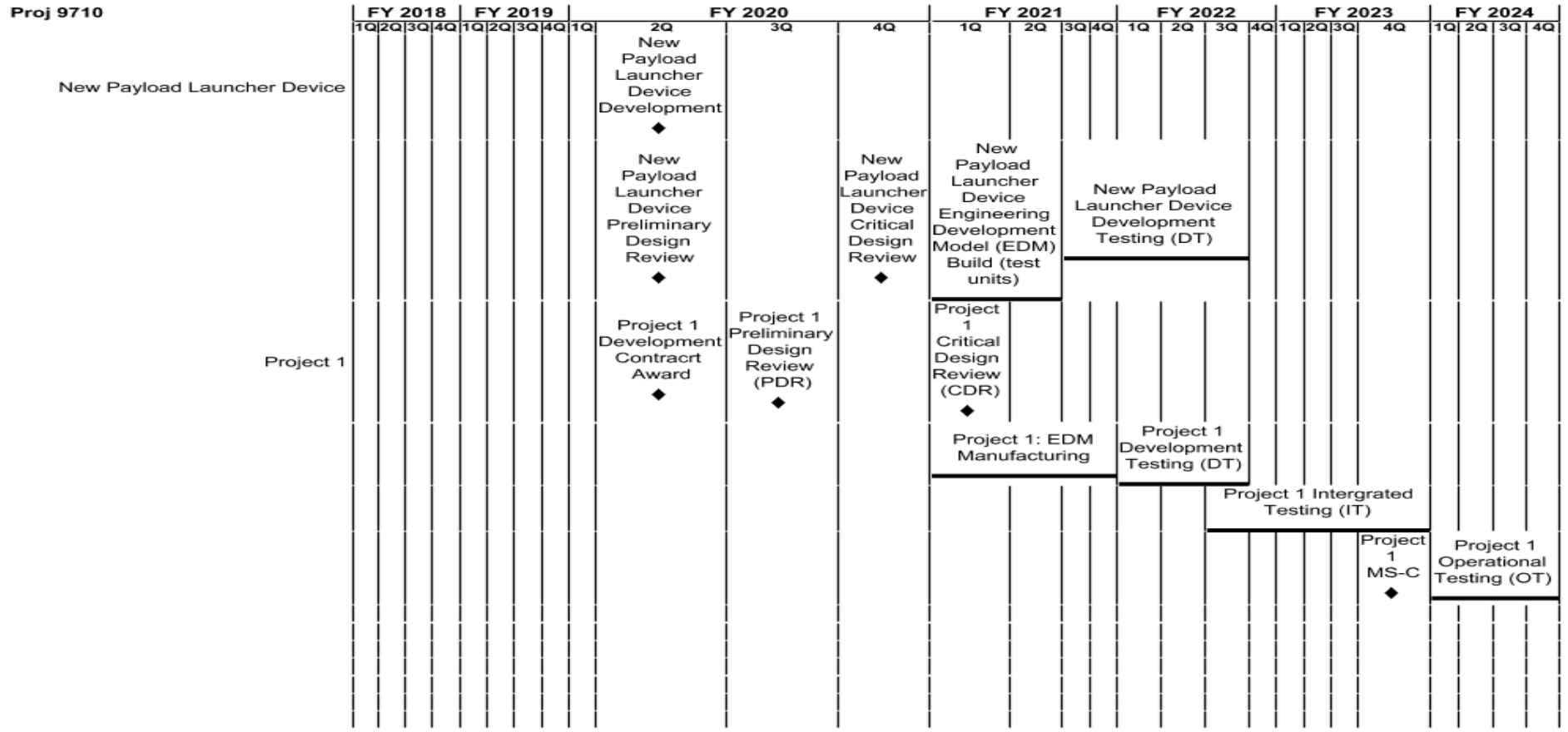
Travel increase from FY2019 to FY2020 covers the travel for the two new development programs beginning in FY2020, New Payload Launcher Device and Project 1.

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	0.000		0.000		38.689		-		38.689	Continuing	Continuing	N/A

Remarks

In FY2020, Project 9710, Project 1 and New Payload Launcher Device (PLD) Program transitions Project 1 from a separately funded demonstration program and begins the redesign of the MK75 Gas Generator (New PLD). Both programs will award development contracts in FY2020.

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603561N / *Advanced Submarine System Development*	**Project (Number/Name)** 9710 / *Advanced Submarine Technology Development*



2020PB - 0603561N - 9710

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603561N / *Advanced Submarine System Development*	**Project (Number/Name)** 9710 / *Advanced Submarine Technology Development*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 9710				
New Payload Launcher Device: Development Contracrt Award	2	2020	2	2020
New Payload Launcher Device: Preliminary Design Review (PDR)	2	2020	2	2020
New Payload Launcher Device: Critical Design Review (CDR)	4	2020	4	2020
New Payload Launcher Device: Engineering Development Model (EDM) Build (test units)	1	2021	2	2021
New Payload Launcher Device: Development Testing (DT)	3	2021	3	2022
Project 1: Development Contracrt Award	2	2020	2	2020
Project 1: Preliminary Design Review (PDR)	3	2020	3	2020
Project 1: Critical Design Review (CDR)	1	2021	1	2021
Project 1: Project 1: EDM Manufacturing	1	2021	4	2021
Project 1: Development Testing (DT)	1	2022	3	2022
Project 1: Intergrated Testing (IT)	3	2022	4	2023
Project 1: MS-C	4	2023	4	2023
Project 1: Operational Testing (OT)	1	2024	4	2024

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603561N / *Advanced Submarine System Development*	Project (Number/Name) 9999 / *Congressional Adds*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
9999: *Congressional Adds*	0.000	4.825	10.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	14.825
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

LITTORAL WATER THREATS. Environmentally characterize the South Florida Ocean Measurement Facility (SFOMF) underwater test range battlespace, upgrade the sensors and infrastructure, and conduct at least two characterization tests of a Virginia Class Submarine to validate model data.

LIGHTWEIGHT COMPOSITE RESEARCH. Continue to develop and demonstrate composite material technologies for future submarines in areas of non-traditional/ advanced materials for hull and platform technologies, propulsors, propellers, and other systems which increase near-term capability and provide cost reduction for in-service and future submarine classes.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019
Congressional Add: Littoral Water Threats ***FY 2018 Accomplishments:*** Initiated planning for SFOMF 3-D environmental characterization and range infrastructure upgrade. Developed Underwater Electro-Magnetics (UEM) Strategic Plan and established initial "Need Lines" for future technical development. Replaced SFOMF range magnetometers. ***FY 2019 Plans:*** Complete 3-D environmental characteristics of the water space and validate models of the operating area. Upgrade SFOMF range infrastructure, including environmental hardware, sensors, data and power cables, and supporting detection/processing algorithms and associated hardware. Update UEM models and develop environmental threat conditions for future submarine designs. Complete analysis of FY18 prototype trial. Perform SFOMF detection array upgrade. Conduct modeling and planning for sea trials on two Virginia Class Submarines.	4.825	5.000
Congressional Add: Lightweight Composite Research ***FY 2018 Accomplishments:*** N/A ***FY 2019 Plans:*** AMP. Finalize structural acceptance process for the Advanced Material Propeller (AMP), including fatigue testing of Generation 2 composite blades in partner country, data analysis, and finite element analysis. Complete the structural certification and planning for AMP sea trials, obtain approval from cognizant technical authorities that AMP is acceptable for trial, and provide partner country with supporting documentation package.	0.000	5.000

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603561N / *Advanced Submarine System Development*	**Project (Number/Name)** 9999 / *Congressional Adds*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019
NEXT GEN THRUST. Continue design studies and plan small and/or large scale testing of innovative, advanced material propulsor and shafting technologies. Complete detailed design of a composite shaft. Begin test article fabrication, testing, and composite shaft manufacture. Continue evaluation and design of a next generation propulsor concept utilizing new/non-traditional materials. NEW COMPOSITE APPLICATIONS. Conduct composite material design and demonstration feasibility studies to explore and validate new applications of composite materials on submarines.		
Congressional Adds Subtotals	4.825	10.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

LITTORAL WATER THREATS. Complete SFOMF environmental analysis, complete range upgrades, update models and complete one Virginia Class Submarine characterization test at SFOMF to validate modeling data.

LIGHTWEIGHT COMPOSITE RESEARCH. AMP. Complete structural Objective Quality Evidence package and structural certification of prototype Advanced Material Propeller (AMP) for at-sea testing and deliver full-scale AMP for at-sea testing, with supporting documentation.

NEXT GEN THRUST. Produce documentation of composite shaft design, material test results, analysis results, and independent assessments. Produce documentation of next generation SSN propulsor concept design, to include performance predictions.

NEW COMPOSITE APPLICATIONS: Identify new/alternate applications for composite technology.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603561N / *Advanced Submarine System Development*	Project (Number/Name) 9999 / *Congressional Adds*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Product Development	Various	NSWC/CD : Bethesda, MD	0.000	2.375	Dec 2018	8.618	Dec 2019	0.000		-		0.000	0.000	10.993	-
Product Development	Various	NOVA Southeastern University : Ft. Lauderdale, FL	0.000	2.350	Dec 2018	0.000		0.000		-		0.000	0.000	2.350	-
Product Development	Various	SPA : Washington, DC	0.000	0.000		0.294	Dec 2019	0.000		-		0.000	0.000	0.294	-
Product Development	Various	ARL/PSU: : State College, PA	0.000	0.000		0.746	Dec 2019	0.000		-		0.000	0.000	0.746	-
		Subtotal	0.000	4.725		9.658		0.000		-		0.000	0.000	14.383	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Product Development	Various	NTT : Washington, DC	0.000	0.100	Dec 2018	0.100	Dec 2019	0.000		-		0.000	0.000	0.200	-
Product Development	Various	Contractor Support : Various	0.000	0.000		0.192	Jan 2019	0.000		-		0.000	0.000	0.192	-
Product Development	Various	Gov Engineering : Various	0.000	0.000		0.050	Jan 2019	0.000		-		0.000	0.000	0.050	-
		Subtotal	0.000	0.100		0.342		0.000		-		0.000	0.000	0.442	N/A

Test and Evaluation ($ in Millions)

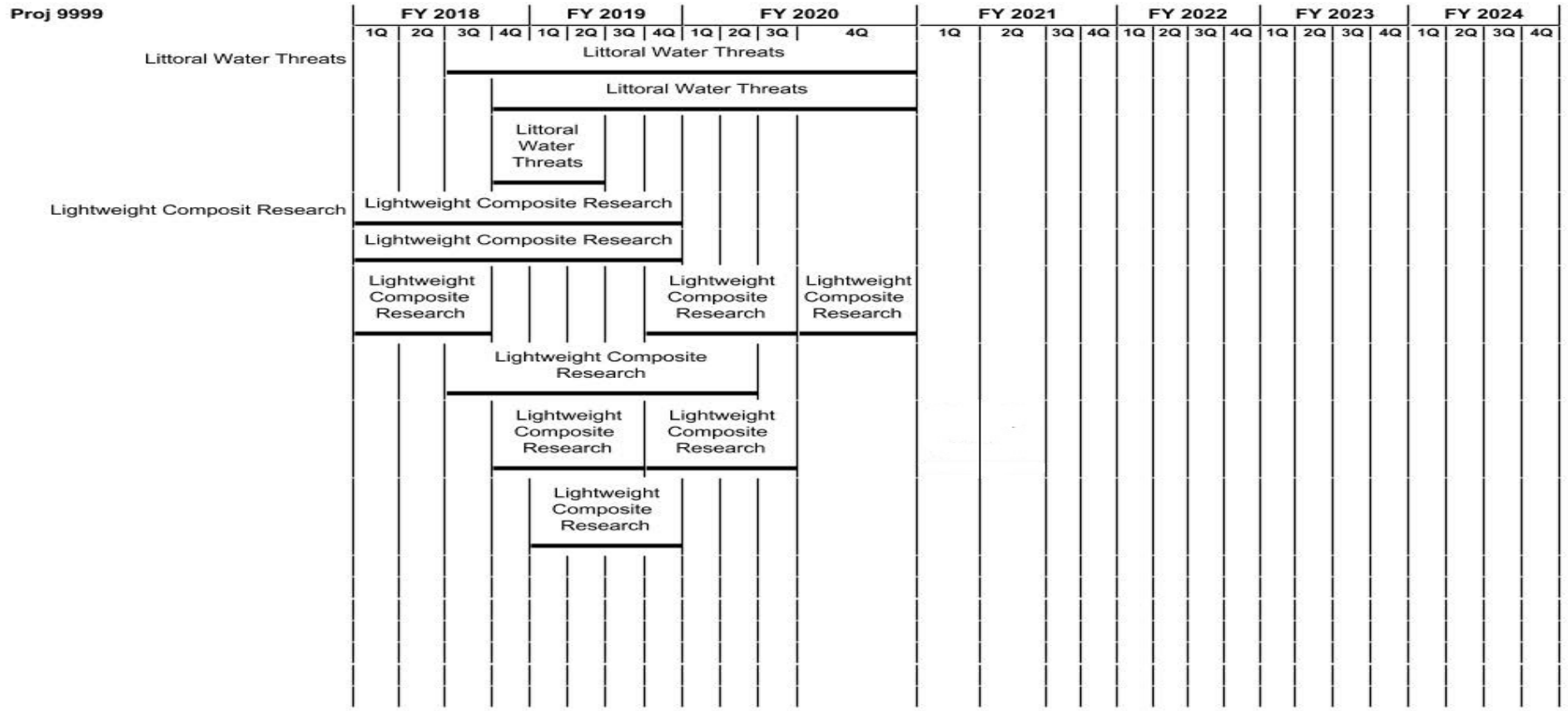
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Test and Evaluation	SS/CPFF	Not Specified : Not Specified	0.000	0.000		0.000		0.000		-		0.000	0.000	0.000	-
		Subtotal	0.000	0.000		0.000		0.000		-		0.000	0.000	0.000	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603561N / *Advanced Submarine System Development*	Project (Number/Name) 9999 / *Congressional Adds*	

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	4.825		10.000		0.000		-		0.000	0.000	14.825	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603561N / *Advanced Submarine System Development*	**Project (Number/Name)** 9999 / *Congressional Adds*



2020PB - 0603561N - 9999

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603561N / *Advanced Submarine System Development*	**Project (Number/Name)** 9999 / *Congressional Adds*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 9999				
Littoral Water Threats: Test RangeSensor and Infrastructure upgrades	3	2018	4	2020
Littoral Water Threats: Test Planning, Execution and Analysis	4	2018	4	2020
Littoral Water Threats: Environmental/UEM Modeling and Characterization	4	2018	2	2019
Lightweight Composite Research: AMP: Complete structural certification process, assemble and test AMP Gen 3 blades and hub	1	2019	4	2019
Lightweight Composite Research: AMP: Deliver and install AMP propeller and supporting documentation to partner country	4	2019	3	2020
Lightweight Composite Research: AMP: At-sea test of AMP on partner submarine	4	2020	4	2020
Lightweight Composite Research: Next Gen Thrust: Complete Test Article design, fabrication and testing	1	2019	3	2020
Lightweight Composite Research: Next Gen Thrust: Complete design for Integrated Shaft and Propulsor	1	2019	3	2019
Lightweight Composite Research: Next Gen Thrust: Manufacture/assemble Integrated Shaft and Propulsor	4	2019	3	2020
Lightweight Composite Research: new Composite Applications: Conduct composite material design and demonstration feasibility studies	1	2019	4	2019

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy											Date: March 2019	
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0603562N *I Submarine Tactical Warfare Sys*							
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
Total Program Element	82.024	13.597	12.374	11.192	-	11.192	11.481	13.311	11.952	12.189	Continuing	Continuing
0770: *Adv Sub Supp Equip Prog*	21.293	4.120	4.307	4.557	-	4.557	4.718	4.822	4.908	5.004	Continuing	Continuing
1739: *Submarine Arctic W/F Development*	60.731	9.477	5.067	6.635	-	6.635	6.763	8.489	7.044	7.185	Continuing	Continuing
9999: *Congressional Adds*	0.000	0.000	3.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	3.000

A. Mission Description and Budget Item Justification

PROJECT 0770 - The Advanced Submarine Support Equipment Program (ASSEP) objective is to improve submarine operational effectiveness through the development and implementation of advanced Research and Development (R&D). In order to provide improved operational effectiveness, R&D efforts are focused on Advanced Imaging Developments and Advanced Electronic Warfare Support (ES) Developments. A continuing need exists to improve these capabilities in view of the advancements in potential imaging counter detection, the need to support specialized missions, and the increasingly dense and sophisticated electronic environment caused by the proliferation of complex radar, communications, and navigation equipment of potential adversaries. Ongoing developments in 360 degree imaging systems and electro-optic infra-red vulnerability signature reduction technologies are supporting these needs.

PROJECT 1739 - The Submarine Arctic Warfare Development Project is aligned to Commander, Undersea Warfighting Development Center (UWDC), Detachment Arctic Submarine Laboratory (ASL). This Project provides the U.S. Navy Submarine Force (SUBFOR) a cadre of trained Arctic Operation Specialists (AOS) and an inventory of unique Arctic sensors that are installed to optimize submarine safety during under-ice operations. AOS personnel assigned from ASL embark on submarines that deploy to the Arctic, cold water and iceberg regions, and marginal ice zones (MIZ) in northern latitudes of the Atlantic and Pacific Oceans, and are advisors to the Commanding Officer.

The Submarine Arctic Warfare Development Project, via ASL, responds to the increased threat of naval activity in the Arctic regions while continuously supporting the Navy's strategic objective of Assured Access and Combat Credibility. ASL and SUBFOR demonstrate existing Arctic Warfare capabilities and operational and tactical proficiency while developing advanced submarine technology in unique cold water environments, in under-ice conditions, and in ice-covered shallow water regions during a biennial Ice Exercise (ICEX). ICEX places an emphasis on submarine operability and mission capability in the world's harshest maritime environment. Efforts include assessment of combat system effectiveness, weapons testing, use of High Frequency (HF) sonars in Arctic regions, testing of ice-capable submarine structures, and development of class-specific Arctic operational guidelines. Tactical Development (TACDEV) ICEXs are conducted biennially and require up front comprehensive planning and work-up training, as well as post exercise analysis and reporting. ICEXs provide the framework for various submarine test and evaluation in Arctic regions and at periodic Ice Camps. This program represents DOD's only drifting ice station capability. Emphasis during ICEX is placed on the areas of sonar operability, tactical surveillance, weapon utility, and other submarine support missions. Efforts include assessment of combat system effectiveness, development of Arctic specific improvements for existing sonar and weapons, development of class-specific Arctic operational guidelines, and testing of ice-capable submarine support structures.

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0603562N *I Submarine Tactical Warfare Sys*

Major ICEXs, occurring every four (4) years (FY 2018, FY 2022, etc.) include a Fleet requirement to conduct exercise torpedo (EXTORP) firings in the Arctic. A Torpedo Exercise (TORPEX) requires a significantly higher level of logistics, personnel, and infrastructure to account for the recovery and transportation efforts of the EXTORPs.

B. Program Change Summary ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	13.834	9.374	11.314	-	11.314
Current President's Budget	13.597	12.374	11.192	-	11.192
Total Adjustments	-0.237	3.000	-0.122	-	-0.122
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	3.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.238	0.000			
• Program Adjustments	0.000	0.000	-0.007	-	-0.007
• Rate/Misc Adjustments	0.001	0.000	-0.115	-	-0.115

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2018	FY 2019
Project: 9999: *Congressional Adds*		
Congressional Add: *Advanced Submarine Electronic Warfare Systems*	0.000	3.000
Congressional Add Subtotals for Project: 9999	0.000	3.000
Congressional Add Totals for all Projects	0.000	3.000

Change Summary Explanation

FUNDING CHANGES AT THE OVERALL PE LEVEL:
- FY 2018 decrease of $-0.237M included: $-0.238M for Small Business Innovative Research (SBIR) transfer, and $+0.001M for various rate adjustment.
- FY 2019 increase of $+3.000M reflects Congressionally directed add for Advanced Submarine Electronic Warfare Systems.
- FY 2020 decrease of $-0.122M reflects minor program and various rate adjustments.

PROJECT 1739 FY 2019 to FY 2020 Increase/Decrease Statement: FY 2019 ($5.067M) to FY 2020 ($6.635M) increase ($+1.568M) is driven by the requirement to execute/conduct the major TACDEV ICEX events scheduled in FY 2020. These events are schedule on a biennial basis and require additional efforts and resources in aviation, personnel, logistics, and operations. FY 2019 is a planning and development year for the events to be conducted in FY 2020. There are no major TACDEV ICEX events planned in FY 2019. Additional efforts in FY 2020 also include the conduct of Arctic work-up training, Arctic transit mission, personnel deployments to drifting ice floes in the Arctic, and ICEX 2020 post mission analysis.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603562N / *Submarine Tactical Warfare Sys*	Project (Number/Name) 0770 / *Adv Sub Supp Equip Prog*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
0770: *Adv Sub Supp Equip Prog*	21.293	4.120	4.307	4.557	-	4.557	4.718	4.822	4.908	5.004	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

A continuing need exists to improve Imaging and Electronic Warfare support (EW) capabilities in view of the advancements in potential imaging counter detection and the increasingly dense electromagnetic environment caused by the proliferation of complex radar, communications, and navigation equipment of potential adversaries. Improvements are necessary for submarine EW and Imaging to be operationally effective in the following mission areas: Joint Littoral Warfare, Joint Surveillance, Space and Electronic Warfare, Intelligence Collection, Maritime Protection, and Joint Strike. The program is divided into two project categories: Advanced Imaging Project Development and Advanced Electronic Warfare Support Project Development. Both of these categories will allow for the mitigation of visual, radar, and infrared detection of submarine masts, periscopes, and sensors. The evaluation of state of the art technology to implement periscope/mast improvements via EW electromagnetic and electro-optic sensors results in improved capability. Engineering Demonstration Models (EDMs) are developed, evaluated, and validated in the lab and through at-sea testing.

The FY20 Advanced Imaging Project Development projects include Anti Reflective Coating Spherical Domes, Volumetric Atmospheric Modeling, Low Power Fiber Delivered Laser Range Finder, Reduced Cost Fabrication of Optical Sapphire Hyper-hemispheres, Vulnerability Improvement, Submarine Meteorological Sensors, System For Non-Acoustic Control of Signatures (SNACS), Imaging Buoy, Near Ocean Imaging through Atmospheric Turbulence and a Project Arrangement (PA) with Australia covering Electromagnetic Spectrum Sensor System Simulation & Development for model-based mission planning.

The FY20 Advanced EW Project Development projects include the development of: Extremely Wideband Digital Receiver (NATO Nunn Project with NAVAIR and Australia), Disposable Decoy Buoys, ISR and Tethered Buoys and Antennas, Radio Frequency (RF) over Fiber (RFoF), Micro-Adaptive Trainer, Mast Antenna Coupler, Ruggedized High speed Optical Fiber Network Connector Interfaces, Data Transmission Using Visible Light Communications (VLC), Digital Early Warning Receiver, Tunable Optic Filters for Radio Frequencies Photonic Signal Distribution Systems, Solid State RADAR Emitter Identification, RADAR Vulnerability Assessment Tool (RVAT) improvements, Virginia (VA) class submarine Direction Finding (DF) improvements, Low Probability of Intercept (LPI) RADAR improvements, solid state RADAR emitter identification improvements, and to provide Subject Matter Expertise (SME) support to the Electronic Warfare Working Group (EWWG). The EW ASSEP line will also develop items, software, and techniques to be assessed during Advanced Processor Build (APB) step testing events.

FY19 to FY20 cost growth is due to the start of three high priority EW developmental efforts: RADAR Vulnerability Assessment Tool (RVAT) improvements, Virginia (VA) class submarine Direction Finding (DF) improvements, and Low Probability of Intercept (LPI) RADAR improvements.

All programs funded in this project are non-Acquisition Category (ACAT) programs. The test articles identified consist of critical components that will be fully developed during Engineering Manufacturing and Development phase into EDMs.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603562N / *Submarine Tactical Warfare Sys*	**Project (Number/Name)** 0770 / *Adv Sub Supp Equip Prog*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Advanced Imaging Project Development	2.325	2.561	2.279	0.000	2.279
Articles:	-	-	-	-	-
FY 2019 Plans: Continue Meteorological Development Complete Low Power Fiber Delivered Laser Range Finder Lab Test and Continue Development Complete Reduced Cost Fabrication of Optical Sapphire Hyper-hemispheres Lab Test and Continue Development Complete Anti-reflective Coating Spherical Domes Lab Test and Continue Development Complete Volumetric Atmospheric Modeling Lab Test and Continue Development Continue Near Ocean Imaging through Atmospheric Turbulence Development Complete Vulnerability Improvement Test and Continue Development Continue System for Non-Acoustic Control of Signatures Development Complete PA Electromagnetic Spectrum Sensor System Simulation Lab Test and Continue Development					
FY 2020 Base Plans: Complete Sea Test and Continue Meteorological Sensors Development Complete Low Power Fiber Delivered Laser Range Finder and Transition to Imaging Complete Reduced Cost Fabrication of Optical Sapphire Hyper-hemispheres and Transition to Imaging Complete Anti-Reflective Coating Spherical Domes Test and Continue Development Complete Volumetric Atmospheric Modeling Testing and Continue Development Complete Near Ocean Imaging Through Atmospheric Turbulence Testing and Continue Development Complete Vulnerability Improvement Testing and Continue Development Start Imaging Buoy Development Continue System for Non-Acoustic Control of Signatures Complete PA Electromagnetic Spectrum Sensor System Simulation & Development for Model - Based Mission Planning Test and Transition to Imaging					
FY 2020 OCO Plans: N/A					
FY 2019 to FY 2020 Increase/Decrease Statement:					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603562N / *Submarine Tactical Warfare Sys*	**Project (Number/Name)** 0770 / *Adv Sub Supp Equip Prog*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Decrease of $282K in FY20 from FY19 is result of completion of Low Power Fiber Delivered Laser Range Finder and Reduced Cost Fabrication of Optical Sapphire Hyper-hemispheres projects.					
Title: Advanced Electronic Warfare Support (EW) Project Development	1.795	1.746	2.278	0.000	2.278
Articles:	-	-	-	-	-
FY 2019 Plans: Complete Solid State RADAR Emitter Identification test and Continue Development Complete EW Digital Direction Finding Lab Test and Continue Development Continue Extremely Wideband Digital Receiver Lab Test and Continue Development Complete Development Wideband Digitizers (Disarmer) and transition to EW Continue Development Tunable Optical Filters for Radio Frequency (RF)Photonic Signal Distributions System Continue Development Data Transmission using Visible Light Communications (VLC) for Undersea Platforms Continue Development Ruggedized High Speed Optical Fiber Network Connector Interfaces for Next Generation Submarine Electronic Warfare (EW) Systems Complete Disposable Buoy Modular Expendable Decoy enhancements Lab Test and Continue Development Complete Disposable Buoy Modular Expendable Intelligence Surveillance and reconnaissance (ISR) Lab Test and Continue Development Complete Tethered Buoy Modular Tethered Antenna Lab Test and Continue Development Complete Tethered Buoy Radio Frequency over Fiber (RFoF) Lab Test and Continue Development Complete Precision DF Lab Test and Transition to EW Complete Multifunction Apertures (SUBSTAR FNC) Lab Test and Transition to EW Start Development of Micro Adaptive Training FY19 FNC Start Development of Mast Antenna Coupler					
FY 2020 Base Plans: Complete Lab Test and Transition Solid State RADAR Emitter Identification to EW Complete EW Digital Direction Finding and transition to EW Complete Extremely Wideband Digital Receiver Lab Test and Transition to EW Complete Tunable Optical Filters for Radio Frequency (RF)Photonic Signal Distributions System Lab Test #2 Complete Data Transmission using Visible Light Comms (VLC) for Undersea Platforms Lab Test Complete Ruggedized High Speed Optical Fiber Network Connector Interfaces for NEXGEN EW Lab Test Complete TI-22 Disposable Buoys Modular Expendable Decoy Buoy Enhancement and Transition to EW					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603562N / *Submarine Tactical Warfare Sys*	**Project (Number/Name)** 0770 / *Adv Sub Supp Equip Prog*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Complete TI-22 Disposable Buoys Modular Expendable ISR Buoy and Transition to EW Complete TI Tethered Buoys Modular Tethered Antennas and RF Over Fiber and Transition to EW Complete Micro Adaptive Training Lab Test Complete Mast Antenna Coupler Lab Test Start RADAR Vulnerability Assessment Tool Development (RVAT) and complete Step 2 & 3 Test Start Virginia Class Submarine Direction Finding Improvement (VA DF) Development and complete Step 2 & 3 Test Start LPI RADAR improvement and complete Step 2 & 3 Test ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increase cost of $532K from FY19 to FY20 is the result growth due to the start of the following three high priority EW developmental efforts: RADAR Vulnerability Assessment Tool (RVAT) improvements, Virginia (VA) class submarine Direction Finding (DF) improvements, and Low Probability of Intercept (LPI) RADAR improvements.					
Accomplishments/Planned Programs Subtotals	4.120	4.307	4.557	0.000	4.557

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

This project optimizes technology insertion using a build-test-build approach to support EW and Imaging operational needs. Operational needs have been based on the tactical requirements identified in the Common Submarine Imaging System (CSIS) (CDD# 849-87-11) dtd 22 Dec 2011, with an updated CDD approved on 15 Mar 2018, for Submarine Imaging Systems, and the Common Submarine Electronic Warfare System (CSEWS) (CDD# 907-97-16) dtd 27 Sep 2016 for the Electronic Warfare Systems. Project efforts develop submarine unique improvements to mast, periscope, and EW electromagnetic spectrum and electro-optic sensors based on emerging technologies that are available from DoD Exploratory Development Programs, industry Independent Research and Development, and other sources. Engineering Demonstration Models (EDMs) will be developed to provide a realistic method of evaluating the improvements, including deployment on submarines for testing.

E. Performance Metrics

The Research, Development and Demonstration (RDD) program goal is to respond to urgent operational needs within 30 days and provide for rapid development and fielding of prototype solutions within 270 days.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603562N / *Submarine Tactical Warfare Sys*	**Project (Number/Name)** 0770 / *Adv Sub Supp Equip Prog*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Systems Engineering	WR	NUWC : RI	20.374	4.092	Nov 2017	4.279	Nov 2018	3.306	Nov 2019	-		3.306	Continuing	Continuing	Continuing
Primary Software and Hardware Development	C/FP	JHU/APL : MD	0.000	0.000		0.000	Nov 2018	0.513	Nov 2019	-		0.513	0.000	0.513	-
Primary Software and Hardware Development	MIPR	MIT/LL : MA	0.590	0.000		0.000	Nov 2018	0.710	Nov 2019	-		0.710	0.000	1.300	-
		Subtotal	20.964	4.092		4.279		4.529		-		4.529	Continuing	Continuing	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Travel	WR	NAVSEA : WNY	0.329	0.028	Nov 2017	0.028	Nov 2018	0.028	Nov 2019	-		0.028	Continuing	Continuing	Continuing
		Subtotal	0.329	0.028		0.028		0.028		-		0.028	Continuing	Continuing	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	21.293	4.120		4.307		4.557		-		4.557	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603562N / *Submarine Tactical Warfare Sys*	**Project (Number/Name)** 0770 / *Adv Sub Supp Equip Prog*

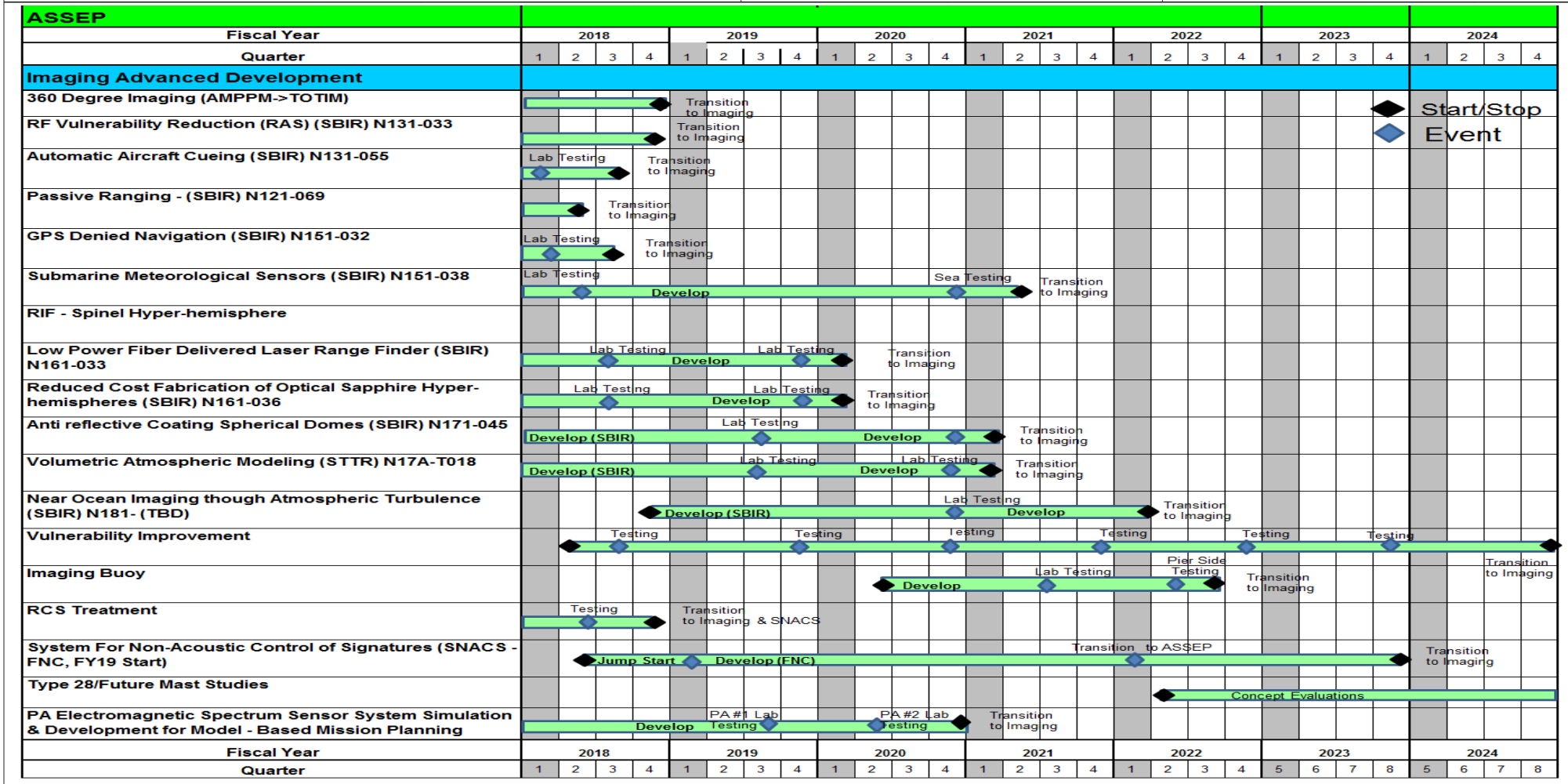


Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603562N / *Submarine Tactical Warfare Sys*	**Project (Number/Name)** 0770 / *Adv Sub Supp Equip Prog*

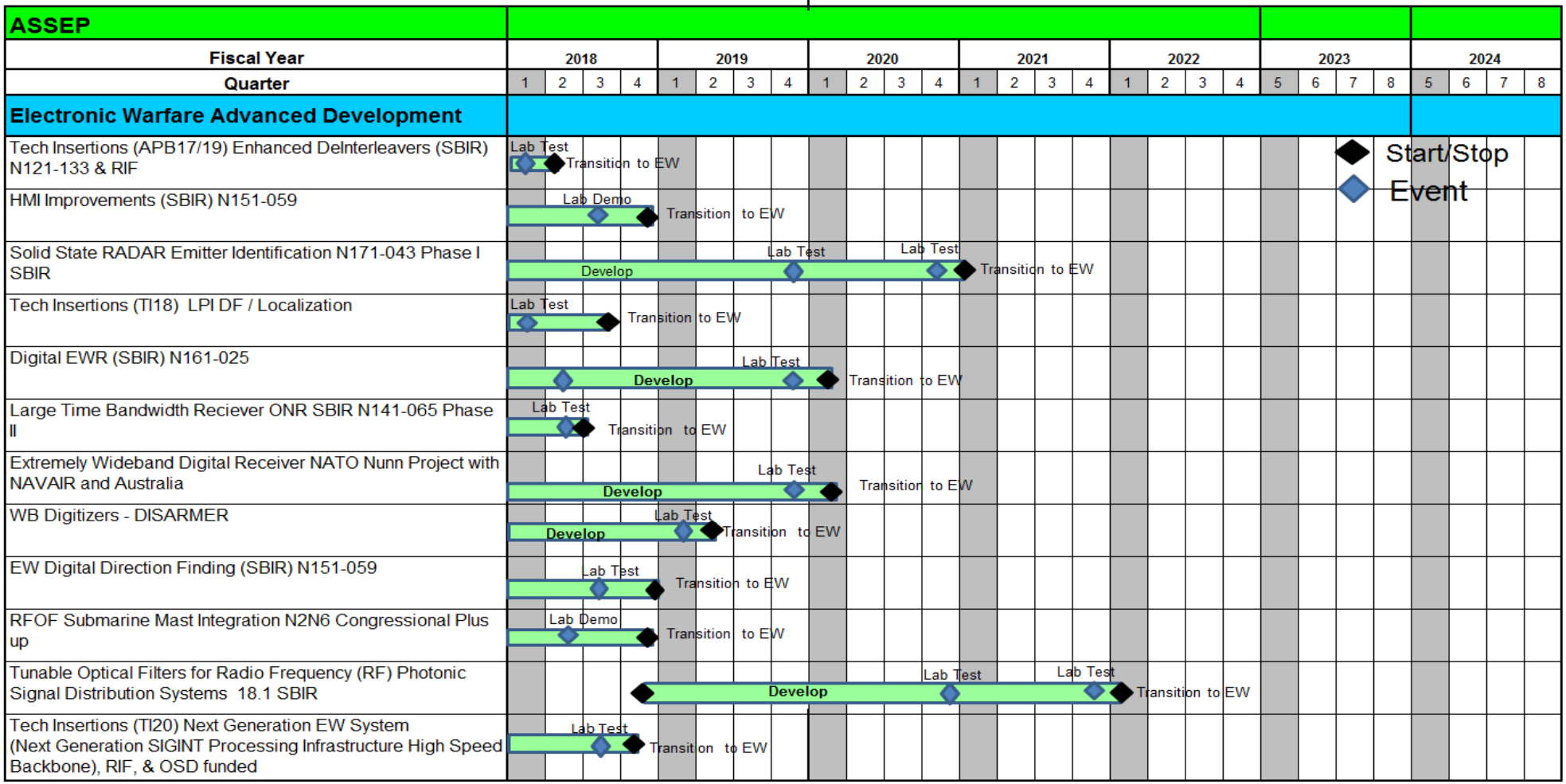


Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603562N / *Submarine Tactical Warfare Sys*	**Project (Number/Name)** 0770 / *Adv Sub Supp Equip Prog*

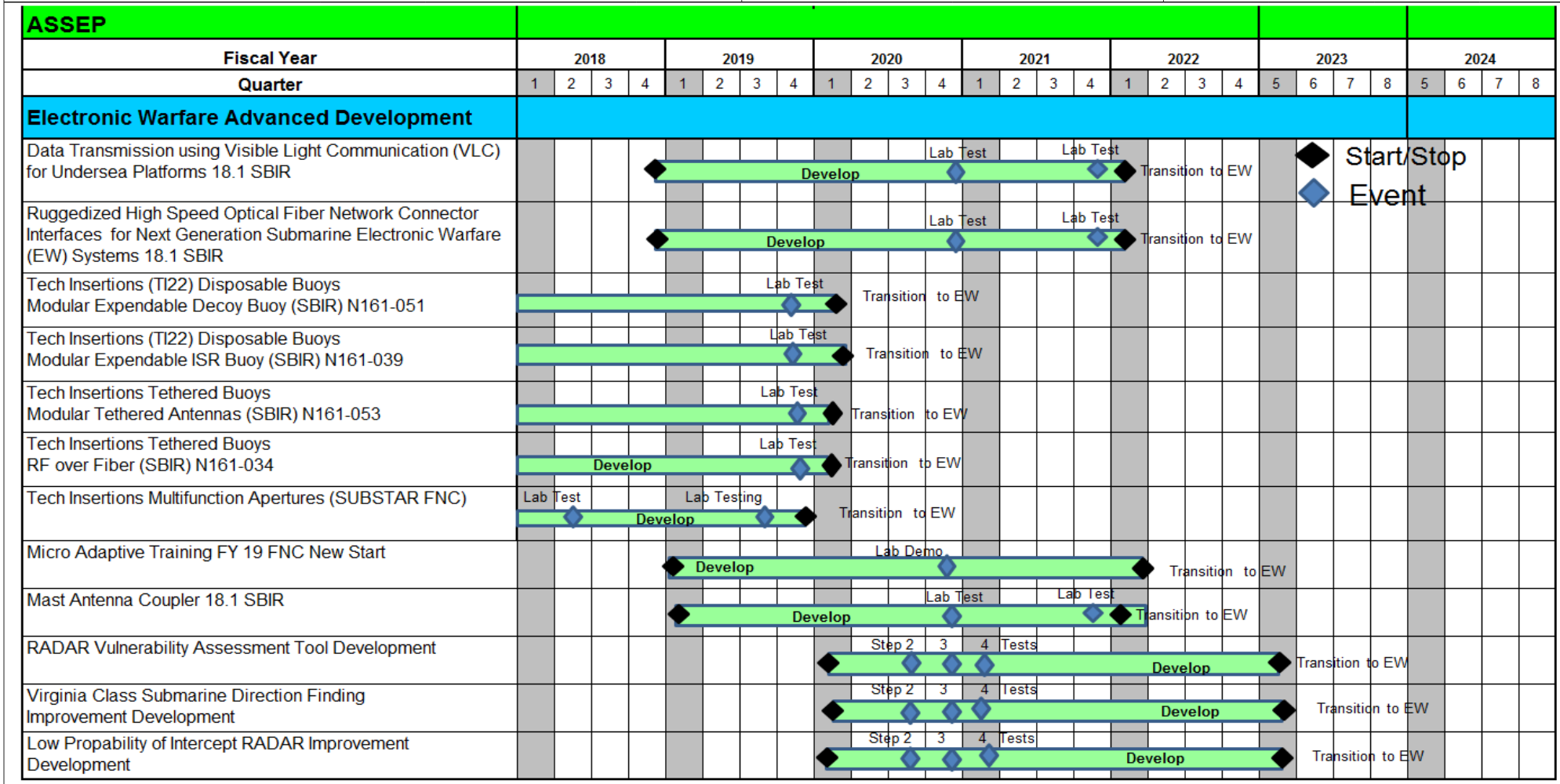


Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603562N / *Submarine Tactical Warfare Sys*	**Project (Number/Name)** 0770 / *Adv Sub Supp Equip Prog*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Imaging Advanced Development				
360 Degree Imaging (TOTIM) Transition to Imaging	4	2018	4	2018
RF Vulnerability Reduction (RAS) Transition to Imaging	4	2018	4	2018
Automatic Aircraft Cueing Lab Test	1	2018	1	2018
Automatic Aircraft Cueing Transition to Imaging	3	2018	3	2018
Passive Ranging Transition to Imaging	2	2018	2	2018
GPS Denied Navigation Lab Test #2	1	2018	1	2018
GPS Denied Navigation Transition to Imaging	3	2018	3	2018
Submarine Meteorological Sensors Lab Test	2	2018	2	2018
Submarine Meteorological Sensors Sea Test #2	4	2020	4	2020
Submarine Meteorological Sensors Transition to Imaging	2	2021	2	2021
Low Power Fiber Delivered Laser Range Finder Lab Test	3	2018	3	2018
Low Power Fiber Delivered Laser Range Finder Lab Test #2	4	2019	4	2019
Low Power Fiber Delivered Laser Range Finder Transition to Imaging	1	2020	1	2020
Reduced Cost Fabrication of Optical Sapphire Hyper-hemispheres Lab Test	3	2018	3	2018
Reduced Cost Fabrication of Optical Sapphire Hyper-hemispheres Lab Test #2	4	2019	4	2019
Reduced Cost Fabrication of Optical Sapphire Hyper-hemispheres Transition to Imaging	1	2020	1	2020
Anti-reflective Coating Spherical Domes Lab Test	3	2019	3	2019
Anti-reflective Coating Spherical Domes Lab Test #2	4	2020	4	2020
Anti -eflective Coating Spherical Domes Transition to Imaging	1	2021	1	2021
Volumetric Atmospheric Modeling Lab Test	3	2019	3	2019

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603562N / *Submarine Tactical Warfare Sys*	**Project (Number/Name)** 0770 / *Adv Sub Supp Equip Prog*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Volumetric Atmospheric Modeling Lab Test #2	4	2020	4	2020
Volumetric Atmospheric Modeling Transition to Imaging	1	2021	1	2021
Near Ocean Imaging though Atmospheric Turbulence Development	4	2018	4	2018
Near Ocean Imaging though Atmospheric Turbulence Lab Test	4	2020	4	2020
Near Ocean Imaging though Atmospheric Turbulence Transition to Imaging	1	2022	1	2022
Vulnerability Improvement Development	2	2018	3	2024
Vulnerability Improvement Lab Test	3	2018	3	2018
Vulnerability Improvement Lab Test #2	4	2019	4	2019
Vulnerability Improvement Lab Test #3	4	2020	4	2020
Vulnerability Improvement Lab Test #4	4	2021	4	2021
Vulnerability Improvement Lab Test #5	4	2022	4	2022
Vulnerability Improvement Transition to Imaging	4	2024	4	2024
Imaging Buoy Development	2	2020	3	2022
Imaging Buoy Lab Test	3	2021	3	2021
Imaging Buoy Pierside Test	2	2022	2	2022
Imaging Buoy Transition to Imaging	3	2022	3	2022
RCS Treatment Testing	2	2018	2	2018
RCS Treatment Transition to Imaging	4	2018	4	2018
System For Non-Acoustic Control of Signatures (SNACS - FNC, FY18 Jump Start)	2	2018	4	2023
SNACS FY19 FNC Start	1	2019	1	2019
SNACS transition to Imaging	4	2023	4	2023
Type 28/Future Mast Studies	2	2022	4	2024
PA Electromagnetic Spectrum Sensor System Simulation & Dev for Model - Based Mission Planning	1	2018	4	2020
PA Electromagnetic Spectrum Sensor System Simulation & Dev for Model - Based Mission Planning Test	3	2019	3	2019

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603562N / *Submarine Tactical Warfare Sys*	**Project (Number/Name)** 0770 / *Adv Sub Supp Equip Prog*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
PA Electromagnetic Spectrum Sensor System Simulation & Dev for Model - Based Mission Planning Test #2	2	2020	2	2020
PA Electromagnetic Spectrum Sensor System Simulation & Dev for Model - Based Mission Planning Transition to Imaging	4	2020	4	2020
Electronic Warfare Advanced Development: Tech Insertions (APB17/19) Enhanced DeInterleavers Lab Test	1	2018	1	2018
Electronic Warfare Advanced Development: Tech Insertions (APB17/19) Enhanced DeInterleavers - Transition to EW	2	2018	2	2018
Electronic Warfare Advanced Development: HMI Lab Demo #2	3	2018	3	2018
Electronic Warfare Advanced Development: HMI Transition to EW	4	2018	4	2018
Electronic Warfare Advanced Development: Solid State RADAR Emitter Identification Lab Test	4	2019	4	2019
Electronic Warfare Advanced Development: Solid State RADAR Emitter Identification Lab Test #2	4	2020	4	2020
Electronic Warfare Advanced Development: Solid State RADAR Emitter Identification - Transition to EW	1	2021	1	2021
Electronic Warfare Advanced Development: TI LPI DF/Localization Lab Test	1	2018	1	2018
Electronic Warfare Advanced Development: TI LPI DF/Localization Transition to EW	3	2018	3	2018
Electronic Warfare Advanced Development: Digital EWR Lab Test	2	2018	2	2018
Electronic Warfare Advanced Development: Digital EWR Lab Test #2	4	2019	4	2019
Electronic Warfare Advanced Development: Digital EWR Transition to EW	1	2020	1	2020
Electronic Warfare Advanced Development: Large Time Bandwidth Receiver Lab Test	3	2018	3	2018
Electronic Warfare Advanced Development: Large Time Bandwidth Receiver - Transition to EW	4	2018	4	2018
Electronic Warfare Advanced Development: Extremely Wideband Digital Receiver NATO Nunn Project with NAVAIR and Australia	2	2018	2	2018
Electronic Warfare Advanced Development: Extremely Wideband Digital Receiver NATO Nunn Project with NAVAIR and Australia Lab Test	4	2019	4	2019

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603562N / *Submarine Tactical Warfare Sys*	**Project (Number/Name)** 0770 / *Adv Sub Supp Equip Prog*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Electronic Warfare Advanced Development: Extremely Wideband Digital Receiver NATO Nunn Project with NAVAIR and Australia Transition to EW	1	2020	1	2020
Electronic Warfare Advanced Development: DISARMER Lab Test	1	2019	1	2019
Electronic Warfare Advanced Development: DISARMER Transition to EW	2	2019	2	2019
Electronic Warfare Advanced Development: EW Digital Direction Finding Lab Test	3	2018	3	2018
Electronic Warfare Advanced Development: EW Digital Direction Finding Transition to EW	4	2018	4	2018
Electronic Warfare Advanced Development: RFOF Submarine Mast Integration Lab Demo	2	2018	2	2018
Electronic Warfare Advanced Development: RFOF Submarine Mast Integration - Transition to EW	4	2018	4	2018
Electronic Warfare Advanced Development: Tunable Optical Filters for Radio Frequency (RF) Photonic Signal Distribution Systems	1	2019	1	2022
Electronic Warfare Advanced Development: Tunable Optical Filters for Radio Frequency (RF) Photonic Signal Distributions System Lab Test	4	2020	4	2020
Electronic Warfare Advanced Development: Tunable Optical Filters for Radio Frequency (RF) Photonic Signal Distribution Systems Lab Test #2	4	2021	4	2021
Electronic Warfare Advanced Development: Tunable Optical Filters for Radio Frequency (RF) Photonic Signal Distribution Systems - Transition to EW	1	2022	1	2022
Electronic Warfare Advanced Development: Next Generation SIGINT Processing Infrastructure High Speed Backbone Lab Test	3	2018	3	2018
Electronic Warfare Advanced Development: Next Generation SIGINT Processing Infrastructure High Speed Backbone Transition to EW	4	2018	4	2018
Electronic Warfare Advanced Development: Data Transmission using Visible Light Comms(VLC) for Undersea Platforms	4	2018	1	2022
Electronic Warfare Advanced Development: Data Transmission using Visible Light Comms(VLC) for Undersea Platforms Lab Test	4	2020	4	2020

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603562N / *Submarine Tactical Warfare Sys*	**Project (Number/Name)** 0770 / *Adv Sub Supp Equip Prog*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Electronic Warfare Advanced Development: Data Transmission using Visible Light Comms(VLC) for Undersea Platforms Lab Test #2	4	2021	4	2021
Electronic Warfare Advanced Development: Data Transmission using Visible Light Comms(VLC) for Undersea Platforms Transition to EW	1	2022	1	2022
Electronic Warfare Advanced Development: Ruggedized High Speed Optical Fiber Network Connector Interfaces for NEXGEN EW	4	2018	3	2022
Electronic Warfare Advanced Development: Ruggedized High Speed Optical Fiber Network Connector Interfaces for NEXGEN EW Lab Test	4	2020	4	2020
Electronic Warfare Advanced Development: Ruggedized High Speed Optical Fiber Network Connector Interfaces for NEXGEN EW Lab Test #2	4	2021	4	2021
Electronic Warfare Advanced Development: Ruggedized High Speed Optical Fiber Network Connector Interfaces for NEXGEN EW Transition to EW	1	2022	1	2022
Electronic Warfare Advanced Development: TI-22 Disposable Buoys Modular Expendable ISR Buoy Lab Test	4	2019	4	2019
Electronic Warfare Advanced Development: TI-22 Disposable Buoys Modular Expendable ISR Buoy Transition to EW	1	2020	1	2020
Electronic Warfare Advanced Development: TI-22 Disposable Buoys Sub Launched Decoy Speed to Fleet Lab Test	4	2019	4	2019
Electronic Warfare Advanced Development: TI-22 Disposable Buoys Sub Launched Decoy Speed to Fleet Transition to EW	1	2020	1	2020
Electronic Warfare Advanced Development: TI Tethered Buoys Modular Tethered Antennas and RF Over Fiber Lab Tests	4	2019	4	2019
Electronic Warfare Advanced Development: TI Tethered Buoys Modular Tethered Antennas and RF Over Fiber Transition to EW	1	2020	1	2020
Electronic Warfare Advanced Development: TI Precision DF Lab Test	2	2019	2	2019
Electronic Warfare Advanced Development: TI Precision DF Transition to EW	4	2019	4	2019
Electronic Warfare Advanced Development: TI Multifunctional Apertures Lab Test	2	2018	2	2018
Electronic Warfare Advanced Development: TI Multifunctional Apertures Lab Test #2	2	2019	2	2019

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603562N / *Submarine Tactical Warfare Sys*	**Project (Number/Name)** 0770 / *Adv Sub Supp Equip Prog*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Electronic Warfare Advanced Development: TI Multifunctional Apertures Transition to EW	4	2019	4	2019
Electronic Warfare Advanced Development: Micro Adaptive Training FY 19 FNC New Start	1	2019	1	2021
Electronic Warfare Advanced Development: Micro Adaptive Training FY19 Lab Demo	4	2020	4	2020
Electronic Warfare Advanced Development: Micro Adaptive Training FY 19 FNC Transition to EW	1	2022	1	2022
Electronic Warfare Advanced Development: Mast Antenna Coupler Development	1	2019	1	2022
Electronic Warfare Advanced Development: Mast Antenna Coupler Lab Test	4	2020	4	2020
Electronic Warfare Advanced Development: Mast Antenna Coupler Lab Test #2	4	2021	4	2021
Electronic Warfare Advanced Development: Mast Antenna Coupler Transition to EW	1	2022	1	2022
Electronic Warfare Advanced Development: RADAR Vulnerability Assessment Tool Development	1	2020	1	2022
Electronic Warfare Advanced Development: RADAR Vulnerability Assessment Tool Step 2 Test	3	2020	3	2020
Electronic Warfare Advanced Development: RADAR Vulnerability Assessment Tool Step 3 Test	4	2020	4	2020
Electronic Warfare Advanced Development: RADAR Vulnerability Assessment Tool Step 4 Test	1	2021	1	2021
Electronic Warfare Advanced Development: RADAR Vulnerability Assessment Tool Development Transition to EW	1	2023	1	2023
Electronic Warfare Advanced Development: Virginia Class Submarine Direction Finding Improvement Development	1	2020	1	2023
Electronic Warfare Advanced Development: Virginia Class Submarine Direction Finding Improvement Step 2 Test	3	2020	3	2020
Electronic Warfare Advanced Development: Virginia Class Submarine Direction Finding Improvement Step 3 Test	4	2020	4	2020

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603562N / *Submarine Tactical Warfare Sys*	**Project (Number/Name)** 0770 / *Adv Sub Supp Equip Prog*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Electronic Warfare Advanced Development: Virginia Class Submarine Direction Finding Improvement Step 4 Test	1	2021	1	2021
Electronic Warfare Advanced Development: Virginia Class Submarine Direction Finding Improvement Transition to EW	1	2023	1	2023
Electronic Warfare Advanced Development: Low Probability of Intercept RADAR Improvement Development	1	2020	1	2023
Electronic Warfare Advanced Development: Low Probability of Intercept RADAR Improvement Step 2 Test	3	2020	3	2020
Electronic Warfare Advanced Development: Low Probability of Intercept RADAR Improvement Step 3 Test	4	2020	4	2020
Electronic Warfare Advanced Development: Low Probability of Intercept RADAR Improvement Step 4	1	2021	1	2021
Electronic Warfare Advanced Development: Low Probability of Intercept RADAR Improvement Test Transition to EW	1	2023	1	2023

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603562N / *Submarine Tactical Warfare Sys*	Project (Number/Name) 1739 / *Submarine Arctic W/F Development*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
1739: *Submarine Arctic W/F Development*	60.731	9.477	5.067	6.635	-	6.635	6.763	8.489	7.044	7.185	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Submarine Arctic Warfare Development Project is aligned to Commander, Undersea Warfighting Development Center (UWDC), Detachment Arctic Submarine Laboratory (ASL). This Project provides the U.S. Navy Submarine Force (SUBFOR) a cadre of trained Arctic Operation Specialists (AOS) and an inventory of unique Arctic sensors that are installed to optimize submarine safety during under-ice operations. AOS personnel assigned from ASL embark on submarines that deploy to the Arctic, cold water and iceberg regions, and marginal ice zones (MIZ) in northern latitudes of the Atlantic and Pacific Oceans, and are advisors to the Commanding Officer.

The Submarine Arctic Warfare Development Project, via ASL, responds to the increased threat of naval activity in the Arctic regions while continuously supporting the Navy's strategic objective of Assured Access and Combat Credibility. ASL and SUBFOR demonstrate existing Arctic Warfare capabilities and operational and tactical proficiency while developing advanced submarine technology in unique cold water environments, in under-ice conditions, and in ice-covered shallow water regions during a biennial Ice Exercise (ICEX). ICEX places an emphasis on submarine operability and mission capability in the world's harshest maritime environment. Efforts include assessment of combat system effectiveness, weapons testing, use of High Frequency (HF) sonars in Arctic regions, testing of ice-capable submarine structures, and development of class-specific Arctic operational guidelines. Tactical Development (TACDEV) ICEXs are conducted biennially and require up front comprehensive planning and work-up training, as well as post exercise analysis and reporting. ICEXs provide the framework for various submarine test and evaluation in Arctic regions and at periodic Ice Camps. This program represents DOD's only drifting ice station capability. Emphasis during ICEX is placed on the areas of sonar operability, tactical surveillance, weapon utility, and other submarine support missions. Efforts include assessment of combat system effectiveness, development of Arctic specific improvements for existing sonar and weapons, development of class-specific Arctic operational guidelines, and testing of ice-capable submarine support structures.

Major ICEXs, occurring every four (4) years (FY 2018, FY 2022, etc.) include a Fleet requirement to conduct exercise torpedo (EXTORP) firings in the Arctic. A Torpedo Exercise (TORPEX) requires a significantly higher level of logistics, personnel, and infrastructure to account for the recovery and transportation efforts of the EXTORPs.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Conduct ICEX and Arctic Transit Mission, ICEX Workup and Training, Ice Camps	9.477	5.067	6.635	0.000	6.635
Articles:	-	-	-	-	-
FY 2019 Plans: - Conduct Arctic work-up training. - Support Arctic deployments, including inter-Fleet transfers, as required by the SUBFOR Commanders.					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603562N / *Submarine Tactical Warfare Sys*	**Project (Number/Name)** 1739 / *Submarine Arctic W/F Development*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
- Investigate, research, develop and deploy new systems for Arctic submarine support. - Conduct Arctic operations to support ice camp equipment evaluation, systems development, and extreme cold weather training as well as to perform drifting sea ice analysis required to improve drifting sea ice camp Arctic operations. - Support testing and tactical development required to improve submarine Arctic operability and warfighting. - Initiate planning, logistics support, procurement, and preparation for ICEX mission 2020 and Ice Camp 2020. ***FY 2020 Base Plans:*** - Conduct Arctic work-up training, ICEX mission 2020, and Ice Camp 2020. - Conduct ICEX 2020 as a TACDEV event. Operate a submarine tracking range for approximately 14 days, conduct complex and coordinated operations from a drifting ice station. Logistically and operationally support submarine and camp operations from a drifting ice station that is re-supplied via contracted commercial rotary and fixed-wing aviation services, via USTRANSCOM, from temporary infrastructure and services on the North Slope of Alaska. - Support Arctic deployments, including inter-Fleet transfers, as required by the SUBFOR Commanders. - Investigate, research, develop, and deploy new systems for Arctic submarine support. - Support testing and tactical development required to improve submarine Arctic operability and warfighting. - Conduct Arctic operations to support ice camp equipment evaluation, systems development and extreme cold weather training, and to also perform drifting sea ice analysis required to improve drifting sea ice camp Arctic operations. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** FY 2019 to FY 2020 increase ($+1.568M) is driven by the requirement to execute/conduct the major TACDEV ICEX events scheduled in FY 2020. These events are schedule on a biennial basis and require additional efforts and resources in aviation, personnel, logistics, and operations. FY 2019 is a planning and development year for the events to be conducted in FY 2020. There are no major TACDEV ICEX events planned in FY 2019. Additional efforts in FY 2020 also include the conduct of Arctic work-up training, Arctic transit mission, personnel deployments to drifting ice floes in the Arctic, and ICEX 2020 post mission analysis.					
Accomplishments/Planned Programs Subtotals	9.477	5.067	6.635	0.000	6.635

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603562N / *Submarine Tactical Warfare Sys*	**Project (Number/Name)** 1739 / *Submarine Arctic W/F Development*

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

- Use NAVSEA University Affiliated Research Center (UARC) omnibus contract for procurement of an acoustic tracking range service and equipment to support ICEX Ice Camps.
- Use sole source and competitively awarded contracts through the U.S. Army Corps of Engineers (USACE) Alaska regional office for ICEX Ice Camp logistics, engineering, and operations support.
- Use sole source and competitively awarded contracts through the Fleet Logistics Center (FLC) regional contracting office and Defense Logistics Agency (DLA) for equipment procurement and technical services.
- Use sole source and competitively awarded contracts through the U.S. Transportation Command for ICEX aviation support.

E. Performance Metrics

Conduct and support Arctic deployments, including inter-Fleet transfers and biennial ICEXs, as required by the SUBFOR Commanders.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603562N / *Submarine Tactical Warfare Sys*	Project (Number/Name) 1739 / *Submarine Arctic W/F Development*	

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Developmental Test & Evaluation	WR	COMSUBLANT : VA	5.257	3.113	Oct 2017	2.907	Oct 2018	3.528	Oct 2019	-		3.528	Continuing	Continuing	Continuing
Developmental Test & Evaluation	WR	COMSUBPAC : CA	36.101	0.000		0.000		0.000		-		0.000	0.000	36.101	-
Developmental Test & Evaluation	WR	NUWC/Keyport : WA	0.000	0.468	Sep 2018	0.375	Dec 2018	0.000		-		0.000	0.000	0.843	-
Developmental Test & Evaluation	WR	NUWC/Newport : RI	0.235	1.560	Oct 2017	0.007	Jan 2019	0.100	Oct 2019	-		0.100	Continuing	Continuing	Continuing
Developmental Test & Evaluation	MIPR	USACE : AK	0.852	1.863	Dec 2017	1.316	Dec 2018	0.960	Dec 2019	-		0.960	Continuing	Continuing	Continuing
Developmental Test & Evaluation	MIPR	USTRANSCOM : IL	0.110	1.395	Dec 2017	0.065	Dec 2018	1.700	Dec 2019	-		1.700	Continuing	Continuing	Continuing
Developmental Test & Evaluation	C/CPFF	UT/ARL : TX	1.434	0.000		0.050	Feb 2019	0.000		-		0.000	0.000	1.484	Continuing
Developmental Test & Evaluation	C/CPFF	UW/APL : WA	15.183	0.644	Dec 2017	0.000		0.000		-		0.000	0.000	15.827	Continuing
Developmental Test & Evaluation	C/CPFF	VAR : VAR	0.000	0.334	Dec 2017	0.245	Jan 2019	0.243	Dec 2019	-		0.243	Continuing	Continuing	Continuing
		Subtotal	59.172	9.377		4.965		6.531		-		6.531	Continuing	Continuing	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management Support	C/CPAF	EG&G : VA	0.311	0.000		0.000		0.000		-		0.000	0.000	0.311	-
Program Management Support	C/CPAF	BAE SYSTEMS : MD	1.088	0.000		0.000		0.000		-		0.000	0.000	1.088	-
Program Management Support	C/CPIF	TMB : DC	0.120	0.100	Sep 2018	0.102	Dec 2018	0.104	Dec 2019	-		0.104	Continuing	Continuing	Continuing
Travel	Allot	NAVSEA PEO IWS 5 : DC	0.040	0.000		0.000		0.000		-		0.000	0.000	0.040	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603562N / *Submarine Tactical Warfare Sys*	**Project (Number/Name)** 1739 / *Submarine Arctic W/F Development*

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
		Subtotal	1.559	0.100		0.102		0.104		-		0.104	Continuing	Continuing	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	60.731	9.477		5.067		6.635		-		6.635	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603562N / *Submarine Tactical Warfare Sys*	**Project (Number/Name)** 1739 / *Submarine Arctic W/F Development*

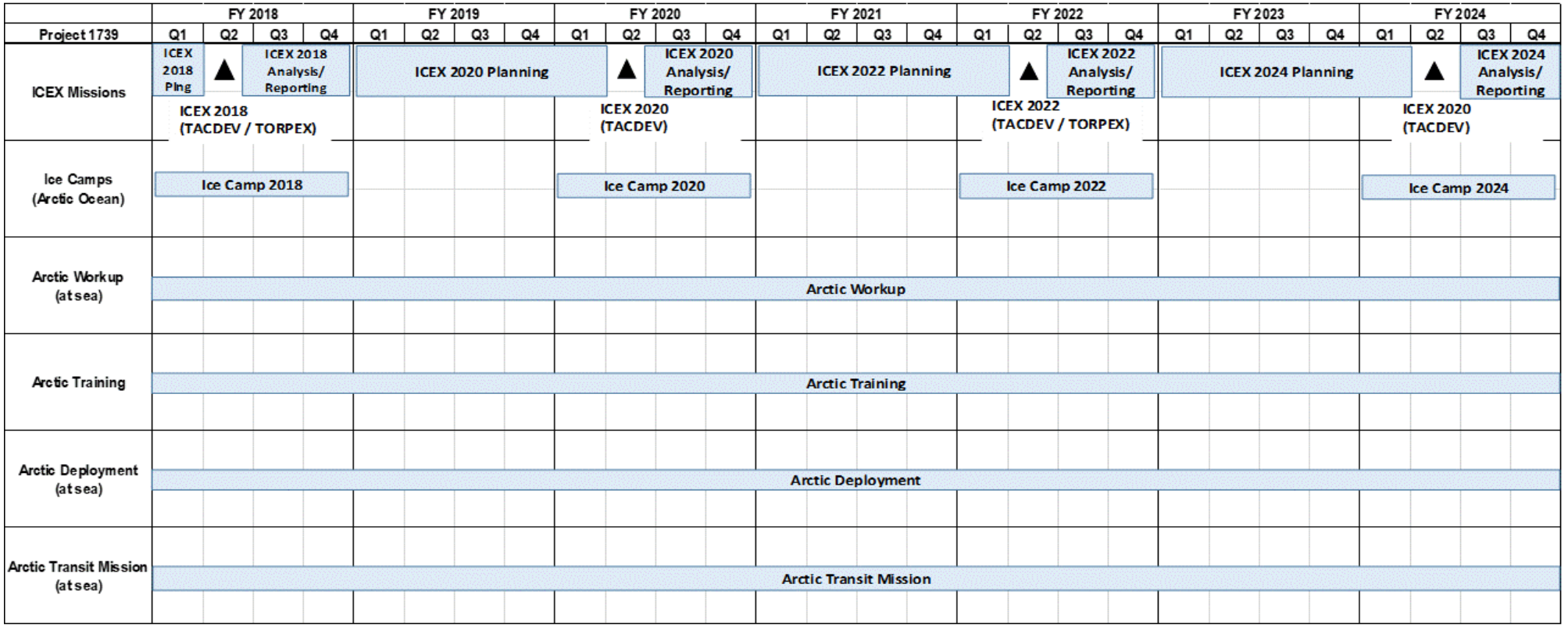


Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603562N / *Submarine Tactical Warfare Sys*	**Project (Number/Name)** 1739 / *Submarine Arctic W/F Development*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 1739				
ICEX Missions: ICEX Mission 2018 (TACDEV / TORPEX) Planning/Logistics	1	2018	1	2018
ICEX Missions: ICEX Mission 2018 (TACDEV / TORPEX)	2	2018	2	2018
ICEX Missions: ICEX Mission 2018 (TACDEV / TORPEX) Post-ICEX Analysis/ Reporting	3	2018	4	2018
ICEX Missions: ICEX Mission 2020 (TACDEV) Planning/Logistics	1	2019	1	2020
ICEX Missions: ICEX Mission 2020 (TACDEV)	2	2020	2	2020
ICEX Missions: ICEX Mission 2020 (TACDEV) Post-ICEX Analysis/Reporting	3	2020	4	2020
ICEX Missions: ICEX Mission 2022 (TACDEV / TORPEX) Planning/Logistics	1	2021	1	2022
ICEX Missions: ICEX Mission 2022 (TACDEV / TORPEX)	2	2022	2	2022
ICEX Missions: ICEX Mission 2022 (TACDEV / TORPEX) Post-ICEX Analysis/ Reporting	3	2022	4	2022
ICEX Missions: ICEX Mission 2024 (TACDEV) Planning/Logistics	1	2023	1	2024
ICEX Missions: ICEX Mission 2024 (TACDEV)	2	2024	2	2024
ICEX Missions: ICEX Mission 2024 (TACDEV) Post-ICEX Analysis/Reporting	3	2024	4	2024
Ice Camps (Arctic Ocean): Ice Camp (Arctic Ocean) 2018	1	2018	4	2018
Ice Camps (Arctic Ocean): Ice Camp (Arctic Ocean) 2020	1	2020	4	2020
Ice Camps (Arctic Ocean): Ice Camp (Arctic Ocean) 2022	1	2022	4	2022
Ice Camps (Arctic Ocean): Ice Camp (Arctic Ocean) 2024	1	2024	4	2024
Arctic Workup (At Sea): Arctic Workup (At Sea)	1	2018	4	2024
Arctic Training: Arctic Training	1	2018	4	2024
Arctic Deployment (At Sea): Submarine Deployment as required by the Submarine Type Commander	1	2018	4	2024

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603562N / *Submarine Tactical Warfare Sys*	**Project (Number/Name)** 1739 / *Submarine Arctic W/F Development*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Arctic Transit Mission (At Sea): Arctic Transit Mission (At Sea)	1	2018	4	2024

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603562N / *Submarine Tactical Warfare Sys*	Project (Number/Name) 9999 / *Congressional Adds*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
9999: *Congressional Adds*	0.000	0.000	3.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	3.000
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

A continuing need exists to improve Electronic Warfare support (EW) capabilities in view of the advancements in potential imaging counter detection and the increasingly dense electromagnetic environment caused by the proliferation of complex radar, communications, and navigation equipment of potential adversaries. Improvements are necessary for submarine EW to be operationally effective in the following mission areas: Joint Littoral Warfare, Joint Surveillance, Space and Electronic Warfare, Intelligence Collection, Maritime Protection, and Joint Strike. The evaluation of state-of-the-art technology to implement periscope/mast improvements via EW electromagnetic results in improved capability. Engineering Demonstration Models (EDMs) are developed, evaluated, and validated in the lab and through at-sea testing.

The RDTE funding line supports development of capability improvements to submarine electronic surveillance measures that are used to detect, classify, localize, and record RADAR and Communications signals. The funding line also supports the specific development of high-speed digital networks and electronic attack demonstrations.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019
Congressional Add: Advanced Submarine Electronic Warfare Systems	0.000	3.000
FY 2018 Accomplishments: N/A		
FY 2019 Plans: Continue development of the Field Programmable Gate Array (FPGA) based Peripheral Component Interconnect Express (PCIe) Switch brassboard and PCIe Switch software. Two engineering development modules will be completed and tested. The Ship Countermeasure Warfare Integrated Demonstration (SCWID) effort is being undertaken to demonstrate the effectiveness of the current Georgia Technology Research Institute (GTRI) SCWID Electronic Attack (EA) techniques when interfaced to a platform-specific antenna assembly, while operating in a maritime environment. The goal of this effort is to demonstrate that the SCWID EA techniques can be used effectively with submarine representative antennas.		
Congressional Adds Subtotals	0.000	3.000

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603562N / *Submarine Tactical Warfare Sys*	**Project (Number/Name)** 9999 / *Congressional Adds*

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• RDT&E/0603562N/0770: *Adv Sub Supp Equip Prog*	4.120	4.307	4.557	-	4.557	4.718	4.822	4.908	5.004	Continuing	Continuing
• RDTE/0604503N/0775: *Submarine Supt Equip Prog*	9.082	28.408	27.273	-	27.273	19.902	30.232	33.266	32.853	Continuing	Continuing

Remarks

D. Acquisition Strategy

This project optimizes technology insertion using a build-test-build approach to support EW operational needs. Operational needs have been based on the tactical requirements identified in the Common Submarine Electronic Warfare System (CSEWS) (CDD# 907-97-16) dtd 27 Sep 2016 for the Electronic Warfare Systems. Project efforts develop submarine unique improvements to mast, periscope, and EW electromagnetic spectrum and electro-optic sensors based on emerging technologies that are available from DoD Exploratory Development Programs, industry Independent Research and Development, and other sources. Engineering Demonstration Models (EDMs) will be developed to provide a realistic method of evaluating the improvements, including deployment on submarines for testing.

E. Performance Metrics

The Research, Development and Demonstration (RDD) program goal is to respond to urgent operational needs within 30 days and provide for rapid development and fielding of prototype solutions within 270 days.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603562N / *Submarine Tactical Warfare Sys*	**Project (Number/Name)** 9999 / *Congressional Adds*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Hardware and Software Development	C/FFP	GTRI : Atlanta, GA	0.000	0.000		0.880	Feb 2019	0.000		-		0.000	0.000	0.880	-
Hardware and Software Development	WR	NUWC : Newport, RI	0.000	0.000		1.120	Dec 2018	0.000		-		0.000	0.000	1.120	-
Hardware and S/W Development SCWID	C/FFP	Accipter : Wexford, PA	0.000	0.000		1.000	Feb 2019	0.000		-		0.000	0.000	1.000	-
		Subtotal	0.000	0.000		3.000		0.000		-		0.000	0.000	3.000	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	0.000		3.000		0.000		-		0.000	0.000	3.000	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603562N / *Submarine Tactical Warfare Sys*	**Project (Number/Name)** 9999 / *Congressional Adds*

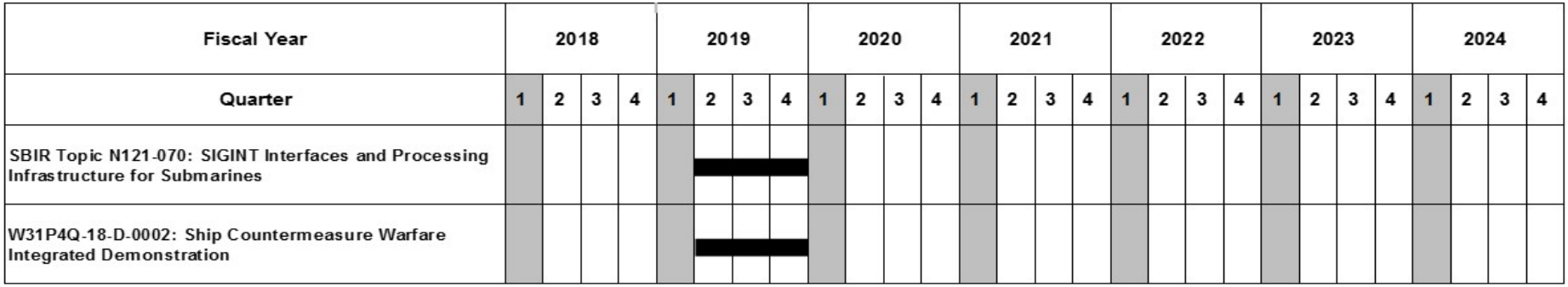


Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603562N / *Submarine Tactical Warfare Sys*	**Project (Number/Name)** 9999 / *Congressional Adds*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 9999				
SBIR Topic N121-070: SIGINT Interfaces and Processing Infrastructure for Submarines: SBIR Topic N121-070: SIGINT Interfaces and Processing Infrastructure for Submarines	2	2019	4	2019
W31P4Q-18-D-0002: Ship Countermeasure Warfare Integrated Demonstration: W31P4Q-18-D-0002: Ship Countermeasure Warfare Integrated Demonstration	2	2019	4	2019

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy											Date: March 2019	
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0603563N *I Ship Concept Advanced Design*							
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
Total Program Element	204.955	23.856	74.603	81.846	-	81.846	47.514	30.366	32.026	32.862	Continuing	Continuing
2196: *Design, Tools, Plans and Concepts*	2.779	4.309	22.451	33.595	-	33.595	22.400	6.923	6.898	7.234	Continuing	Continuing
3161: *NAVSEA Tech Authority*	192.430	13.346	27.817	34.247	-	34.247	18.987	17.193	18.751	19.123	Continuing	Continuing
3376: *Strategic Sealift*	9.746	0.000	6.335	6.004	-	6.004	6.127	6.250	6.377	6.505	Continuing	Continuing
4037: *Common Hull Auxiliary Multi-Mission Platform (CHAMP)*	0.000	0.000	18.000	8.000	-	8.000	0.000	0.000	0.000	0.000	0.000	26.000
9999: *Congressional Adds*	0.000	6.201	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	6.201

A. Mission Description and Budget Item Justification

The FY 2020 funding request was reduced by $1.185 million to account for the availability of prior year execution balances.

Explore alternative surface and expeditionary ship force structures (encompassing amphibious warfare), advanced surface ship and unmanned surface vehicles concepts, and new and emerging technical architectures and solutions in support of pre-acquisition mission needs analysis, mission area analysis and planning, and systems engineering. The objective is a more affordable, mission capable surface ship force including increased ship production capability; ships with reduced manning, reduced operating and support costs, and greater utilization of the latest technology. The program directly supports the Navy Shipbuilding Plan and NAVSEA Technical Authority with state-of-the-art design tools and methods that develop technical options and requirements for surface ship force structure, ship & unmanned vehicle concepts, advanced material and manufacturing efforts, and improved engineering prototypes and solutions for ships that may become part of the shipbuilding plan.

Project 2196 - This project provides the foundation for an affordable and mission capable surface ship force. It also supports the next step in the development of a transformed naval force by accomplishing the pre-milestone A (especially pre-concept decision) efforts for all potential surface ships. These efforts are the required first step in the integration of total ship systems, including combat systems, weapons systems and Hull, Mechanical and Electrical (HM&E) systems. Inadequate early planning and ship concept formulation can result in down-stream design, construction and operational problems. A subtler and severely negative impact of neglecting this early effort is that the "best" concepts and technologies may never even be considered and the greatest potential ship design advances never realized. Designs and technologies must consider how to meet the threat. This project supports this requirement.
This project funds concept development engineering, mission effectiveness analysis, force architecture analysis, and other analyses for formulation of future surface ship force structure along with development of the tools required to accomplish these efforts. Advanced ship concept studies, ship and ship systems technology assessments, and the development and upgrade of ship concept design and engineering tools, methods, and criteria are also funded in this project.
This project:
(1) Develops alternative surface ship force structure concepts including ships and unmanned vehicles.
(2) Evaluates the mission capability effectiveness and costs for these alternative surface fleet architectures.
(3) Performs fleet war fighting/mission effectiveness assessment studies.

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0603563N / *Ship Concept Advanced Design*

(4) Identifies future surface ship requirements and characteristics necessary to meet future threats and support mission needs.
(5) Investigates new affordable ship concepts and evaluates technologies necessary to support these concepts.
(6) Provides design methods and automated design tools to develop and evaluate ship concepts.
(7) Supports development of Initial Capabilities Documents (ICD) and analogous early requirements documents for future ships.
These efforts are done to support analysis; mission needs development and technology assessment in support of future fleet concepts and potential ship acquisition programs. These efforts are fundamental to the Navy's formulation of the future fleet requirements.
These efforts support and maintain naval ship design and engineering capabilities in the design phase of developing concept design tools, criteria and methods.

Project 3161 - This project is the only R&D effort that provides a coordinated approach to the development of cross platform ship and weapon system designs and technologies 'common' to multiple ships and systems. This project directly informs technical standards for design, construction, certification and operation and provides an avenue for innovative solutions and technologies to compete with legacy product requirements and specifications. This project conducts risk reduction of alternative technical architectures, designs and technology solutions that meet Fleet operational and technical requirements at lower cost, and develops engineering capabilities in the areas of design tools, criteria and methods. This project funds a prioritized portfolio of time-sensitive initiatives through the Cross Platform Systems Development (CPSD) program, supporting NAVSEA Technical Authority and associated risk reduction activity. The areas of exploration for CPSD include Ship Technology Improvements, Fleet Maintenance and Life Cycle Cost Reduction, Advanced Manufacturing and Material Technology, Additive Manufacturing, Digital Framework/Electromagnetic Environment and Development and Unmanned Systems and Cyber security. The research products developed by this project directly support and influence both in-service fleet requirements and future acquisition programs by providing a range of technically acceptable alternatives and evaluation of emerging technologies. The prototypes, standards/specs, tools and processes and other products developed in this project focus on technical requirements and technologies applicable to multiple ship classes or systems. Products from this project transition directly to early-stage ship design for Ship Preliminary Design and Feasibility Studies, Program Executive Office (PEO) ship acquisition programs, and Systems Engineering Technical Authority (SETA) requirements documentation. Tasks within this project include R&D efforts focused on increasing sustainment technologies and improving performance at reduced cost for current and future naval platforms.

Project 3376 - Strategic Sealift Research and Development - Develops new concepts and technologies which can be applied to or will enable future strategic sealift, and Seabasing systems. The technologies include ship configuration concepts, equipment to increase cargo handling and cargo loading/unloading rates (including commercial and merchant ship systems), improved man/machine interfaces, improved structural configurations and materials, and Logistics-Over-the-Shore (LOTS) equipment and system improvements. FY2016 and prior years (FY2014 and earlier) efforts were financed under the National Defense Sealift Fund (NDSF) BA 04 Project 3116 Strategic Sealift Research and Development. FY2015, FY2017, and FY2019-FY2024 efforts are financed under this RDT&E,N program element and project (3376).

Project 4037 - This project supports Common Hull Auxiliary Multi-Mission Platform (CHAMP)Design and Total Ship Integration. The CHAMP concept leverages a new approach to requirements generation and shipbuilding to replace aging mission specific designs with a common hull to reduce life cycle costs, leverage tailored payloads, and stabilize the industrial base. Identified missions include: sealift, aviation intermediate maintenance support, medical services, command & control, and submarine tending. Funding will inform requirements definition, early industry engagement and follow-on assessment across CHAMP mission functionality.

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0603563N *I Ship Concept Advanced Design*

Project 9999 (Congressional Add)- Continues efforts previously financed under the National Defense Sealift Fund (NDSF) BA 04 Project 3116 Strategic Sealift Research and Development (FY14 and prior) and RDT&E,N BA04, Project 3376 Strategic Sealift (FY2015 and FY2017)to develop new concepts and technologies which can be applied to or will enable future strategic sealift, and Seabasing systems.

B. Program Change Summary ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	36.891	89.419	82.387	-	82.387
Current President's Budget	23.856	74.603	81.846	-	81.846
Total Adjustments	-13.035	-14.816	-0.541	-	-0.541
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-14.816			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.461	0.000			
• Program Adjustments	0.000	0.000	0.218	-	0.218
• Rate/Misc Adjustments	0.001	0.000	-0.759	-	-0.759
• Congressional Directed Reductions Adjustments	-19.000	-	-	-	-
• Congressional Add Adjustments	6.425	-	-	-	-

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2018	FY 2019
Project: 9999: *Congressional Adds*		
Congressional Add: *Strategic Sealift Research and Development*	6.201	0.000
Congressional Add Subtotals for Project: 9999	6.201	0.000
Congressional Add Totals for all Projects	6.201	0.000

Change Summary Explanation

The FY 2020 funding request was reduced by $1.185 million to account for the availability of prior year execution balances.

The FY 2019 funding was reduced by 14.816 million for Future Surface Combatant Studies Excess Growth. (Proj 2196).

The FY 2018 funding was reduced by $19.000 million Congressional adjustment for Future Surface Combatant Studies Early to Need (Proj 2196).

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0603563N *I Ship Concept Advanced Design*

The FY 2018 funding was increased by $6.425 million Congressional adjustment for Strategic Sealift Research and Development - Transfer from NDSF (Proj 9999).

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603563N / *Ship Concept Advanced Design*	Project (Number/Name) 2196 / *Design, Tools, Plans and Concepts*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
2196: *Design, Tools, Plans and Concepts*	2.779	4.309	22.451	33.595	-	33.595	22.400	6.923	6.898	7.234	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This project provides the foundation for an affordable and mission capable surface ship force. It also supports the next step in the development of a transformed naval force by accomplishing the pre-milestone A (especially pre-concept decision) efforts for all potential surface ships. These efforts are the required first step in the integration of total ship systems, including combat systems, weapons systems and Hull, Mechanical and Electrical (HM&E) systems. Inadequate early planning and ship concept formulation can result in down-stream design, construction and operational problems. A more subtle and severely negative impact of neglecting this early effort is that the "best" concepts and technologies may never even be considered and the greatest potential ship design advances never realized. Designs and technologies must consider how to meet the threat. This project supports this requirement.

This project funds concept development engineering, mission effectiveness analysis, force architecture analysis, and other analyses for formulation of future surface ship force structure along with development of the tools required to accomplish these efforts. Advanced ship concept studies, ship and ship systems technology assessments, and the development and upgrade of ship concept design and engineering tools, methods, and criteria are also funded in this project.

This project:
(1) Develops alternative surface ship force structure concepts including ships and unmanned vehicles.
(2) Evaluates the mission capability effectiveness and costs for these alternative surface fleet architectures.
(3) Performs fleet war fighting/mission effectiveness assessment studies.
(4) Identifies future surface ship requirements and characteristics necessary to meet future threats and support mission needs.
(5) Investigates new affordable ship concepts and evaluates technologies necessary to support these concepts.
(6) Provides design methods and automated design tools to develop and evaluate ship concepts.
(7) Supports development of Initial Capabilities Documents (ICD) and analogous early requirements documents for future ships.

These efforts are done to support analysis, mission needs development, and technology assessment in support of future fleet concepts and potential ship acquisition programs which are fundamental to the Navy's formulation of the future fleet requirements. These efforts support and maintain naval ship design and engineering capabilities in the design phase of developing concept design tools, criteria, and methods.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Ship Concepts and Mission Need Analysis	0.452	0.473	0.494	0.000	0.494
Articles:	-	-	-	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603563N / *Ship Concept Advanced Design*	**Project (Number/Name)** 2196 / *Design, Tools, Plans and Concepts*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Description: Develop ship concepts and perform analysis for potential ships and Force Architectures 5-30 years out in shipbuilding plan. Develop design methods and engineering tools to support the development of ship concepts and forces. ***FY 2019 Plans:*** Evaluate multi-mission effectiveness and costs, and develop ship concept designs. ***FY 2020 Base Plans:*** Continue development of ship and force designs and their evaluations for multi-mission effectiveness and costs. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** The FY 2020 increase covers expanded scope of continued and new development of ship and force designs as well as their evaluations for multi-mission effectiveness.					
Title: Future Surface Combatant Studies	3.857	21.978	33.101	0.000	33.101
Articles:	-	-	-	-	-
Description: This effort will lay the analytic foundation for the development of the Future Surface Combatant (FSC). Ships produced from this effort will fill critical gaps in the fleet in the 2030 timeframe created by the decommissioning of CG 47, DDG 51, and LCS 1/2 ships. Unmanned vehicle efforts will expand CONOPS to decouple mission capability from manned force structure. ***FY 2019 Plans:*** The resources necessary to support a shipyard engagement requires a significant increase in human capital (both government and contractor) to perform the requisite studies and analyses necessary to develop, finalize and evaluate system and mission requirements; and develop Milestone-documentation in support of Preliminary Design. Funding will also be used to continue to conduct ship design and unmanned vehicle studies to support analytic foundation for the development of a Future Surface Combatant Force. Develop FSCs and associated unmanned surface vehicles including mission payloads, sensors and handling systems. Define Top Level requirements for: modular unmanned system mission payloads, common control systems, ship concepts. ***FY 2020 Base Plans:***					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603563N / *Ship Concept Advanced Design*	**Project (Number/Name)** 2196 / *Design, Tools, Plans and Concepts*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Continued development for the Large Surface Combatant (LSC) platform as a part of the Future Surface Combatant Force, including shipyard engagement. Technology integration studies to support the LSC as well as other platforms within the Surface Combatant Force required to deliver the Future Surface Combatant Force. Unmanned Surface Vehicle requirements evaluation and development. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** The FY 2020 increase is due to increased tasking associated of pre-preliminary design efforts for the Large Surface Combatant as part of the Future Surface Combatant Force. The Future Surface Combatant Force (FSCF) AOA team will be performing detailed analysis for threshold and objective requirements, and multiple concept formulation teams will be stood up to both develop the workforce as well as to develop concepts in order to shorten the acquisition timeline for future programs.					
Accomplishments/Planned Programs Subtotals	4.309	22.451	33.595	0.000	33.595

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• RDTEN/0204202N: *DDG-1000*	134.664	140.264	111.435	-	111.435	107.912	72.025	15.042	10.164	Continuing	Continuing
• RDTEN/0603512N: *Carrier Systems Development*	9.184	5.440	4.997	-	4.997	5.658	5.719	5.702	5.814	Continuing	Continuing
• RDTEN/0603564N: *Ship Preliminary Design/Feasibility*	18.369	13.348	69.084	-	69.084	75.480	75.544	55.217	21.810	Continuing	Continuing
• RDTEN/0604567N: *Ship Contract Design/Live Fire T&E*	65.857	71.062	46.809	-	46.809	61.547	55.036	55.612	56.726	Continuing	Continuing
• RDTEN/0603582N: *Combat System Integration*	15.471	16.351	17.251	-	17.251	16.015	15.509	15.826	16.142	Continuing	Continuing

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603563N / *Ship Concept Advanced Design*	**Project (Number/Name)** 2196 / *Design, Tools, Plans and Concepts*

D. Acquisition Strategy

This is a non-acquisition program that develops, evaluates, and validates early stages of total ship concepts and technologies in support of SCN planning and potential future ship acquisition programs. This program also supports development, demonstration, evaluation, and validation of engineering tools, methods, and criteria for those concept designs and assessments.

E. Performance Metrics

Quarterly Program Reviews

Monthly Reviews

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603563N / *Ship Concept Advanced Design*	Project (Number/Name) 2196 / *Design, Tools, Plans and Concepts*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Systems Engineering	C/CPFF	Various Contractors : Various	0.584	0.000		2.677	Feb 2019	3.571	Feb 2020	-		3.571	Continuing	Continuing	Continuing
Systems Engineering	WR	NSWC : Various	0.906	0.000		1.000	Feb 2019	1.500	Feb 2020	-		1.500	Continuing	Continuing	Continuing
Systems Engineering	WR	NSWC DD : Dahlgren, VA	0.000	1.662	Jul 2018	1.275	Nov 2018	2.500	Nov 2019	-		2.500	Continuing	Continuing	Continuing
Systems Engineering	WR	NSWC PL : Philadelphia, PA	0.000	0.675	Jul 2018	1.250	Nov 2018	3.000	Nov 2019	-		3.000	Continuing	Continuing	Continuing
Systems Engineering	WR	SPAWAR : San Diego, CA	0.000	0.172	Jul 2018	0.000		1.500	Nov 2019	-		1.500	Continuing	Continuing	Continuing
Systems Engineering	WR	JHU APL : Baltimore, MD	0.000	0.000		0.000		2.500	Feb 2020	-		2.500	Continuing	Continuing	Continuing
Systems Engineering	WR	NSWC CD : Carderock, MD	0.000	0.612	Nov 2017	1.918	Oct 2018	4.000	Oct 2019	-		4.000	Continuing	Continuing	Continuing
Engineering Development	C/CPFF	Various Contractors : Various	0.171	0.000		7.127	Feb 2019	4.794	Feb 2020	-		4.794	Continuing	Continuing	Continuing
Engineering Development	WR	NSWC CD : Carderock, MD	1.069	0.917	Jul 2018	1.289	Nov 2018	4.000	Nov 2019	-		4.000	Continuing	Continuing	Continuing
Engineering Development	C/BA	NSWC : Various	0.000	0.000		1.610	Feb 2019	1.500	Feb 2020	-		1.500	Continuing	Continuing	Continuing
Demonstration & Evaluation	C/CPFF	Various Contractors : Various	0.029	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Test & Evaluation	C/CPFF	Various Contractors : Various	0.020	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Engineering Development	WR	NSWC PL : Philadelphia, PA	0.000	0.000		1.900	Nov 2018	2.500	Nov 2019	-		2.500	0.000	4.400	-
Engineering Development	WR	NSWC DD : Dahlgren, VA	0.000	0.000		2.405	Nov 2018	2.230	Nov 2019	-		2.230	0.000	4.635	-
Engineering Development	WR	NAVAIR : Patuxent River	0.000	0.196	Jun 2018	0.000		0.000		-		0.000	0.000	0.196	-
Systems Engineering	WR	NUWC : Newport	0.000	0.075	Jul 2018	0.000		0.000		-		0.000	0.000	0.075	-
		Subtotal	2.779	4.309		22.451		33.595		-		33.595	Continuing	Continuing	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
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Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract

Remarks

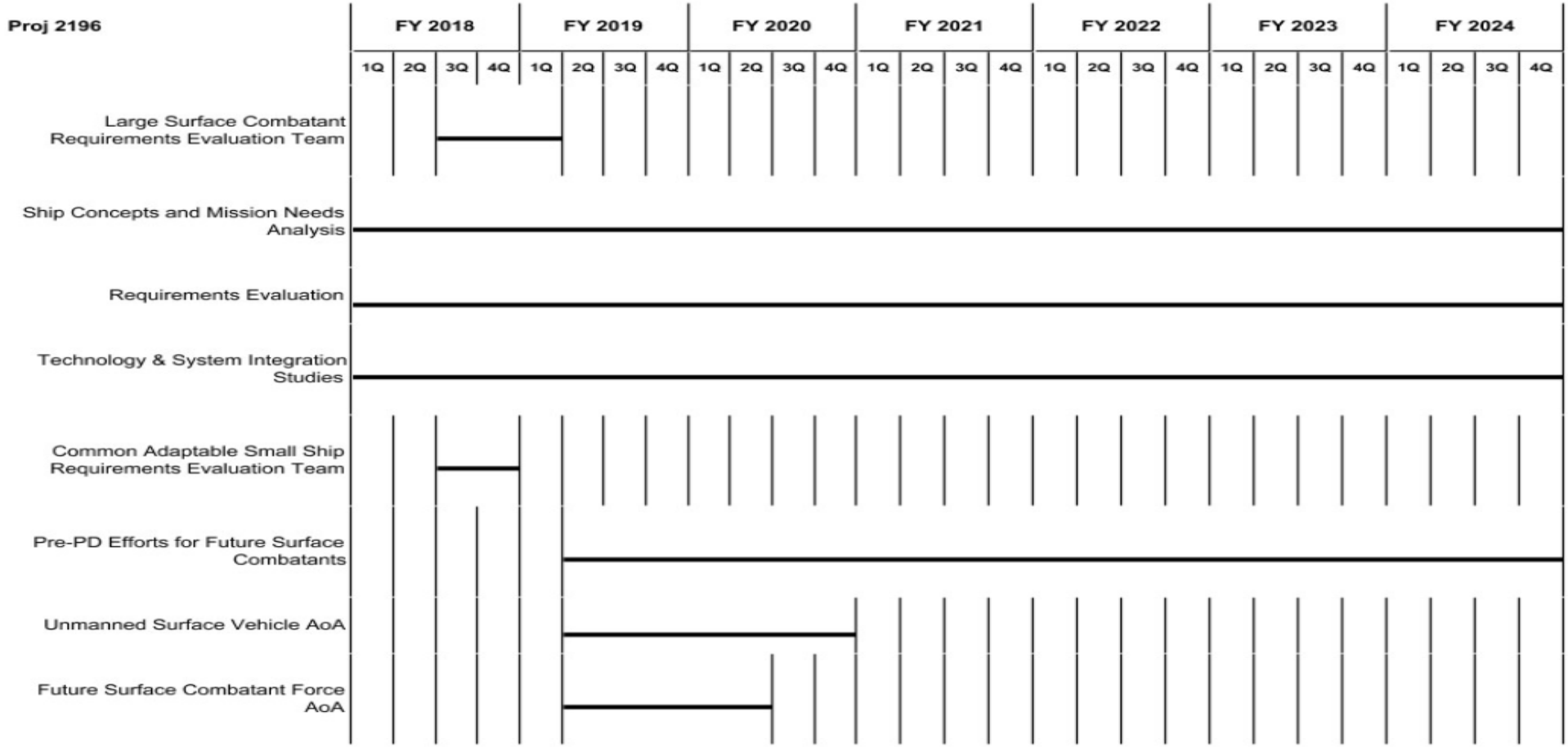
Changes in Systems Engineering between FY19 and FY20 to support changing program priorities and needs to support continuing and future AoA's and RET's. This is reflected mainly in Large Surface Combatant Pre-Preliminary design, continuous efforts to investigate and define the future force, and in Top Level Requirements development for specific platforms as they begin to move from the concept phase to preliminary design. Some of the larger items will include LSC beginning hull-form development and model testing at warfare center facilities. The Future Surface Combatant Force (FSCF) AOA team will be performing detailed analysis to move from IOVs set out in the FSCF Initial Capabilities Document(ICD) to threshold and objective requirements, and multiple concept formulation teams will be stood up to both develop the workforce as well as to develop concepts in order to shorten the acquisition timeline for future programs.

This funding is essential to:
- Ensure participation in AoA/RET to examine the alternative concepts and feasibility of acquisition strategies
- Prepare required documents for Alternative Systems Reviews (ASR) after the AoA and Navy determines preferred material solution(s)
- Perform operational & technical analysis on preferred material solutions
- Establish program framework and strategies
- Prepare required Milestone A documents for preferred material solution(s)
- Develop technology development strategy

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	2.779	4.309		22.451		33.595		-		33.595	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603563N / *Ship Concept Advanced Design*	**Project (Number/Name)** 2196 / *Design, Tools, Plans and Concepts*



2020DON - 0603563N - 2196

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603563N / *Ship Concept Advanced Design*	**Project (Number/Name)** 2196 / *Design, Tools, Plans and Concepts*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 2196				
Large Surface Combatant Requirements Evaluation Team: Large Surface Combatant Requirements Evaluation Team	3	2018	1	2019
Ship Concepts and Mission Needs Analysis: Ship Concepts and Mission Needs Analysis	1	2018	4	2024
Requirements Evaluation: Requirements Evaluation	1	2018	4	2024
Technology & System Integration Studies: Technology & System Integration Studies	1	2018	4	2024
Common Adaptable Small Ship Requirements Evaluation Team: Common Adaptable Small Ship Requirements Evaluation Team	3	2018	4	2018
Pre-PD Efforts for Future Surface Combatants: Pre-PD Efforts for Future Surface Combatants	2	2019	4	2024
Unmanned Surface Vehicle AoA: Unmanned Surface Vehicle AoA	2	2019	4	2020
Future Surface Combatant Force AoA: Future Surface Combatant Force AoA	2	2019	2	2020

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603563N / *Ship Concept Advanced Design*	Project (Number/Name) 3161 / *NAVSEA Tech Authority*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
3161: *NAVSEA Tech Authority*	192.430	13.346	27.817	34.247	-	34.247	18.987	17.193	18.751	19.123	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Note

All Cross Platform System Development (CPSD) Pillars have been rebaselined in FY19 to better address CNO and NAVSEA Chief Engineer (SEA05) technical priorities. FY18 Pillars remain as requested in PRESBUD.

A. Mission Description and Budget Item Justification

This project has been established to support the NAVSEA Tech Authority with the coordination of design and development efforts for cross-platform applicability to result in more affordable, mission-capable, and interoperable surface ship forces including ships that are less expensive to build and operate with reduced manning, reduced support costs, and greater utilization of emerging technology.

NAVSEA Tech Authority efforts under Project 3161, known as the Cross Platform Systems Development (CPSD) Program transition directly to early-stage ship design for Ship Preliminary Design and Feasibility Studies and other Program Executive Office (PEO) ship design programs. While these efforts support concept exploration and mission needs assessment for potential future ship acquisition programs, they also develop cross-program technology solutions and associated technical authority products. They are not direct efforts for specific, authorized shipbuilding programs. This project is the only R&D effort that provides a coordinated, collaborative approach to the development of: cross-platform naval ship and weapon system design, as well as engineering capabilities in the areas of design tools, criteria, and methods. This project also provides innovative solutions for current Fleet issues involving Technical Authority, such as interoperability issues with new systems or platforms, or broad technology insertion topics.

In FY18, the CPSD program was rebaselined to account for a decreasing budget to the following functional areas:

CPSD 1.0 - Platform Concept Advanced Development
CPSD 2.0 - Platform Design and Certification Tools/Engineering and Tech Data Exchange Development
CPSD 3.0 - Ship Systems Engineering/Modular Ship Systems Development
CPSD 5.0 - High Speed Ships and Craft Engineering
CPSD 6.0 - Alternate Power Systems Engineering
CPSD 8.0 - Embedded Interoperability (I/O) Engineering
CPSD 9.0 - Mission Capability Systems Engineering
CPSD 13.0 - Cybersecurity
CPSD 14.0 - Future Surface Combatant Study

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
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In FY19, all CPSD Pillars have been rebaselined again to better address CNO and NAVSEA Chief Engineer (SEA05) technical priorities and shall be comprised of the following functional areas:

CPSD A - Ship Technology Improvements
CPSD B - Fleet Maintenance and Life Cycle Cost Reduction
CPSD C - Additive and Advanced Manufacturing Technology
CPSD D - Digital Framework/Electromagnetic Environment and Development
CPSD E - Unmanned Systems
CPSD F - Cybersecurity

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Platform Design and Certification Tools/Engineering and Tech Data Exchange (CPSD 2.0)	1.313	0.000	0.000	0.000	0.000
Articles:	-	-	-	-	-
Description: This effort supports the development of validation tools to certify the safety and mission capability of platform concepts and subsequently ships; establishes the integrated NAVSEA suite; and advances design methods, validation tools, and manpower tools to aid in rapid total platform definition and assessment.					
FY 2019 Plans: N/A					
FY 2020 Base Plans: N/A					
FY 2020 OCO Plans: N/A					
Title: Ship Systems Engineering /Modular Ship Systems Development (CPSD 3.0)	1.937	0.000	0.000	0.000	0.000
Articles:	-	-	-	-	-
Description: This effort supported Ship system development with a focus on technology transition, modularity and ship system technology integration to support ongoing ship modernization.					
FY 2019 Plans: N/A					
FY 2020 Base Plans:					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
N/A ***FY 2020 OCO Plans:*** N/A					
Title: Alternative Power Systems Engineering (CPSD 6.0) ***Articles:*** ***Description:*** This effort investigates concepts for ships with alternative HM&E/power/propulsion systems evaluating effectiveness in mobility, survivability, hull, mechanical/electrical and in traditional and evolving warfare mission areas. ***FY 2019 Plans:*** N/A ***FY 2020 Base Plans:*** N/A ***FY 2020 OCO Plans:*** N/A	0.500 -	0.000 -	0.000 -	0.000 -	0.000 -
Title: Mission Capability Systems Engineering (CPSD 9.0) ***Articles:*** ***Description:*** This effort supports the development of force-level systems engineering criteria and guidance at the Systems of Systems (SoS) and Family of Systems (FoS) level. This effort allows for the enhanced warfighter and system performance with reduced personnel costs with project costs savings. ***FY 2019 Plans:*** N/A ***FY 2020 Base Plans:*** N/A ***FY 2020 OCO Plans:*** N/A	1.500 -	0.000 -	0.000 -	0.000 -	0.000 -
Title: Cybersecurity (CPSD 13.0) ***Articles:***	8.096 -	0.000 -	0.000 -	0.000 -	0.000 -

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Description: This supports the research, design, development and testing of cybersecurity solutions for shipboard Hull Mechanical and Electrical (HM&E) , Navigation Systems, Combat Systems, and other shipboard control systems. It also supports the development of specifications and standards for the cybersecurity of all Navy Control Systems (NCS). ***FY 2019 Plans:*** N/A ***FY 2020 Base Plans:*** N/A ***FY 2020 OCO Plans:*** N/A					
Title: Cybersecurity (CPSD F) ***Articles:***	0.000 -	16.739 -	20.953 -	0.000 -	20.953 -
Description: This supports the research, design, development, and testing of Cybersecurity solutions for shipboard Hull Mechanical and Electrical (HM&E), Navigation Systems, Combat Systems, and other shipboard control systems. It also supports the development of specifications and standards for the Cybersecurity of all Navy Control Systems (NCS). This pillar was created for FY19 and follow-on years and includes FY18 pillars CPSD 13.0. ***FY 2019 Plans:*** Efforts will concentrate on ensuring the stability and supportability of hardware and software to be deployed operationally. Long term ownership and maintenance of capabilities will be established. Since cybersecurity is a constantly evolving environment, efforts will continue to research, develop, and mature various cross-platform cybersecurity solutions including but not limited to: situational awareness tools, boundary defense capabilities, cyber security optimized network design, network reconnaissance and discovery, and operational indifference to malicious intent. Continue development of specifications and standards for cybersecurity of NCS. Cybersecurity implementation will be expanded to additional classes of ships on a schedule to be determined based on availability. ***FY 2020 Base Plans:***					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603563N / *Ship Concept Advanced Design*	**Project (Number/Name)** 3161 / *NAVSEA Tech Authority*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Continue engineering and development efforts to mature numerous cross-platform hardware and software cybersecurity solutions that will be rapidly deployed on afloat systems to increase Ship platforms and ships forces' ability to protect, detect, react to, and recover from Cybersecurity incidents on NCS's. The plan will fund the research and development of situational awareness tools, boundary defense capabilities, to include Government Off The Shelf (GOTS) tool Situational Awareness Boundary Enforcement and Response (SABER), cyber security optimized network design, network inspection and detection, and operational indifference to cybersecurity threats. This effort will also continue development of system specifications related to cybersecurity and development of enterprise standards for cybersecurity of NCS's. The implementation, which started with a targeted set of systems and platforms, will be expanded to additional classes of ships on a schedule to be determined based on availability. These solutions take system reliability, maintainability, and supportability requirements into account allowing lifecycle sustainment requirements to be developed and tailored to suit future needs and the constantly evolving Cybersecurity threat landscape This effort will continue to address Navy Cyber T&E policy and requirements through the development of USS Secure, a distributed system of system cyber test and assessment capability. USS Secure provides full mission assurance cyber risk assessments through vulnerability and resolution testing of operational platforms and systems. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** The increase from FY 2019 to FY 2020 is attributed to the continued maturation of numerous cross-platform hardware and software cybersecurity solutions.					
Title: Ship Technology Improvements (CPSD A)	0.000	1.572	1.787	0.000	1.787
Articles:	-	-	-	-	-
Description: This effort provides for the analysis of ship system technologies to reduce design and construction costs. This also includes the development of validation tools to certify the safety and mission capability of platform concepts and subsequently ships. ***FY 2019 Plans:*** Continue the development of ship construction technology improvements to reduce risk related to alternative technical architectures and designs. Complete support of tri-maran hull configuration performance evaluation. ***FY 2020 Base Plans:***					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603563N / *Ship Concept Advanced Design*	**Project (Number/Name)** 3161 / *NAVSEA Tech Authority*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Continue the development of ship construction technology improvements to reduce risk related to alternative technical architectures and designs. The Next Generation Cooling Systems (NGCS) to support our higher powered systems is a technology that will be improved. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increase due to improvements required to the NGCS in order to support high powered systems.					
Title: Fleet Maintenance and Life Cycle Cost Reduction (CPSD B)	0.000	1.153	2.118	0.000	2.118
Articles:	-	-	-	-	-
Description: This effort funds the development of tools, analyses and technologies to reduce fleet life cycle costs, reduce life-cycle failure risk and improved refurbishment cycles. This will allow the Navy to better meet fleet operational and technical requirements and lower cost. ***FY 2019 Plans:*** Develop technologies to reduce in-service costs and technical risk associated with deployed technologies and systems. FY19 shall include a focus on technology improvements to reduce known in-service deficiencies. ***FY 2020 Base Plans:*** Develop technologies to reduce in-service costs and technical risk associated with deployed technologies and systems. FY20 shall include a focus on technology improvements to reduce known in-service deficiencies. A suite of Standardized Guidelines for design tools will be researched to establish criteria for determining when a Departure of Specification (DFS) should be written. Also, the integration issues within Combat Systems is another fleet maintenance criteria investigated which will improve life cycle costs. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increase attributed to increased scope and added focus on technology improvements to reduce known in-service deficiencies as well as the assessment of integration issues within Combat Systems which will improve life cycle costs					
Title: Additive and Advanced Manufacturing Technology (CPSD C)	0.000	7.360	8.155	0.000	8.155
Articles:	-	-	-	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Description: This effort funds the development of additive manufacturing technologies, advanced coating techniques, topology optimization and materials characterization and selection. This pillar was created for FY19 and follow-on years and includes FY18 pillars CPSD 3.0. ***FY 2019 Plans:*** Funding transitioned from FY18 CPSD Pillar 3.0 will be utilized to analyze the logistical and engineering aspects of the application of 3D modeling and additive manufacturing (AM) technology for metal and polymer components. Further conduct material characterization and selection efforts for both additively manufactured and conventional materials. Additional funding provided in FY19 will be used to accelerate CNO additive manufacturing priorities and aligns them with technical authority requirements and products. Solutions will provide the foundation to increase Fleet readiness and improve warfighting capacity by enabling production at or near the point of need. Specific efforts include development of AM design and manufacturing standards; determining AM equipment performance requirements in dynamic environments (I.e. shipboard); ship integration requirements for AM equipment; and navy-specific AM industrial base requirements including digital file transfer and cyber. ***FY 2020 Base Plans:*** FY20 funding will be utilized to analyze the logistical and engineering aspects of the application of 3D modeling and additive manufacturing (AM) technology for metal and polymer components. Further conduct material characterization and selection efforts for both additively manufactured and conventional materials. Continue development of AM design and manufacturing standards; determining AM equipment performance requirements in dynamic environments (I.e. shipboard); ship integration requirements for AM equipment; and navy-specific AM industrial base requirements including digital file transfer and cyber. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increased funding is required to realize the cost-savings potential of additive manufacturing in maintenance facilities and improve sustainability by additively manufacturing parts at point of use.					
Title: Digital Framework/Electromagnetic Environment and Development (CPSD D)	0.000	0.405	0.631	0.000	0.631
Articles:	-	-	-	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603563N / *Ship Concept Advanced Design*	**Project (Number/Name)** 3161 / *NAVSEA Tech Authority*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Description: Develop an understanding and address the energy demands of the future fleet including power management and energy harvesting. ***FY 2019 Plans:*** Develop power management and distribution technologies. Complete ship display system testing. ***FY 2020 Base Plans:*** Continue development of power management and distribution technologies. Complete ship display system testing. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** The second year of development of power management and distribution technologies will involve more lab time and personnel than the year prior which will result in higher cost in FY20. The FY 2020 funding request was reduced by $0.013 million to account for the availability of prior year execution balances.					
Title: Unmanned Systems (CPSD E)	0.000	0.588	0.603	0.000	0.603
Articles:	-	-	-	-	-
Description: This effort funds the development and advancement of NAVY unmanned systems across various platforms. Note: Unmanned system efforts in years prior to FY19 were captured under CPSD Pillar 1.0. ***FY 2019 Plans:*** Efforts focus on the development of rapid deployment and swarming technologies (and the deployment of such weapon systems). Swarming technologies require funding to provide weapon system alternatives for both large and small scale unmanned platforms. Perform evaluation of multi-scaled vehicles for deployment from various host vessels. ***FY 2020 Base Plans:*** Continue efforts to focus on the development of rapid deployment and swarming technologies (and the deployment of such weapon systems). Swarming technologies require funding to provide weapon system					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
alternatives for both large and small scale unmanned platforms. Perform evaluation of multi-scaled vehicles for deployment from various host vessels. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increase due to direction to develop rapid deployment and swarming technologies to aid in Naval capabilities.					
Accomplishments/Planned Programs Subtotals	13.346	27.817	34.247	0.000	34.247

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• RDTEN/0204202N: *DDG-1000*	140.500	161.264	132.337	-	132.337	133.781	88.573	16.617	0.000	Continuing	Continuing
• RDTEN/0603512N: *Carrier Systems Development*	9.296	5.440	5.401	-	5.401	5.531	5.637	5.778	0.000	Continuing	Continuing
• RDTEN/0603564N: *Ship Preliminary Design/ Feasibility Studies*	12.012	13.348	22.534	-	22.534	9.320	9.494	9.687	0.000	Continuing	Continuing
• RDTEN/0604567N: *Ship Contract Design/Live Fire T&E*	67.166	60.062	59.688	-	59.688	54.596	55.677	56.859	0.000	Continuing	Continuing
• RDTEN/0603582N: *Combat System Integration*	24.674	16.351	27.921	-	27.921	16.015	15.509	26.496	0.000	Continuing	Continuing

Remarks

D. Acquisition Strategy

This is a non-acquisition program that develops, evaluates, and validates early stages of total ship concepts and technologies in support of SCN planning and potential future ship acquisition programs. This program also supports development, demonstration, evaluation, and validation of engineering tools, methods, and criteria for those concept designs and assessments. This program provides validated engineering tools, methods, and criteria for ship, and weapon system concept designs and assessments while fostering collaboration and coordination of efforts resulting in more effective use of funding.

E. Performance Metrics

Quarterly Program Reviews

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603563N / *Ship Concept Advanced Design*	Project (Number/Name) 3161 / *NAVSEA Tech Authority*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Systems Engineering	C/CPFF	Various Contractors : Various	18.436	0.000		0.000		3.655	May 2020	-		3.655	Continuing	Continuing	Continuing
Systems Engineering	WR	NSWC, NUWC, CDSA : Various	62.829	0.000		0.000		1.150	Feb 2020	-		1.150	Continuing	Continuing	Continuing
Engineering Development	C/CPFF	DRS : Stevensville, MD	3.249	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Engineering Development	WR	NSWC, NUWC : Various	53.465	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Demonstration & Evaluation	WR	NSWC : Various	20.044	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Demonstration & Evaluation	WR	SPAWAR : Various	1.922	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Test and Evaluation	WR	NSWC : Various	11.910	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Systems Engineering	WR	NSWC DD : Dahlgren, VA	0.400	0.200	May 2018	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Systems Engineering	WR	NSWC CD : Carderock, MD	2.280	1.000	Dec 2017	1.050	Dec 2018	2.500	Nov 2019	-		2.500	Continuing	Continuing	Continuing
Systems Engineering	WR	NSWC PL : Philadelphia, PA	1.748	0.872	May 2018	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Systems Engineering	WR	NRL : Washington, D.C.	0.092	0.046	Aug 2018	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Systems Engineering	C/CPFF	ALION : Wahington, D.C.	0.240	0.120	May 2018	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Systems Engineering	C/CPFF	CSC : Washington, D.C.	0.600	0.300	Jul 2018	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Systems Engineering	MIPR	Army Research Lab : Aberdeen Proving Ground, MD	0.150	0.075	Jul 2018	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Engineering Development	WR	NUWC Newport : Newport, RI	0.264	0.382	Dec 2017	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Engineering Development	WR	NUWC Keyport : Keyport, WA	0.300	0.150	Nov 2017	0.000		0.000		-		0.000	Continuing	Continuing	Continuing

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603563N / *Ship Concept Advanced Design*	Project (Number/Name) 3161 / *NAVSEA Tech Authority*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Engineering Development	WR	NSWC Crane : Crane, IN	0.338	0.169	Dec 2017	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Engineering Development	WR	NSWC DD : Dahlgren, VA	0.850	0.800	May 2018	0.500	Dec 2018	0.487	Dec 2019	-		0.487	Continuing	Continuing	Continuing
Engineering Development	WR	NSWC CD : Carderock, MD	1.589	1.775	Dec 2017	1.278	Dec 2018	1.250	Dec 2019	-		1.250	Continuing	Continuing	Continuing
Engineering Development	WR	NSWC PD : Philadelphia, PA	0.488	0.294	Nov 2017	0.500	Nov 2018	1.120	Nov 2019	-		1.120	Continuing	Continuing	Continuing
Engineering Development	C/CPFF	CSC : Washington, D.C.	0.200	0.100	Jul 2018	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Engineering Development	C/CPFF	JHU APL : Baltimore, MD	0.400	0.200	May 2018	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Demonstration & Evaluation	WR	NUWC Keyport : Keyport, WA	0.100	0.050	Mar 2018	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Demonstration & Evaluation	WR	NSWC CD : Carderock, MD	0.500	0.250	Dec 2017	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Demonstration & Evaluation	WR	NSWC PD : Philadelphia, PA	0.250	0.125	Dec 2017	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Cybersecurity Technologies	C/CPFF	JHU/APL : Baltimore, MD	3.168	3.555	May 2018	1.500	May 2019	3.000	May 2020	-		3.000	Continuing	Continuing	Continuing
Cybersecurity Technologies	C/CPFF	MITRE : McLean, VA	0.608	0.500	Oct 2017	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Cybersecurity Technologies	MIPR	PNNL DOE : Richland, WA	0.600	0.300	Jul 2018	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Engineering Development	WR	NSWC Carderock : Carderock, MD	0.000	0.000		1.330	Oct 2018	0.000		-		0.000	0.000	1.330	-
Engineering Development	WR	NUWC Keyport Washington : Keyport, WA	0.000	0.000		0.020	Oct 2018	0.000		-		0.000	0.000	0.020	-
Engineering Development	WR	PHD NSWC : Port Hueneme, CA	0.060	0.030	May 2018	0.000		0.000		-		0.000	Continuing	Continuing	Continuing

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603563N / *Ship Concept Advanced Design*	Project (Number/Name) 3161 / *NAVSEA Tech Authority*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Engineering Development	C/CPFF	Various Contractors : Various	0.000	0.000		5.350	Oct 2018	0.000		-		0.000	0.000	5.350	-
Cybersecurity Technologies	WR	NUWC Keyport : Keyport, WA	0.000	0.000		0.350	Dec 2018	1.704	Dec 2019	-		1.704	0.000	2.054	-
Cybersecurity Technologies	WR	NUWC Newport : Newport, RI	0.000	0.000		0.600	Dec 2018	2.000	Dec 2019	-		2.000	0.000	2.600	-
Cybersecurity Technologies	WR	NSWC Crane : Crane, IN	0.000	0.000		0.350	Dec 2018	0.350	Dec 2019	-		0.350	0.000	0.700	-
Cybersecurity Technologies	WR	NSWC DD : Dahlgren, VA	0.000	0.000		7.600	Dec 2018	7.126	Dec 2019	-		7.126	0.000	14.726	-
Cybersecurity Technologies	WR	NSWC PD : Philadelphia, PA	0.000	0.000		2.100	Dec 2018	2.935	Dec 2019	-		2.935	0.000	5.035	-
Systems Engineering	WR	NSWC IH : Indian Head, MD	0.000	0.000		0.000		1.000	Nov 2019	-		1.000	0.000	1.000	-
Systems Engineering	WR	NSWC PD : Philadelphia, PA	0.000	0.000		0.000		0.500	Nov 2019	-		0.500	0.000	0.500	-
Systems Engineering	WR	NUWC Keyport : Keyport, WA	0.000	0.000		0.000		0.500	Nov 2019	-		0.500	0.000	0.500	-
		Subtotal	187.080	11.293		22.528		29.277		-		29.277	Continuing	Continuing	N/A

Remarks

Product development cost growth identified for Systems Engineering in FY20 is required to support CPSD efforts. Additive Manufacturing and traditional materials technology are high growth areas in FY20 that will provide increased Fleet readiness and improve warfighting capacity by enabling production at or near the point of need.
Cybersecurity Technologies reflects a growth in funding to FY20 levels for continued development of cybersecurity technologies, tools and test capabilities to address existing Fleet cybersecurity gaps and enhance warfighting defensive cybersecurity capability needs. The addition of funding dedicated for cyber test and assessment capabilities, development of cybersecurity T&E policy and directives, and development of requirements supports Navy's goal to certify enhancements to NCS's, modernization of NCS's and innovative technologies prior to operational use.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603563N / *Ship Concept Advanced Design*	Project (Number/Name) 3161 / *NAVSEA Tech Authority*	

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Systems Engineering	WR	NUWC Newport : Newport, RI	0.200	0.100	Dec 2017	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Systems Engineering	WR	NSWC DD : Dahlgren, VA	0.200	0.100	Mar 2018	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Systems Engineering	WR	NSWC CD : Carderock, MD	0.500	0.250	Dec 2017	0.500	Dec 2018	0.500	Dec 2019	-		0.500	Continuing	Continuing	Continuing
Systems Engineering	WR	NSWC PD : Philadelphia, PA	0.250	0.175	Oct 2017	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Systems Engineering	C/CPFF	G2OPS : Virginia Beach, VA	0.500	0.250	Mar 2018	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Systems Engineering	C/CPFF	JHU/APL : Baltimore, MD	0.200	0.100	May 2018	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Cybersecurity Technologies	WR	NSWC CD : Carderock, MD	0.000	0.000		1.489	Dec 2018	1.080	Dec 2019	-		1.080	0.000	2.569	-
Cybersecurity Technologies	MIPR	SPAWAR : Various	0.000	0.000		0.250	Dec 2018	0.250	Dec 2019	-		0.250	0.000	0.500	-
Cybersecurity Technologies	C/CPFF	Various Contractors : Various	0.000	0.000		1.500	Jan 2019	1.990	Jan 2020	-		1.990	0.000	3.490	-
		Subtotal	1.850	0.975		3.739		3.820		-		3.820	Continuing	Continuing	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Test Planning & Execution	WR	NSWC DD : Dahlgren, VA	0.040	0.020	Dec 2017	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Cybersecurity Technologies	WR	NSWC CD : Carderock, MD	0.700	0.250	Dec 2017	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Cybersecurity Technologies	C/CPFF	JHU/APL : Baltimore, MD	0.550	0.100	May 2018	0.500	May 2019	0.500	May 2020	-		0.500	Continuing	Continuing	Continuing
		Subtotal	1.290	0.370		0.500		0.500		-		0.500	Continuing	Continuing	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
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Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
PM/Travel	Allot	NAVSEA HQ : Washington, DC	0.749	0.050	Dec 2017	0.050	Dec 2018	0.150	Dec 2019	-		0.150	Continuing	Continuing	Continuing
DAWDF	Various	Not Specified : Not Specified	0.145	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Program Mgmt Spt	WR	NUWC Newport : Newport, RI	0.064	0.032	Dec 2017	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Program Mgmt Spt	WR	NSWC DD : Dahlgren, VA	0.200	0.100	Dec 2017	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Program Mgmt Spt	WR	NSWC CD : Carderock, MD	0.500	0.250	Nov 2017	0.250	Nov 2018	0.250	Nov 2019	-		0.250	Continuing	Continuing	Continuing
Program Mgmt Spt	C/CPFF	CSC : Washington, D.C.	0.210	0.105	Jul 2018	0.250	Nov 2018	0.250	Nov 2019	-		0.250	Continuing	Continuing	Continuing
Program Mgmt Spt	C/FFP	ARDEC : Picatinny Arsenal, NJ	0.200	0.100	Jun 2018	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Program Mgmt Spt	MIPR	PNNL DOE : Richland, WA	0.142	0.071	Jul 2018	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Cybersecurity Technologies	C/CPFF	CSC : Washington, D.C.	0.000	0.000		0.250	Dec 2018	0.000		-		0.000	0.000	0.250	-
Cybersecurity Technologies	C/CPFF	Alion : Washington, D.C.	0.000	0.000		0.250	Dec 2018	0.000		-		0.000	0.000	0.250	-
		Subtotal	2.210	0.708		1.050		0.650		-		0.650	Continuing	Continuing	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	192.430	13.346		27.817		34.247		-		34.247	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603563N / *Ship Concept Advanced Design*	**Project (Number/Name)** 3161 / *NAVSEA Tech Authority*

Fiscal Year	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
Quarter	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
CPSD A Ship Technology Improvements	**CPSD 2.0** **CPSD 5.0**				**CPSD A**																							
CPSD B Fleet Maintenance and Life Cycle Cost Reduction	**CPSD 8.0** **CPSD 9.0**				**CPSD B**																							
CPSD C Additive and Advanced Manufacturing Technology	**CPSD 3.0**				**CPSD C**																							
CPSD D Digital Framework Electromagnetic Environment and Development	**CPSD 6.0**				**CPSD D**																							
CPSD E Unmanned Systems	**CPSD 1.0**				**CPSD E**																							
CPSD F Cybersecurity	**CPSD 13.0**				**CPSD F**																							

Legend: CPSD Pillars FY18 & Prior | CPSD Pillars FY19+

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603563N / *Ship Concept Advanced Design*	**Project (Number/Name)** 3161 / *NAVSEA Tech Authority*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 3161				
CPSD A - Ship Technology Improvements	1	2019	4	2024
CPSD B - Fleet Maintenance and Life Cycle Cost Reduction	1	2019	4	2024
CPSD C - Additive and Advanced Manufacturing Technology	1	2019	4	2024
CPSD D - Digital Framework/Electromagnetic Environment and Development	1	2019	4	2024
CPSD E - Unmanned Systems	1	2019	4	2024
CPSD F - Cybersecurity	1	2019	4	2024

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603563N / *Ship Concept Advanced Design*	Project (Number/Name) 3376 / *Strategic Sealift*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
3376: *Strategic Sealift*	9.746	0.000	6.335	6.004	-	6.004	6.127	6.250	6.377	6.505	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Project 3376 - Strategic Sealift Research and Development - Develops new concepts and technologies which can be applied to or will enable future strategic sealift, and Seabasing systems. The technologies include ship configuration concepts, equipment to increase cargo handling and cargo loading/unloading rates (including commercial and merchant ship systems), improved man/machine interfaces, improved structural configurations and materials, and Logistics-Over-the-Shore (LOTS) equipment and system improvements.

Note: FY2016 and prior years (FY2014 and earlier) efforts were financed under the National Defense Sealift Fund (NDSF) BA 04 Project 3116 Strategic Sealift Research and Development. FY2015, FY2017, and FY2019-FY2024 efforts are financed under this program element, RDT&E,N BA04, Project 3376 (Strategic Sealift).

FY2018 efforts are financed under RDT&E,N BA 04 Project 9999 (Congressional Adds)

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Shipboard Crane Systems/Shipboard Cargo Systems	0.000	3.800	2.550	0.000	2.550
Articles:	-	-	-	-	-
FY 2019 Plans: Continue investigation and demonstration of shipboard crane/cargo system improvements including weapons handling and transfer capabilities.					
FY 2020 Base Plans: Continue investigation and demonstration of shipboard crane/cargo system improvements including weapons handling and transfer capabilities.					
FY 2020 OCO Plans: N/A					
FY 2019 to FY 2020 Increase/Decrease Statement: Decrease of 1.25M from FY 2019 to FY 2020 is due to completion of MPS Crane Modernization & Capability Enhancement project.					
Title: Sealift Concept Development	0.000	0.750	0.800	0.000	0.800

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603563N / *Ship Concept Advanced Design*	**Project (Number/Name)** 3376 / *Strategic Sealift*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Articles:	-	-	-	-	-
FY 2019 Plans: Continue providing Sealift Research and Technology development and program guidance. Conduct Sealift ship concept development and analysis. ***FY 2020 Base Plans:*** Continue providing Sealift Research and Technology development and program guidance. Conduct Sealift ship concept development and analysis. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increase of 0.05M from FY 2019 to FY 2020 is due to anticipated rate increases and labor required to support large scale demonstration planned for FY 2020.					
Title: Lighter/HSV Seabase to Shore Cargo Transfer	0.000	0.385	1.254	0.000	1.254
Articles:	-	-	-	-	-
FY 2019 Plans: Continue development and demonstration of at-sea vehicle transfer capability. ***FY 2020 Base Plans:*** Continue development and demonstration of at-sea vehicle transfer capability. FY 2020 plans continue to support the EPF V-22 Interface Project. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increase of 0.869M from FY 2019 to FY 2020 is to account for implementation of capabilities for EPF in development in FY 2018 and FY 2019.					
Title: Advanced Tools	0.000	1.400	1.400	0.000	1.400
Articles:	-	-	-	-	-
FY 2019 Plans:					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603563N / *Ship Concept Advanced Design*	**Project (Number/Name)** 3376 / *Strategic Sealift*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Continue investigation and demonstration of individual and multi-ship motion measurement and prediction. ***FY 2020 Base Plans:*** Continue investigation and demonstration of individual and multi-ship motion measurement and prediction. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** No Increase/Decrease from FY 2019 to FY 2020.					
Accomplishments/Planned Programs Subtotals	0.000	6.335	6.004	0.000	6.004

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Not applicable for SEALIFT R&D efforts.

E. Performance Metrics

Annual Program Review.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603563N / *Ship Concept Advanced Design*	Project (Number/Name) 3376 / *Strategic Sealift*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Shipboard Crane Systems/ Shipboard Cargo Systems	WR	Various Contractors : Various	2.561	0.000		3.800	Jan 2019	2.550	Jan 2020	-		2.550	Continuing	Continuing	Continuing
Sealift Concept Development	WR	Various Contractors : Various	3.125	0.000		0.750	Jan 2019	0.800	Jan 2020	-		0.800	Continuing	Continuing	Continuing
Lighter/HSV Seabase to Shore Cargo Transfer	WR	Various Contractors : Various	4.060	0.000		0.385	Jan 2019	1.254	Jan 2020	-		1.254	Continuing	Continuing	Continuing
Advanced Tools	WR	Various : Various	0.000	0.000		1.400	Jan 2019	1.400	Jan 2020	-		1.400	Continuing	Continuing	Continuing
		Subtotal	9.746	0.000		6.335		6.004		-		6.004	Continuing	Continuing	N/A

Remarks

1. Prior Years column only includes FY2015 and FY2017 funding as FY2016 and prior years (FY14 and earlier) were funded under NDSF BA 04 Project 3116 Strategic Sealift Research and Development.
2. Award dates reflect initial date of incremental funding execution.
3. FY18 amounts are in Congressional add RDTE PRJ 9999 at end of exhibit set.

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	9.746	0.000		6.335		6.004		-		6.004	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603563N / *Ship Concept Advanced Design*	**Project (Number/Name)** 3376 / *Strategic Sealift*

Appropriation/Budget Activity	R-1 Program Element (Number/Name)	Project (Number/Name)
1319/ 04	PE 0603563N, Ship Concept Advanced Design	3376 / Strategic Sealift

Note: FY2016 and prior years (FY14 and earlier) efforts were financed under the National Defense Sealift Fund (NDSF) BA 04, Project 3116 (Strategic Sealift Research and Development). FY 2015, FY 2017, FY 2019 and out-year funds are financed under this program element. FY 2018 efforts are financed under RDT&E N BA 04, Project 9999 (Congressional Adds).

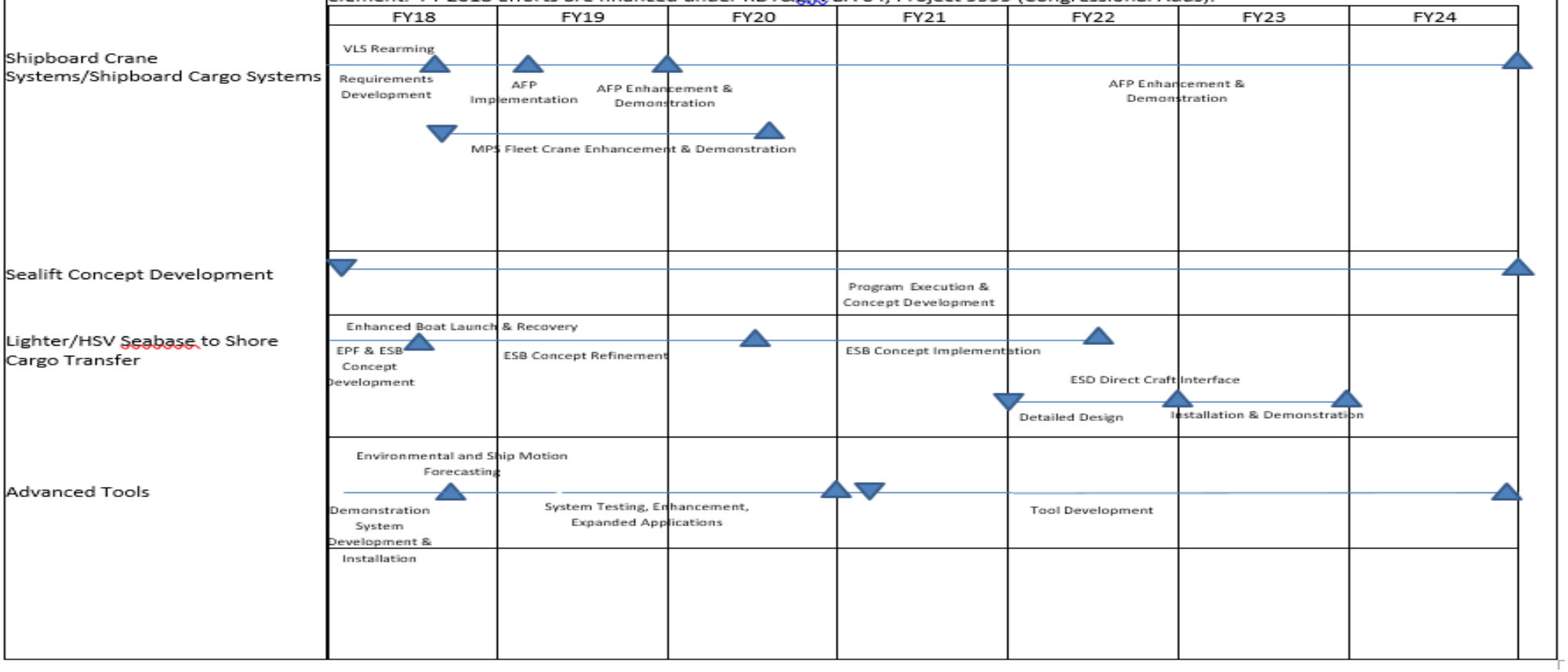


Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603563N / *Ship Concept Advanced Design*	**Project (Number/Name)** 3376 / *Strategic Sealift*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 3376				
Shipboard Crane Systems/Shipboard Cargo Systems	1	2018	4	2024
Sealift Concept Development	1	2018	4	2024
Lighter/HSV Seabase to Shore Cargo Transfer	1	2018	4	2023
Advanced Tools	1	2018	4	2024

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603563N / *Ship Concept Advanced Design*	Project (Number/Name) 4037 / *Common Hull Auxiliary Multi-Mission Platform (CHAMP)*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
4037: *Common Hull Auxiliary Multi-Mission Platform (CHAMP)*	0.000	0.000	18.000	8.000	-	8.000	0.000	0.000	0.000	0.000	0.000	26.000
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Common Hull Auxiliary Multi-Mission Platform (CHAMP) concept leverages a new approach to requirements generation and shipbuilding to replace aging mission specific designs with a common hull to reduce life cycle costs, leverage tailored payloads, and stabilize the industrial base. Identified CHAMP missions include: Sealift, Aviation Intermediate Maintenance support, Medical Services, Command & Control, and Submarine Tending. FY 2019 funding supports Industry Studies to inform requirements definition, provide early industry engagement and follow-on assessment across CHAMP mission functionality.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: CHAMP Design and Total Ship Integration	0.000	18.000	8.000	0.000	8.000
Articles:	-	-	-	-	-
FY 2019 Plans: CHAMP Design and Total Ship Integration - Issued Industry Studies RFP, conducted source selection and award Industry Studies contracts. Industry Studies included trade studies and analysis on main machinery, reconfigurable system arrangements, and ship and reconfigurable system interfaces. Developed and initiated initial acquisition planning documents. Coordinated with NAVSEA, MSC, PEO Ships, CNO, ASN RD&A, OSD and Fleet.					
FY 2020 Base Plans: Continue Industry Studies and award Preliminary Design options. Preliminary Designs will allow for Shipbuilders to begin developing a baseline design, leading to quality contract and details designs. Continue development of Acquisition planning documents. Develop and continue to update the Top Level Requirements document, provide engineering oversight for Industry Studies and Preliminary Designs.					
FY 2020 OCO Plans: N/A					
FY 2019 to FY 2020 Increase/Decrease Statement: Decrease of $10M from FY 2019 to FY 2020 reflects Industry Studies contracts awarded in FY 2019.					
Accomplishments/Planned Programs Subtotals	0.000	18.000	8.000	0.000	8.000

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603563N / *Ship Concept Advanced Design*	**Project (Number/Name)** 4037 / *Common Hull Auxiliary Multi-Mission Platform (CHAMP)*

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Develop and issue Industry Studies RFP for award of multiple contracts in FY19 to participate in trade studies and analysis on main machinery, reconfigurable system arrangements, and ship and reconfigurable system interfaces. Based on the results of the tradeoffs, develop preliminary designs and inform Government requirements definition for future ship acquisition.

E. Performance Metrics

None.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603563N / *Ship Concept Advanced Design*	Project (Number/Name) 4037 / *Common Hull Auxiliary Multi-Mission Platform (CHAMP)*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Design Trade-off Tool & Design Studies	WR	NSWC : MD	0.000	0.000		1.000	Oct 2018	1.500	Oct 2019	-		1.500	0.000	2.500	-
Industry Studies / PDs	C/FFP	Various : Various	0.000	0.000		10.700	Jan 2019	4.500	Jan 2020	-		4.500	0.000	15.200	-
Engineering Support	Various	Various : Various	0.000	0.000		5.000	Oct 2018	1.500	Oct 2019	-		1.500	0.000	6.500	-
		Subtotal	0.000	0.000		16.700		7.500		-		7.500	0.000	24.200	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
RFP & Program Documentation Development	Various	Various : Various	0.000	0.000		1.300	Oct 2018	0.500	Oct 2019	-		0.500	0.000	1.800	-
		Subtotal	0.000	0.000		1.300		0.500		-		0.500	0.000	1.800	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	0.000		18.000		8.000		-		8.000	0.000	26.000	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603563N / *Ship Concept Advanced Design*	**Project (Number/Name)** 4037 / *Common Hull Auxiliary Multi-Mission Platform (CHAMP)*

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: February 2019
Appropriation/Budget Activity 1319/ 04	**R-1 Program Element (Number/Name)** PE 0603563N, Ship Concept Advanced Design	**Project (Number/Name)** 4037 / *Common Hull Auxiliary Multi-Mission Platform (CHAMP)*

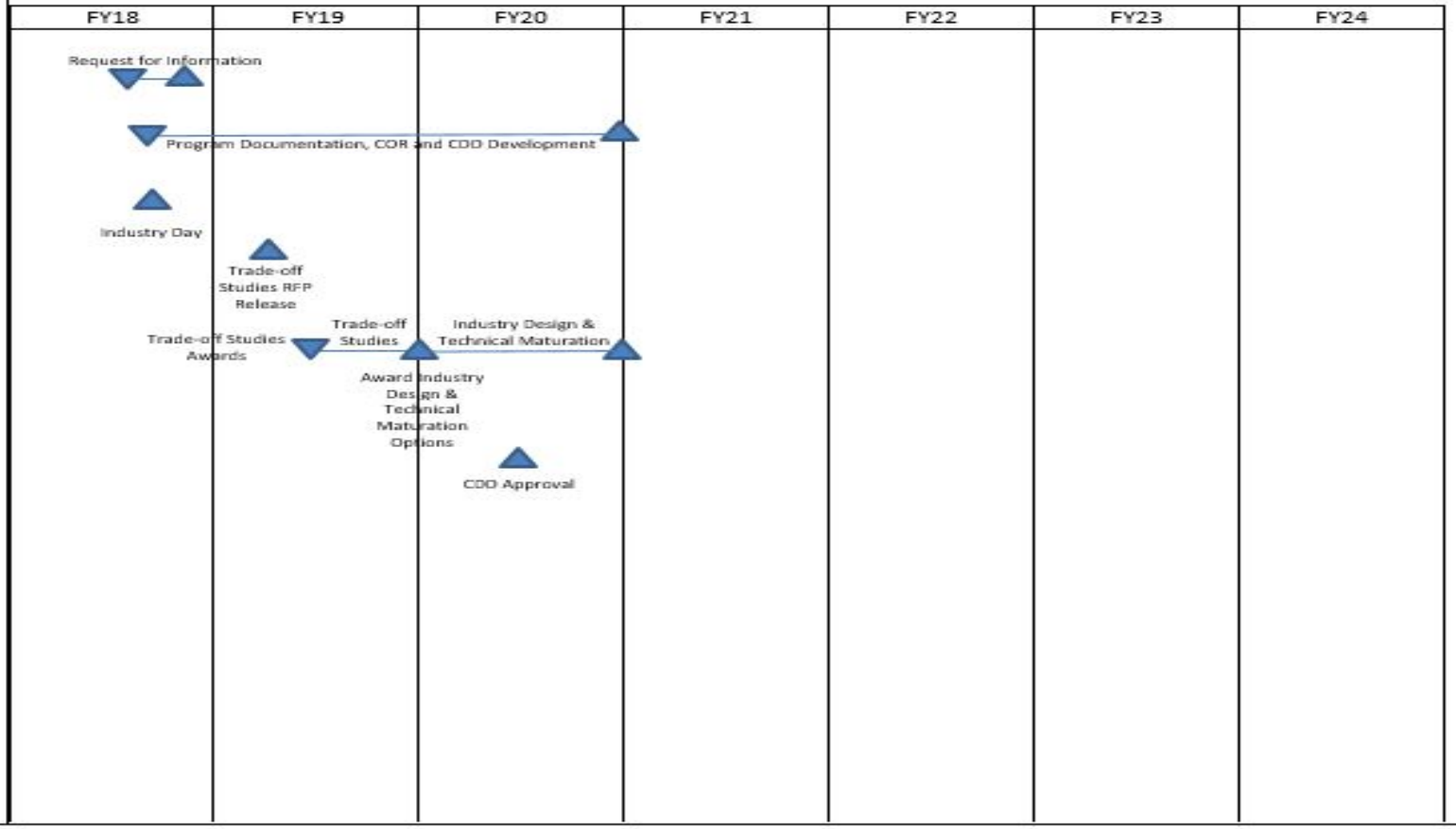


Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603563N / *Ship Concept Advanced Design*	**Project (Number/Name)** 4037 / *Common Hull Auxiliary Multi-Mission Platform (CHAMP)*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 4037				
Request for Information	3	2018	4	2018
Program Documentation, COR & CDD Development	3	2018	4	2020
Industry Day	3	2018	3	2018
Trade-Off Studies RFP Release	2	2019	2	2019
Trade-off Studies	2	2019	4	2019
Industry Design & Technical Maturation	4	2019	4	2020
CDD Approval	3	2020	3	2020

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603563N / *Ship Concept Advanced Design*	Project (Number/Name) 9999 / *Congressional Adds*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
9999: *Congressional Adds*	0.000	6.201	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	6.201
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Project 9999 Congressional Adds - Strategic Sealift Research and Development - Develops new concepts and technologies which can be applied to or will enable future strategic sealift, and Seabasing systems. The technologies include ship configuration concepts, equipment to increase cargo handling and cargo loading/unloading rates (including commercial and merchant ship systems), improved man/machine interfaces, improved structural configurations and materials, and Logistics-Over-the-Shore (LOTS) equipment and system improvements.

Note: FY2016 and FY2014 and prior year efforts were financed under the National Sealift Defense Fund (NDSF) BA 04, Project 3116 (Strategic Sealift Research and Development). FY2015, FY2017 and FY2019-FY2024 efforts are financed under RDT&E,N BA 04, Project 3376 (Strategic Sealift).

FY2018 efforts are being funded under RDT&E,N BA04, Project 9999 (Congressional Adds) due to transfer from NDSF to RDT&E,N.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019
Congressional Add: Strategic Sealift Research and Development	6.201	0.000
FY 2018 Accomplishments: Shipboard Crane Systems/Shipboard Cargo Systems: Continued investigation and demonstration of shipboard crane/cargo system improvements including weapons handling and transfer capabilities. $2.200M Sealift Concept Development: Continued providing Sealift Research and Technology development and program guidance. Conduct Sealift ship concept development and analysis. $1.700M Lighter/HSV Seabase to Shore Cargo Transfer: Continued development and demonstration of at-sea vehicle transfer capability. $1.411M Advanced Tools: Continued investigation and demonstration of individual and multi-ship motion measurement and prediction. $0.890M		
FY 2019 Plans: N/A		
Congressional Adds Subtotals	6.201	0.000

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603563N / *Ship Concept Advanced Design*	**Project (Number/Name)** 9999 / *Congressional Adds*

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Not applicable for SEALIFT R&D efforts.

E. Performance Metrics

Annual Program Review.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603563N / *Ship Concept Advanced Design*	**Project (Number/Name)** 9999 / *Congressional Adds*

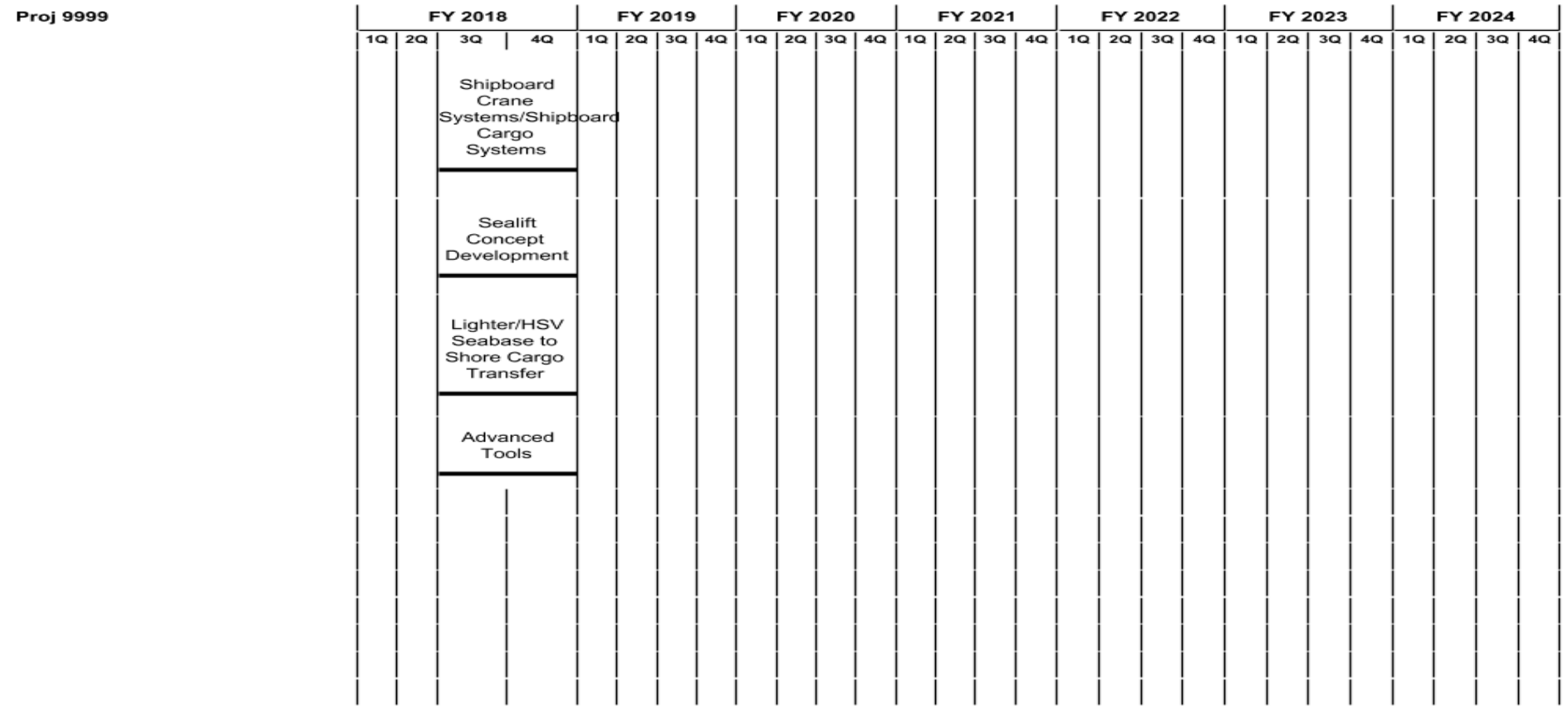
Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Shipboard Crane Systems/ Shipboard Cardo Systems	Various	Various : Various	0.000	2.200	Jun 2018	0.000		0.000		-		0.000	0.000	2.200	-
Sealift Concept Development	Various	Various : Various	0.000	1.700	Jun 2018	0.000		0.000		-		0.000	0.000	1.700	-
Lighter/HSV Seabase to Shore Cargo Transfer	Various	Various : Various	0.000	1.411	Jun 2018	0.000		0.000		-		0.000	0.000	1.411	-
Advanced Tools	Various	Various : Various	0.000	0.890	Jun 2018	0.000		0.000		-		0.000	0.000	0.890	-
		Subtotal	0.000	6.201		0.000		0.000		-		0.000	0.000	6.201	N/A

	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	6.201		0.000		0.000		-		0.000	0.000	6.201	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603563N / *Ship Concept Advanced Design*	**Project (Number/Name)** 9999 / *Congressional Adds*



2020PB - 0603563N - 9999

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603563N / *Ship Concept Advanced Design*	**Project (Number/Name)** 9999 / *Congressional Adds*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 9999				
Shipboard Crane Systems/Shipboard Cargo Systems	3	2018	4	2018
Sealift Concept Development	3	2018	4	2018
Lighter/HSV Seabase to Shore Cargo Transfer	3	2018	4	2018
Advanced Tools	3	2018	4	2018

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy											Date: March 2019	
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0603564N *I Ship Prel Design & Feasibility Studies*							
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
Total Program Element	17.097	18.369	13.348	69.084	-	69.084	75.480	75.544	55.217	21.810	Continuing	Continuing
0411: *Future Surface Combatant Concept Development*	0.000	0.000	0.000	46.550	-	46.550	53.160	51.050	45.530	11.930	Continuing	Continuing
3261: *TAGOS Design & Total Ship Integration*	0.000	7.050	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	7.050
3377: *T-ATS Ship Concept Development*	4.587	0.000	0.393	0.893	-	0.893	0.000	0.000	0.000	0.000	0.000	5.873
3389: *OPLOG IPT Development*	12.510	0.000	12.955	21.641	-	21.641	22.320	24.494	9.687	9.880	Continuing	Continuing
9999: *Congressional Adds*	0.000	11.319	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	11.319

Note

Project 0411 (Future Surface Combatant Concept Development) is a new start in FY 2020.

A. Mission Description and Budget Item Justification

0411 - The Navy's Large Surface Combatant (LSC) Program is a new ship evolutionary acquisition program essential to the Future Surface Combatant Force. The purpose of the program is to initially integrate non-developmental systems into a new hull design that incorporates platform flexibility and growth capabilities to meet projected future Fleet system requirements. Initial LSCs will leverage DDG 51 Flight III combat systems as well as increased flexibility/adaptability features including expanded Space, Weight, Power & Cooling Service Life Allowances (SWaP-C SLA) to allow for more rapid and affordable upgrades in capabilities over the ships' service life and allow for fielding of future high demand electric weapons and sensor systems and computing resources. The ability of the ship's Vertical Launch System to accommodate longer and larger diameter missiles for increased speed and range of weapons, additional capacity for an embarked warfare commander and staff, support for 360-degree coverage with Directed Energy weapons, and improved signatures with support for additional improvements over time. The new ships will be designed to provide these initial capability increases as well as the growth capacity to support projected future systems requirements. The design will also incorporate flexibility features to quickly back-fit and forward-fit systems to pace known threats and meet future emergent needs through evolutionary block upgrades and modernization.

3261 - T-AGOS Design & Total Ship Integration - Ocean surveillance ships gather underwater acoustical data to support the mission of the Integrated Undersea Surveillance System by providing a ship platform capable of theater anti-submarine acoustic passive and active surveillance. Auxiliary General Ocean Surveillance Ships (T-AGOS) are operated by Military Sealift Command to support the anti-submarine warfare mission of the commanders of the Atlantic and Pacific Fleets. The two current classes of surveillance ships use surveillance towed-array sensor system (SURTASS) equipment to gather undersea acoustic data. The ships also carry electronic equipment to process and transmit that data via satellite to shore stations for evaluation. Funding will support recapitalization of the four SWATH (T-19 Class) and one SWATH (T-23 Class) Auxiliary General Ocean Surveillance ships (T-AGOS). Funding in FY19 and later was transferred to PE 0204313N (Ship-Towed Array Surveillance Systems).

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0603564N *I Ship Prel Design & Feasibility Studies*

3377 - The Navy requires ocean-going towing, salvage, and rescue capabilities to support Fleet operations. The Navy's current capabilities are provided by four T-ATF 166 class Fleet Tugs and four T-ARS 50 class Salvage ships which reach the end of their expected service lives starting in 2020 and 2025, respectively.

The T-ATF Fleet Tugs perform towing at sea, salvage, and diving operations; act as a support ship for portable deep-diving equipment and submarine rescue operations; provide fire-fighting assistance; and perform oil spill pollution abatement. The T-ARS Salvage Ships perform combat salvage, lifting, emergency repair, and rescue towing of combatant or support ships damaged, stranded, scuttled, distressed, or abandoned at sea to repair yards or safe havens. The T-ATS program will recapitalize the current Fleet Tugs and Salvage Ships with a common hull Towing, Salvage and Rescue Ship (T-ATS) that is capable of performing the missions of the retiring T-ATF and T-ARS classes.

3389 - Naval Operational Logistics (OPLOG) Integration IPT Development - Develops enabling technologies for future and in-service afloat operational logistics and integrated supply force and combatant logistics requirements; and conducts cooperative initiatives with acquisition programs, program sponsors, engineering managers, the Navy science and technology community and Fleet customers. OPLOG develops integrated, cross-platform (i.e. applicable to more than one ship class/type) operational logistics and energy conservation technologies and capabilities as well as draft acquisition and operations policy ensuring future Naval systems leverage emerging logistic capabilities and technologies to provide operationally effective and energy efficient logistics delivery.

9999 - (Congressional Add Proj C404)- Continues efforts in FY2018 previously financed under the National Defense Sealift Fund (NDSF) PE0408042N Project 3117 OPLOG IPT Development in FY2016 and prior and PE0603564N Project 3389 OPLOG IPT Development in FY2017 to develop enabling technologies for future and in-service afloat operational logistics and integrated supply force and combatant logistics requirements.

B. Program Change Summary ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	12.012	13.348	22.534	-	22.534
Current President's Budget	18.369	13.348	69.084	-	69.084
Total Adjustments	6.357	0.000	46.550	-	46.550
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-4.592	0.000			
• SBIR/STTR Transfer	-0.780	0.000			
• Program Adjustments	0.000	0.000	46.550	-	46.550
• Rate/Misc Adjustments	0.000	0.000	0.000	-	0.000
• Congressional Add Adjustments	11.729	-	-	-	-

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0603564N *I Ship Prel Design & Feasibility Studies*

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2018	FY 2019
Project: 9999: *Congressional Adds*		
Congressional Add: *Naval Operational Logistics Integration*	11.319	0.000
Congressional Add Subtotals for Project: 9999	11.319	0.000
Congressional Add Totals for all Projects	11.319	0.000

Change Summary Explanation

The FY 2018 budget changes are due to an increase from the congressional transfer of $11.729 million from NDSF to RDTEN and a reprogramming reduction of $4.592 million to fund higher priority Navy requirements.

The FY 2020 increase is in support of the Large Surface Combatant design and development.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603564N / *Ship Prel Design & Feasibility Studies*	Project (Number/Name) 0411 / *Future Surface Combatant Concept Development*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
0411: *Future Surface Combatant Concept Development*	0.000	0.000	0.000	46.550	-	46.550	53.160	51.050	45.530	11.930	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Note

Project 0411, Future Surface Combatant Concept Development, is a new start in FY 2020.

A. Mission Description and Budget Item Justification

The Navy's Large Surface Combatant (LSC) Program is a new ship evolutionary acquisition program essential to the Future Surface Combatant Force. The purpose of the program is to initially integrate non-developmental systems into a new hull design that incorporates platform flexibility and growth capabilities to meet projected future Fleet system requirements. Initial LSCs will leverage DDG 51 Flight III combat systems as well as increased flexibility/adaptability features including expanded Space, Weight, Power & Cooling Service Life Allowances (SWaP-C SLA) to allow for more rapid and affordable upgrades in capabilities over the ships' service life and allow for fielding of future high demand electric weapons and sensor systems and computing resources. The ability of the ship's Vertical Launch System to accommodate longer and larger diameter missiles for increased speed and range of weapons, additional capacity for an embarked warfare commander and staff, support for 360-degree coverage with Directed Energy weapons, and improved signatures with support for additional improvements over time. The new ships will be designed to provide these initial capability increases as well as the growth capacity to support projected future systems requirements. The design will also incorporate flexibility features to quickly back-fit and forward-fit systems to pace known threats and meet future emergent needs through evolutionary block upgrades and modernization.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Large Surface Combatant Design Studies and Analysis	0.000	0.000	46.550	0.000	46.550
Articles:	-	-	-	-	-
Description: Beginning in FY 2020, this project will continue the efforts started under PE 0603563N PU 2196 Ship Concept Advanced Design. Prior to FY 2020, the Large Surface Combatant (LSC) program will have released requests for Information (RFI) to the shipbuilding industry and the supplier industry to collect product and process information to support the design effort as well as solicit input on acquisition and competition strategies that will optimally involve industry in the design effort and lead to a seamless RFP release and Detailed Design Contract award.					
FY 2019 Plans: N/A					
FY 2020 Base Plans:					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603564N / *Ship Prel Design & Feasibility Studies*	**Project (Number/Name)** 0411 / *Future Surface Combatant Concept Development*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
In FY 2020, the LSC program office will conduct additional concept refinement Preliminary Design Phase 1 culminating in a System Requirements Review in Q4FY20. Set Based Design will be utilized during this phase of design to narrow subsystem trade space, refine and allocate draft Capabilities Development Document (CDD) requirements, develop a draft ship Concept of Operations (CONOPS), and ultimately develop an Initial Ship Baseline design as a starting point for Preliminary Design Phase 2 (PDD2). PDD2 will begin in Q4FY20 with the primary goal of refining the Initial Baseline into a Ship Functional Baseline. Key activities during this phase of design are down select of major ship systems and subsystems (including hull form and power and propulsion system), hull form scale model testing, development of draft ship specifications and validation of CDD performance objectives. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** The FY 2020 increase is in support of the Large Surface Combatant design and development.					
Accomplishments/Planned Programs Subtotals	0.000	0.000	46.550	0.000	46.550

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• RDTEN/0603563N/2196: *Ship Concept Advanced Design*	4.309	22.451	33.595	-	33.595	22.400	6.923	6.898	7.234	Continuing	Continuing

Remarks

D. Acquisition Strategy

The Navy envisions an evolutionary acquisition strategy for LSC utilizing a flexible, adaptable HM&E design coupled with open architecture mission systems that will allow for affordable block buys utilizing the most up to date mission systems available at the time of acquisition. The initial block of LSCs will utilize the DDG 51 Flight III Combat System with additional capabilities as described above. The schedule for LSC Block 1 continues Concept Refinement until 3QFY20 at which point Preliminary Design will commence. Contract Design, with primary objectives of development of an Allocated Baseline and development of a ship specification and selected procurement specifications will follow Preliminary Design. While the design for Block 1 is ongoing there will be aligned activity to work feasibility studies and concept refinement and technology maturation for block 2. The design activities would be low level of effort initially and start ramping up as block 1 goes into Detail Design. The block 1 and block 2 efforts would be closely aligned to ensure consistency and seamless handover from block 1 to block 2 design.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603564N / *Ship Prel Design & Feasibility Studies*	**Project (Number/Name)** 0411 / *Future Surface Combatant Concept Development*

E. Performance Metrics

Quarterly Program Reviews with Industry Partners

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603564N / *Ship Prel Design & Feasibility Studies*	**Project (Number/Name)** 0411 / *Future Surface Combatant Concept Development*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Sytems Engineering	Various	Various : Various	0.000	0.000		0.000		46.550	Dec 2019	-		46.550	Continuing	Continuing	Continuing
		Subtotal	0.000	0.000		0.000		46.550		-		46.550	Continuing	Continuing	N/A

Remarks

In FY 2020, the large surface combatant program will build a national team of design agents, shipbuilders, and system integrators through open competition using competitive contract vehicles.

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	0.000		0.000		46.550		-		46.550	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603564N / *Ship Prel Design & Feasibility Studies*	**Project (Number/Name)** 0411 / *Future Surface Combatant Concept Development*

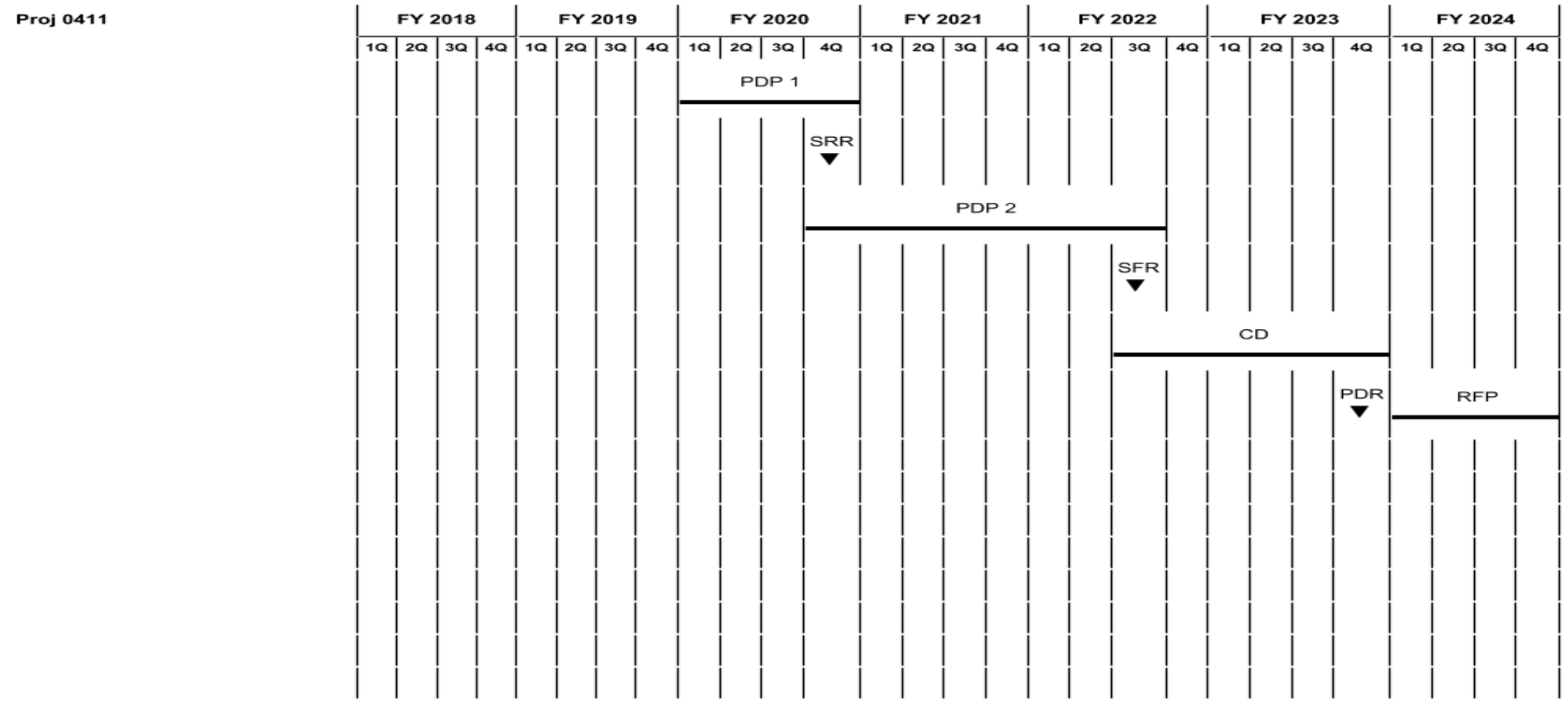


Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603564N / *Ship Prel Design & Feasibility Studies*	**Project (Number/Name)** 0411 / *Future Surface Combatant Concept Development*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 0411				
Preliminary Design Phase 1	1	2020	4	2020
System Requirements Review	4	2020	4	2020
Preliminary Design Phase 2	4	2020	3	2022
System Functional Review	3	2022	3	2022
Contract Design	3	2022	4	2023
Preliminary Design Review	4	2023	4	2023
Request for Proposal	1	2024	4	2024

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603564N / *Ship Prel Design & Feasibility Studies*	Project (Number/Name) 3261 / *TAGOS Design & Total Ship Integration*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
3261: *TAGOS Design & Total Ship Integration*	0.000	7.050	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	7.050
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Note

Funding for FY 2019 to FY 2022 was transferred to Ship-towed Array Surveillance Systems (PE 0204313N).

A. Mission Description and Budget Item Justification

T-AGOS Design & Total Ship Integration - Ocean surveillance ships gather underwater acoustical data to support the mission of the Integrated Undersea Surveillance System by providing a ship platform capable of theater anti-submarine acoustic passive and active surveillance. Auxiliary General Ocean Surveillance Ships (T-AGOS) are operated by Military Sealift Command to support the anti-submarine warfare mission of the commanders of the Atlantic and Pacific Fleets. The two current classes of surveillance ships use surveillance towed-array sensor system (SURTASS) equipment to gather undersea acoustic data. The ships also carry electronic equipment to process and transmit that data via satellite to shore stations for evaluation. Funding will support recapitalization of the four SWATH (T-19 Class) and one SWATH (T-23 Class) Auxiliary General Ocean Surveillance ships (T-AGOS).

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: T-AGOS Design & Total Ship Integration	7.050	0.000	0.000	0.000	0.000
Articles:	-	-	-	-	-
FY 2019 Plans: Funding for FY 2019 to FY 2022 was transferred to Ship-towed Array Surveillance Systems (PE 0204313N).					
FY 2020 Base Plans: N/A					
FY 2020 OCO Plans: N/A					
Accomplishments/Planned Programs Subtotals	7.050	0.000	0.000	0.000	0.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603564N / *Ship Prel Design & Feasibility Studies*	**Project (Number/Name)** 3261 / *TAGOS Design & Total Ship Integration*

D. Acquisition Strategy

Develop CDD, conduct trade studies and Pre-Preliminary Design in FY18. Issue RFP for Industry Studies for award of multiple contracts in FY19 to participate in Navy-led Preliminary/Contract Design (PD/CD) efforts. Complete Navy-led PD/CD efforts in FY21in order to issue Detail Design and Construction (DD&C) RFP and award to a single shipbuilder in FY22 for DD&C of a Lead Ship with options for up to four follow-on ships.

E. Performance Metrics

None.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603564N / *Ship Prel Design & Feasibility Studies*	**Project (Number/Name)** 3261 / *TAGOS Design & Total Ship Integration*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Engineering Integration/ Design	Various	Various : Various	0.000	2.243	Feb 2018	0.000		0.000		-		0.000	0.000	2.243	-
Model Testing	Various	Various : Various	0.000	0.000	Jun 2018	0.000		0.000		-		0.000	0.000	0.000	-
SURTASS Integration	Various	various : various	0.000	1.000	Feb 2018	0.000		0.000		-		0.000	0.000	1.000	-
		Subtotal	0.000	3.243		0.000		0.000		-		0.000	0.000	3.243	N/A

Remarks

Funding for FY19 to FY23 was transferred to PE 0204313N.

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
MS documentation prep & RFP Development	Various	Various : Various	0.000	1.300	Feb 2018	0.000		0.000		-		0.000	0.000	1.300	-
Specification & TDP Development	Various	Various : Various	0.000	1.107	Feb 2018	0.000		0.000		-		0.000	0.000	1.107	-
Systems Integration (C4I/ Safety/Risk)	Various	Various : Various	0.000	1.000	Feb 2018	0.000		0.000		-		0.000	0.000	1.000	-
		Subtotal	0.000	3.407		0.000		0.000		-		0.000	0.000	3.407	N/A

Remarks

Funding for FY19 to FY23 was transferred to PE 0204313N.

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Test and Evaluation Planning	Various	Various : Various	0.000	0.400	Feb 2018	0.000		0.000		-		0.000	0.000	0.400	-
		Subtotal	0.000	0.400		0.000		0.000		-		0.000	0.000	0.400	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603564N / *Ship Prel Design & Feasibility Studies*	Project (Number/Name) 3261 / *TAGOS Design & Total Ship Integration*	

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Remarks															
Funding for FY19 to FY23 was transferred to PE 0204313N.															

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	7.050		0.000		0.000		-		0.000	0.000	7.050	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603564N / *Ship Prel Design & Feasibility Studies*	**Project (Number/Name)** 3261 / *TAGOS Design & Total Ship Integration*

T-AGOS Design & Total Ship Integration

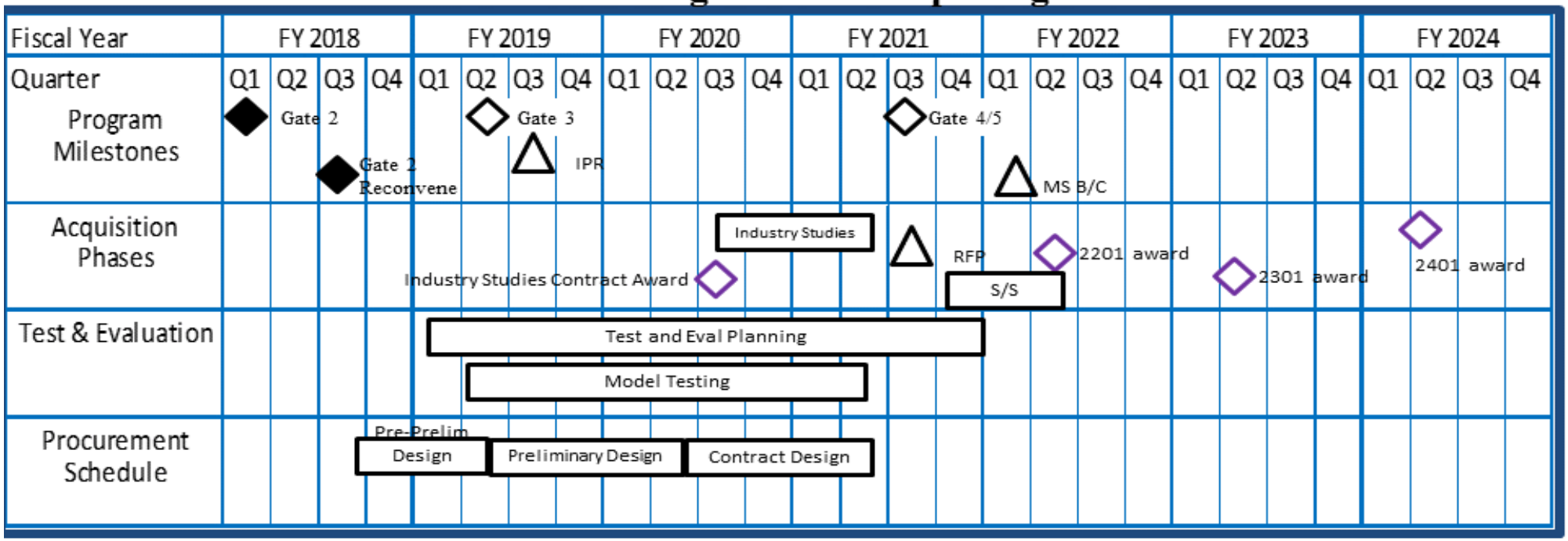


Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603564N / *Ship Prel Design & Feasibility Studies*	**Project (Number/Name)** 3261 / *TAGOS Design & Total Ship Integration*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 3261				
Gate 3	2	2019	2	2019
Milestone B/C	1	2022	1	2022
DD&C Award	2	2022	2	2022

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603564N / *Ship Prel Design & Feasibility Studies*	Project (Number/Name) 3377 / *T-ATS Ship Concept Development*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
3377: *T-ATS Ship Concept Development*	4.587	0.000	0.393	0.893	-	0.893	0.000	0.000	0.000	0.000	0.000	5.873
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

T-ATS Design - Recapitalizes the existing T-ATF 166 Fleet Tug and T-ARS 50 Salvage Ship Classes with a common hull Towing, Salvage and Rescue Ship (T-ATS) to support Fleet operations. The T-ATF Fleet Tugs perform towing at sea, salvage, and diving operations; act as a support ship for portable deep-diving equipment and submarine rescue operations; provide fire-fighting assistance; and perform oil spill pollution abatement. The T-ARS Salvage Ships perform combat salvage, lifting, emergency repair, and rescue towing of combatant or support ships damaged, stranded, scuttled, distressed, or abandoned at sea to repair yards or safe havens. Funding supports Ship Concept Development and Test & Evaluation (T&E) for future tug, salvage, and rescue mission capabilities.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Ship Concept Development	0.000	0.393	0.893	0.000	0.893
Articles:	-	-	-	-	-
Description: Ship Concept Development and Test & Evaluation (T&E) for future tug, salvage, and rescue mission capabilities.					
FY 2019 Plans: Support the execution of Test and Evaluation Phase Developmental Test (DT) schedule per the Test and Evaluation Master Plan (TEMP)and cybersecurity testing. Coordinate efforts with NAVSEA, Military Sealift Command (MSC), PEO Ships, Operational Test and Evaluation Force (OPTEVFOR) , Joint Interoperability Test Command (JITC) and OSD Director of Operational Test & Evaluation (ODT&E).					
FY 2020 Base Plans: Support the execution of Test and Evaluation Phase Developmental Test (DT) schedule per the Test and Evaluation Master Plan (TEMP). Operational Test and Evaluation Force (OPTEVFOR) , Joint Interoperability Test Command (JITC) and OSD Director of Operational Test & Evaluation (ODT&E).					
FY 2020 OCO Plans: N/A					
FY 2019 to FY 2020 Increase/Decrease Statement:					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603564N / *Ship Prel Design & Feasibility Studies*	**Project (Number/Name)** 3377 / *T-ATS Ship Concept Development*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
FY18 increase on Project Unit 3377 due to T&E schedule (starts FY18 4Q and continues in FY19).					
Accomplishments/Planned Programs Subtotals	0.000	0.393	0.893	0.000	0.893

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• SCN/5035: *Towing, Salvage and Rescue Ship (T-ATS)*	76.204	80.517	150.282	-	150.282	77.893	79.237	80.469	0.000	0.000	619.602

Remarks

D. Acquisition Strategy

Contract was awarded March 2018 for Lead Hull.

E. Performance Metrics

None.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603564N / *Ship Prel Design & Feasibility Studies*	Project (Number/Name) 3377 / *T-ATS Ship Concept Development*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Engineering Support	Various	NAVAIR/NSWC/ SPAWAR : MD, MD, SC	0.769	0.000		0.000		0.000		-		0.000	0.000	0.769	-
Industry Design Studies	Various	Various : Various	0.679	0.000		0.000		0.000		-		0.000	0.000	0.679	-
		Subtotal	1.448	0.000		0.000		0.000		-		0.000	0.000	1.448	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Milestone Documention Support	C/FFP	CACI : DC	2.041	0.000		0.000		0.000		-		0.000	0.000	2.041	-
RFP and Specification Development	Various	Alion/CACI/ SPAWAR : DC, DC, SC	0.708	0.000		0.000		0.000		-		0.000	0.000	0.708	-
Test & Evaluation Planning	Various	OPTEVFOR, CACI, ALION : VA, DC	0.390	0.000		0.300	Jan 2019	0.350	Dec 2019	-		0.350	0.000	1.040	-
		Subtotal	3.139	0.000		0.300		0.350		-		0.350	0.000	3.789	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Development Test & Evaluation	C/FFP	Various : Various	0.000	0.000		0.093	Jun 2019	0.543	Apr 2020	-		0.543	0.393	1.029	-
		Subtotal	0.000	0.000		0.093		0.543		-		0.543	0.393	1.029	N/A

	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	4.587	0.000		0.393		0.893		-		0.893	0.393	6.266	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603564N / *Ship Prel Design & Feasibility Studies*	Project (Number/Name) 3377 / *T-ATS Ship Concept Development*	

	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603564N / *Ship Prel Design & Feasibility Studies*	**Project (Number/Name)** 3377 / *T-ATS Ship Concept Development*

T-ATS Design & Total Ship Integration

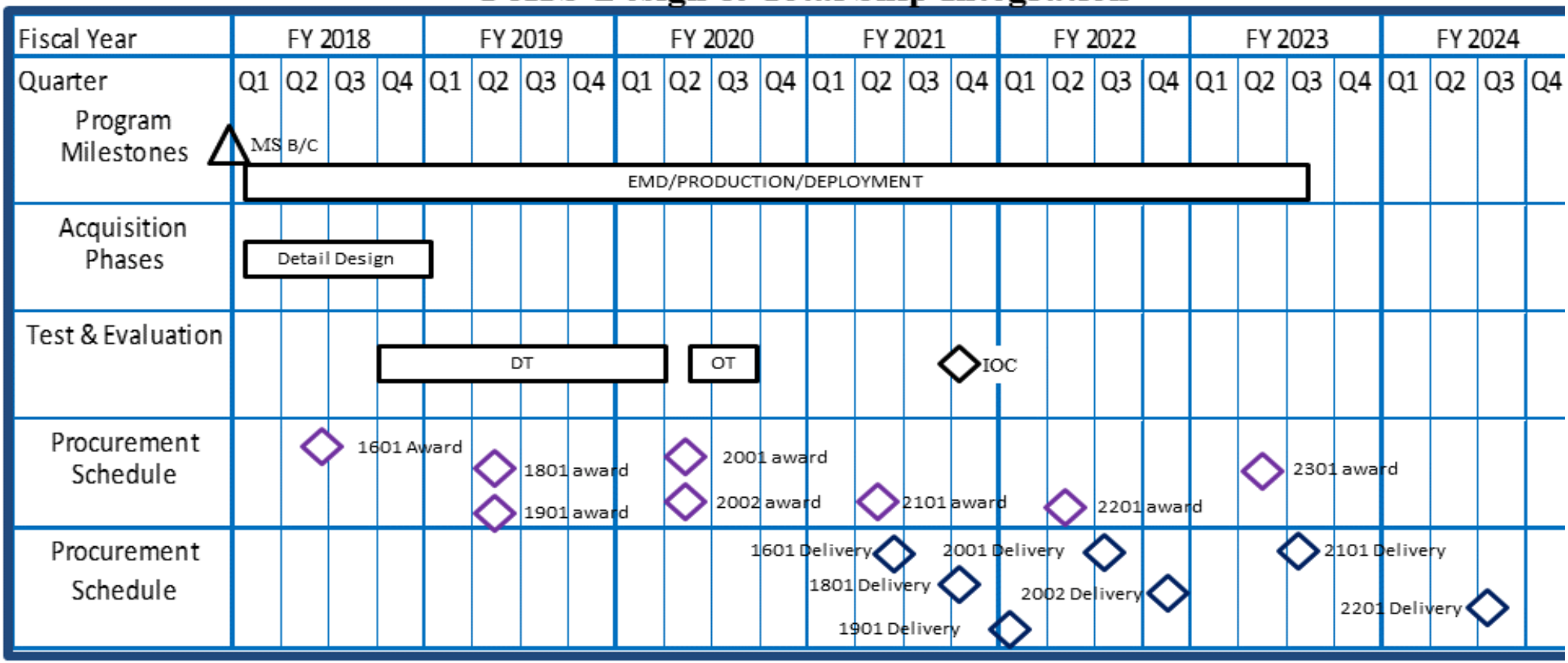


Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603564N / *Ship Prel Design & Feasibility Studies*	**Project (Number/Name)** 3377 / *T-ATS Ship Concept Development*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 3377				
MILESTONE B/C	1	2018	1	2018
DT/OT	4	2018	3	2020
IOC	4	2021	4	2021

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603564N / *Ship Prel Design & Feasibility Studies*	Project (Number/Name) 3389 / *OPLOG IPT Development*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
3389: *OPLOG IPT Development*	12.510	0.000	12.955	21.641	-	21.641	22.320	24.494	9.687	9.880	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Note

FY2016 and prior year efforts were financed under NDSF BA4 PE 0408042N Project 3117 Naval Operational Logistics (OPLOG) Integration. FY2017 is financed under this Program Element (Project 3389). FY2018 financed under Congressional add Project 9999/C404 in this budget.

A. Mission Description and Budget Item Justification

Project 3389 - Develops enabling technologies for future and in-service afloat operational logistics and integrated supply systems; defines integrated combat logistics force and combatant logistics requirements; and conducts cooperative initiatives with acquisition programs, program sponsors, engineering managers, the Navy science and technology community, and Fleet customers. OPLOG develops integrated, cross-platform (i.e. applicable to more than one ship class/type) operational logistics and energy conservation technologies and capabilities as well as draft acquisition and operations policy ensuring future Naval systems leverage emerging logistic capabilities and technologies to provide operationally effective and energy efficient logistics delivery.

Though the operational logistics family of systems touches all aspects of Naval presence and power projection, operational logistics capability and system interfaces typically have been left to individual acquisition programs to develop and resolve. Technology development is necessary to mitigate technological and operational risk before ship acquisition programs accept new technologies. This project provides a foundation for the transition and systems development of science & technology initiatives evolving from the Office of Naval Research (ONR) Power & Energy Future Naval Capabilities (FNC), Enterprise and Platform Enablers FNC, Seabasing FNC, and from other enabling Government, industry and academia concepts to the acquisition community. Thus, this project resources continued research and development of appropriate technologies with applicability to multiple acquisition programs and defines and matures performance and interface requirements for those technologies. This project continues to identify, develop, integrate, demonstrate, and transition logistics technologies to improve the cost effectiveness of Fleet at sea logistics delivery through outreach, coordination and collaboration with industry, academia, Fleet, and Enterprise representatives.

This project will continue to develop improved shipboard replenishment, transfer, and handling systems and components as well as asset visibility and standardized packaging technologies. This project includes development of approaches to reduce operation and maintenance costs of, and energy consumption by the logistics Fleet. This integrated suite of developed capabilities will enable multiple ship types to leverage common technologies common across DoD (Joint) and commercial transportation networks providing a more affordable, energy efficient, mission capable force. These capabilities and system-of-systems approach will be applied to concept development of future auxiliary force
architectures.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Advanced Systems	0.000	9.250	17.475	0.000	17.475

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603564N / *Ship Prel Design & Feasibility Studies*	**Project (Number/Name)** 3389 / *OPLOG IPT Development*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Articles:	-	-	-	-	-
FY 2019 Plans: Continue advanced refueling system R&D to include: Complete SeaBased Petroleum Distribution System (SPDS) concept development (which began in FY18 utilizing PROJ C404 Congressional Add funds in this budget)and begin prototype development; begin Joint Offshore Fuel Farm (JOFF) concept development; continue Consolidated (CONSOL) tanker modular adapter kit detailed design and prototype development; and continue improved Modular Fuel Distribution System (iMFDS) preliminary design and Computer Aided Design (CAD) modeling. ***FY 2020 Base Plans:*** Continue advanced refueling system R&D to include: Complete SPDS prototype development and begin demonstrations, test and evaluations; complete JOFF concept development and begin prototype development; continue CONSOL tanker modular adapter kit test, evaluation, and demonstrations; and continue iMFDS detailed design and prototype development. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** The $8.225M increase from FY19 to FY20 is to procure additional hardware for JOFF prototype development and to procure/lease additional hardware for SPDS prototype test, evaluation, and demonstrations. It should be noted only the SPDS prototype development occurs in FY19, but both SPDS and JOFF prototype development occurs in FY20 along with the addition of the SPDS T&E.					
Title: Logistics Architectures	0.000	0.050	0.050	0.000	0.050
Articles:	-	-	-	-	-
FY 2019 Plans: Conduct combat logistics force data collection and operational studies. ***FY 2020 Base Plans:*** Conduct combat logistics force data collection and operational studies. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:***					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603564N / *Ship Prel Design & Feasibility Studies*	**Project (Number/Name)** 3389 / *OPLOG IPT Development*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
No increase/decrease of funding					
Title: Shipboard Energy Conservation (E-STREAM) ***Articles:*** ***FY 2019 Plans:*** Continue energy management approach improvements including efficient ESTREAM system and components. Data package development and prototype purchase, installations, and testing for energy initiatives efficient shipboard replenishment at sea (RAS) Hybrid E-STREAM planned for FY 2019. ***FY 2020 Base Plans:*** Continue and complete Data package development for Navy Standard Transmission Replacement (NSTR) and E-RAS. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Decrease of $2.3M from FY19 to FY20 reflects the completion of testing for energy initiatives efficient shipboard replenishment at sea (RAS) Hybrid E-STREAM.	0.000 -	3.100 -	0.800 -	0.000 -	0.800 -
Title: Shipboard Energy Conservation (Other) ***Articles:*** ***FY 2019 Plans:*** Continue limited operational energy and total ownership cost reduction initiatives to include: partial testing of adjustable speed drive (ASD) shipboard integration; holistic biofouling control hull evaluations. ***FY 2020 Base Plans:*** Continue operational energy and total ownership cost reduction initiatives from FY17, FY18, and FY19 to include: ASD and VFD pump integration development; Holistic biofouling reduction development and evaluations; mission and efficient route planning with improved energy command and control development; variable refrigerant flow and chiller improvement; new class intelligent HVAC development; shipboard energy audit, fuel/shorepower meter work package development; shorepower cost management development. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:***	0.000 -	0.205 -	2.916 -	0.000 -	2.916 -

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603564N / *Ship Prel Design & Feasibility Studies*	**Project (Number/Name)** 3389 / *OPLOG IPT Development*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
The increase in FY20 is to continue the shipboard energy conservation and cost reduction initiatives that started in FY17/FY18 but were realigned in FY19 due to the priority of SeaBased Petroleum Distribution System development to meet critical COCOM Over-The-Shore fueling requirements and replace capability provided by SS Petersburg that is retiring.					
Title: Shipboard Material Transport ***Articles:*** ***FY 2019 Plans:*** Develop prototype Lithium Ion Battery storage and charging technologies for Combat Logistics Force (CLF) ships ***FY 2020 Base Plans:*** Develop and test prototype Lithium Ion Battery storage and charging technologies for Combat Logistics Force (CLF) ships ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** No significant changes from FY19 to FY20	0.000 -	0.350 -	0.400 -	0.000 -	0.400 -
Accomplishments/Planned Programs Subtotals	0.000	12.955	21.641	0.000	21.641

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Not applicable for OPLOG R&D efforts

E. Performance Metrics

Annual Program Review

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603564N / *Ship Prel Design & Feasibility Studies*	**Project (Number/Name)** 3389 / *OPLOG IPT Development*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Primary Hardware Development	Various	VARIOUS : Various	2.650	0.000		5.357	Jan 2019	9.357	Jan 2020	-		9.357	Continuing	Continuing	Continuing
Ancillary Hardware Development	Various	VARIOUS : Various	1.296	0.000		1.500	Jan 2019	3.000	Jan 2020	-		3.000	Continuing	Continuing	Continuing
Ship Integration	Various	VAROUS : Various	1.200	0.000		0.600	Jan 2019	0.900	Jan 2020	-		0.900	Continuing	Continuing	Continuing
Ship Suitability	Various	VARIOUS : Various	0.750	0.000		0.500	Jan 2019	1.000	Jan 2020	-		1.000	Continuing	Continuing	Continuing
System Engineering	Various	VARIOUS : Various	1.250	0.000		0.940	Jan 2019	1.911	Jan 2020	-		1.911	Continuing	Continuing	Continuing
		Subtotal	7.146	0.000		8.897		16.168		-		16.168	Continuing	Continuing	N/A

Remarks

1. Primary Hardware Development, Ancillary Hardware Development and System Engineering is related to the Advanced Systems Joint Offshore Fuel Farm (JOFF) and SeaBased Petroleum Distribution System (SPDS) prototype development.
2. Award dates reflect initial award of incremental execution.

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Development Suport	Various	VARIOUS : Various	0.750	0.000		0.900	Jan 2019	1.000	Jan 2020	-		1.000	Continuing	Continuing	Continuing
Software Development	Various	VARIOUS : Various	0.000	0.000		0.050	Jan 2019	0.100	Jan 2020	-		0.100	Continuing	Continuing	Continuing
Integrated Logistics Support	Various	VARIOUS : Various	0.300	0.000		0.350	Jan 2019	0.350	Jan 2020	-		0.350	Continuing	Continuing	Continuing
Configuration Management	Various	VARIOUS : Various	0.500	0.000		0.400	Jan 2019	1.000	Jan 2020	-		1.000	Continuing	Continuing	Continuing
Technical Data	Various	VAROUS : Various	0.800	0.000		0.600	Jan 2019	0.600	Jan 2020	-		0.600	Continuing	Continuing	Continuing
Studies & Analysis	Various	VARIOUS : Various	0.367	0.000		0.135	Jan 2019	0.250	Jan 2020	-		0.250	Continuing	Continuing	Continuing
		Subtotal	2.717	0.000		2.435		3.300		-		3.300	Continuing	Continuing	N/A

Remarks

1. Award dates reflect initial award of incremental execution.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603564N / *Ship Prel Design & Feasibility Studies*	Project (Number/Name) 3389 / *OPLOG IPT Development*	

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Developmental Test & Evaluation	Various	VARIOUS : Various	1.297	0.000		0.700	Jan 2019	0.950	Jan 2020	-		0.950	Continuing	Continuing	Continuing
Operational Test & Evaluation	Various	VARIOUS : Various	1.000	0.000		0.573	Jan 2019	0.823	Jan 2020	-		0.823	Continuing	Continuing	Continuing
		Subtotal	2.297	0.000		1.273		1.773		-		1.773	Continuing	Continuing	N/A

Remarks

1. DT&E and OT&E cost are related to prototype test and demonstration for Advanced Systems Joint Offshore Fuel Farm (JOFF) and SeaBased Petroleum Distribution System (SPDS).
2. Award dates reflect initial award of incremental execution.

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Contractor Engineering Support	Various	VARIOUS : Various	0.100	0.000		0.100	Jan 2019	0.150	Jan 2020	-		0.150	Continuing	Continuing	Continuing
Government Engineering Support	Various	VARIOUS : Various	0.250	0.000		0.250	Jan 2019	0.250	Jan 2020	-		0.250	Continuing	Continuing	Continuing
		Subtotal	0.350	0.000		0.350		0.400		-		0.400	Continuing	Continuing	N/A

Remarks

Award dates reflect initial award of incremental execution.

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	12.510	0.000		12.955		21.641		-		21.641	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603564N / *Ship Prel Design & Feasibility Studies*	**Project (Number/Name)** 3389 / *OPLOG IPT Development*

Appropriation/Budget Activity	R-1 Program Element (Number/Name)	Project (Number/Name)
13119: Research, Development, Test & Evaluation, Navy BA 04: Advanced Component Development & Prototypes (ACD&P)	PE 0603564N, Ship Preliminary Design & Feasibility Studies	Project 3389 OPLOG IPT development

Note: FY16 and Prior, Project 3889 was funded in PE 0408042N / *National Defense Sealift Fund* under Project 3117 OPLOG IPT development.

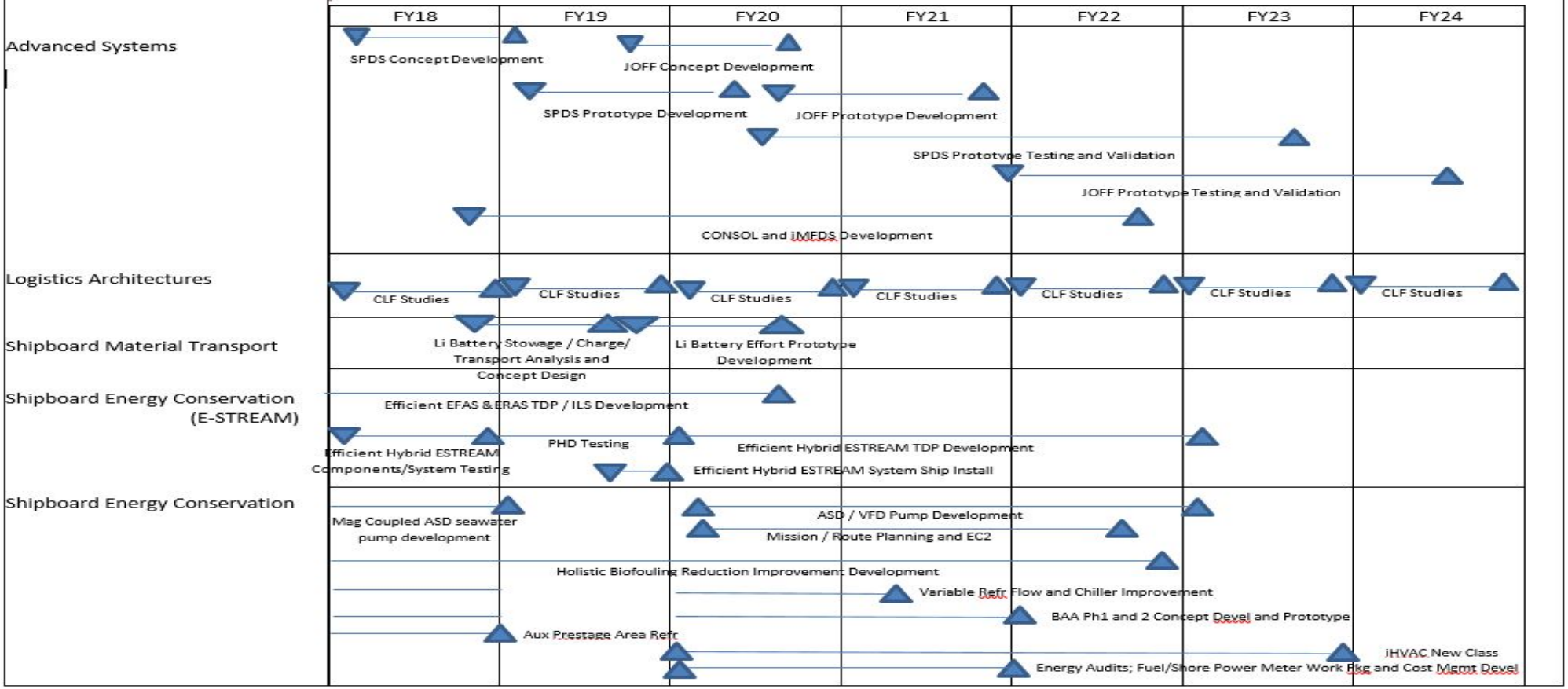


Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603564N / *Ship Prel Design & Feasibility Studies*	**Project (Number/Name)** 3389 / *OPLOG IPT Development*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 3389				
Advanced Systems	1	2018	4	2024
Logistics Architectures	1	2018	4	2024
Shipboard Energy Conservation (E-STREAM)	1	2018	4	2020
Shipboard Energy Conservation (Other)	1	2018	4	2023
Shipboard Material Transport	1	2018	4	2024

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603564N / *Ship Prel Design & Feasibility Studies*	Project (Number/Name) 9999 / *Congressional Adds*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
9999: *Congressional Adds*	0.000	11.319	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	11.319
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Note

Project C404 for execution

A. Mission Description and Budget Item Justification

Project C404 funds efforts previously funded under NDSF PE0408042N Project 3117 OPLOG IPT Development for FY2016 and prior and PE0603564N Project 3389 OPLOG IPT Development in FY2017 to develop enabling technologies for future and in-service afloat operational logistics and integrated supply force and combatant logistics requirements.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019
Congressional Add: Naval Operational Logistics Integration	11.319	0.000
FY 2018 Accomplishments: Advanced Systems: Advanced refueling system concept: Start of SeaBased Petroleum Distribution System (SPDS) concept development; start of CONSOL tanker modular adapter kit and improved Modular Fuel Distribution System (iMFDS) concept development. Logistics Architectures: Conducted combat logistics force data collection and operational studies. Shipboard Material Transport: Conducted evaluation of Lithium-Ion battery storage technologies for CLF ships. Shipboard Energy Conservation (E-STREAM): Continued energy management approach improvements including efficient ESTREAM system and components. Continued Data package development and prototype purchase, installations, and testing for energy initiatives efficient shipboard replenishment at sea (RAS) ESTREAM planned for FY 2018. Shipboard Energy Conservation (OTHER): Continued energy management approach improvements including validation of energy savings from implementation of energy conservation measures, identification and evaluation of additional energy conservation concepts, transition of successful energy conservation measures to MSC		

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603564N / *Ship Prel Design & Feasibility Studies*	**Project (Number/Name)** 9999 / *Congressional Adds*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019
and coordination with other Navy energy conservation programs to leverage successful energy reduction approaches. ***FY 2019 Plans:*** N/A		
Congressional Adds Subtotals	11.319	0.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

Program review.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603564N / *Ship Prel Design & Feasibility Studies*	**Project (Number/Name)** 9999 / *Congressional Adds*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Primary Hardware Development	Various	Various : Various	0.000	3.000	May 2018	0.000		0.000		-		0.000	0.000	3.000	-
Ancillary Hardware Development	Various	Various : Various	0.000	1.095	May 2018	0.000		0.000		-		0.000	0.000	1.095	-
Ship Integration	Various	Various : Various	0.000	1.600	May 2018	0.000		0.000		-		0.000	0.000	1.600	-
Ship Suitability	Various	Various : Various	0.000	1.000	May 2018	0.000		0.000		-		0.000	0.000	1.000	-
System Engineering	Various	Various : Various	0.000	1.224	May 2018	0.000		0.000		-		0.000	0.000	1.224	-
		Subtotal	0.000	7.919		0.000		0.000		-		0.000	0.000	7.919	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Development Support	Various	Various : Various	0.000	0.750	May 2018	0.000		0.000		-		0.000	0.000	0.750	-
Software Development	Various	Various : Various	0.000	0.250	May 2018	0.000		0.000		-		0.000	0.000	0.250	-
Integrated Logistics Support	Various	Various : Various	0.000	0.250	May 2018	0.000		0.000		-		0.000	0.000	0.250	-
Configuration Management	Various	Various : Various	0.000	0.400	May 2018	0.000		0.000		-		0.000	0.000	0.400	-
Technical Data	Various	Various : Various	0.000	0.700	May 2018	0.000		0.000		-		0.000	0.000	0.700	-
Studies & Analysis	Various	Various : Various	0.000	0.350	May 2018	0.000		0.000		-		0.000	0.000	0.350	-
		Subtotal	0.000	2.700		0.000		0.000		-		0.000	0.000	2.700	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Development Test & Evaluation	Various	Various : Various	0.000	0.100	May 2018	0.000		0.000		-		0.000	0.000	0.100	-
Operational Test & Evaluation	Various	Various : Various	0.000	0.250	May 2018	0.000		0.000		-		0.000	0.000	0.250	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603564N / *Ship Prel Design & Feasibility Studies*	Project (Number/Name) 9999 / *Congressional Adds*	

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
		Subtotal	0.000	0.350		0.000		0.000		-		0.000	0.000	0.350	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Contractor Engineering Support	Various	Various : Various	0.000	0.100	May 2018	0.000		0.000		-		0.000	0.000	0.100	-
Government Engineering Support	Various	Various : Various	0.000	0.250	May 2018	0.000		0.000		-		0.000	0.000	0.250	-
		Subtotal	0.000	0.350		0.000		0.000		-		0.000	0.000	0.350	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	11.319		0.000		0.000		-		0.000	0.000	11.319	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603564N / *Ship Prel Design & Feasibility Studies*	**Project (Number/Name)** 9999 / *Congressional Adds*

Exhibit R-4, RDT&E Schedule Profile: BES 2020 Navy		Date: September 2018
Appropriation/Budget Activity 13119: Research, Development, Test & Evaluation, Navy BA 04: Advanced Component Development & Prototypes (ACD&P)	**R-1 Program Element (Number/Name)** PE 0603564N, Ship Preliminary Design & Feasibility Studies	**Project (Number/Name)** Project 9999 Congressional Adds (OPLOG)

Note: FY16 and Prior, Project 3889 was funded in PE 0408042N / *National Defense Sealift Fund* under Project 3117 OPLOG IPT development.

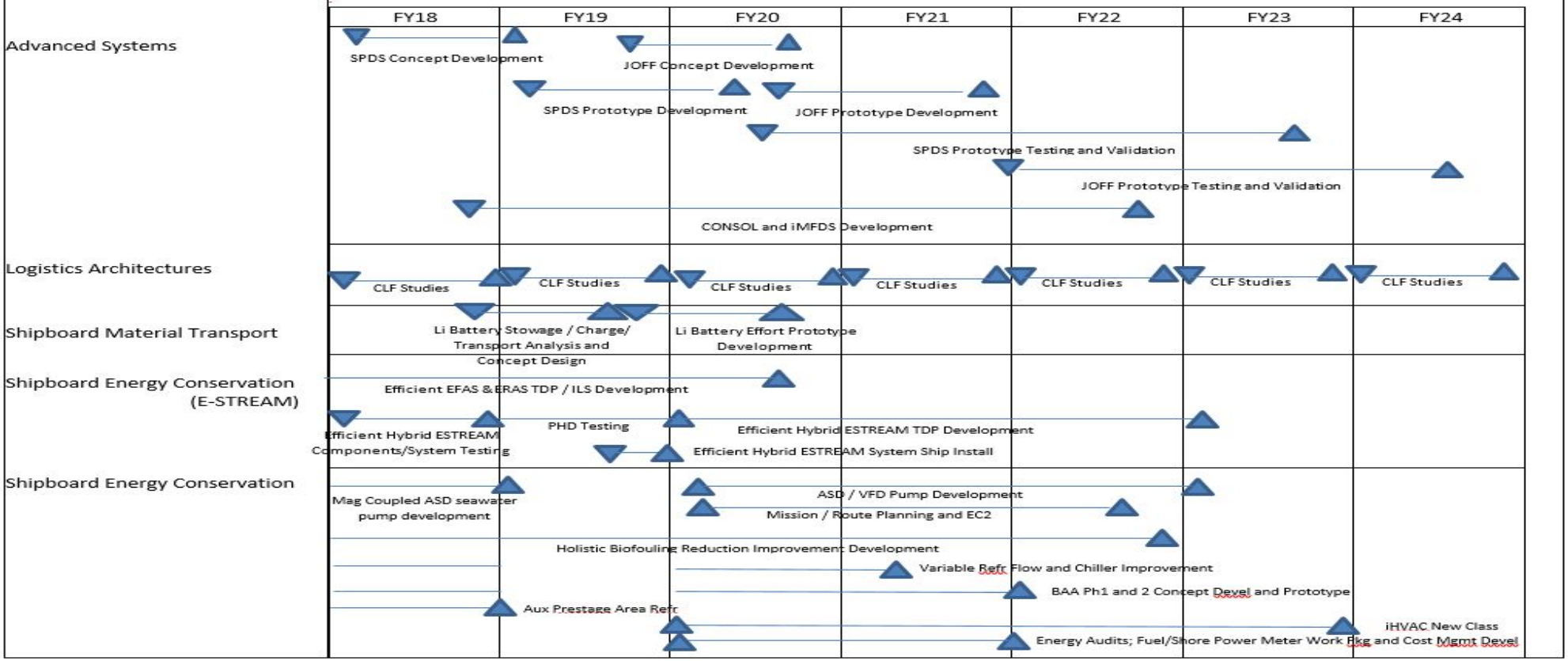


Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603564N / *Ship Prel Design & Feasibility Studies*	**Project (Number/Name)** 9999 / *Congressional Adds*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 9999				
Advanced Systems	1	2018	4	2018
Logistics Architectures	1	2018	4	2018
Shipboard Material Transport	1	2018	4	2018
Shipboard Energy Conservation (E-STREAM)	1	2018	4	2018
Shipboard Energy Conservation (Other)	1	2018	4	2018

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy											Date: March 2019	
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0603573N *I Advanced Surface Machinery Sys*							
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
Total Program Element	221.748	22.406	27.109	25.408	-	25.408	42.825	31.709	24.465	24.292	Continuing	Continuing
2471: *Integrated Power Systems (IPS)*	221.748	22.406	22.109	25.408	-	25.408	42.825	31.709	24.465	24.292	Continuing	Continuing
9999: *Congressional Adds*	0.000	0.000	5.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	5.000

A. Mission Description and Budget Item Justification

The FY 2020 funding request was reduced by $2.086 million to account for the availability of prior year execution balances.

This Program Element (PE) includes the development of advanced surface ship Hull, Mechanical, and Electrical (HM&E) components and systems for all future ships and back-fit ships where appropriate as well as development of Cybersecurity protections for HM&E systems, previously referred to as Boundary Defense Capabilities, now called Situational Awareness, Boundary Enforcement & Response (SABER) for HM&E systems. This PE is managed by PMS 320, the Electric Ships Office, located organizationally within PEO SHIPS, responsible for developing Naval Power and Energy Systems that focus power system integration of Directed Energy (DE) and other high powered mission systems as well as platform integration and improving energy efficiency of those components and systems. The mission of PMS 320 is to develop and provide smaller, simpler, more affordable and more capable electric power systems for all Navy platforms, focus Navy and industry investments, and reduce total ownership cost. PEO Ships AM manages the SABER effort, responsible for protecting HM&E systems from cyber-attacks.

This PE serves as the bridge between Science and Technology (S&T) and ship platform and mission systems acquisition programs by identifying prospective applications for S&T research, advanced development, and performing additional product development and qualification when necessary to meet platform or mission system requirements. This PE also includes the HM&E cybersecurity SABER development. The HM&E systems to be protected from cyber-attack by SABER include Machinery Control Systems, steering control systems, Electric Power Systems, Damage Control and Firefighting, Auxiliary Machinery and Fluid Systems, Engines and Power Transmission Systems, Gas Turbine Systems, Video Systems, as well as other HM&E systems. SABER will allow the ship to better protect, detect, respond, and recover itself from a cyber-attack.

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0603573N *I Advanced Surface Machinery Sys*

B. Program Change Summary ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	29.953	22.109	21.251	-	21.251
Current President's Budget	22.406	27.109	25.408	-	25.408
Total Adjustments	-7.547	5.000	4.157	-	4.157
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	5.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.458	0.000			
• Program Adjustments	0.000	0.000	4.299	-	4.299
• Rate/Misc Adjustments	0.000	0.000	-0.142	-	-0.142
• Congressional Directed Reductions Adjustments	-7.089	-	-	-	-

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2018	FY 2019
Project: 9999: *Congressional Adds*		
Congressional Add: *Silicon Carbide Power Modules*	0.000	5.000
Congressional Add Subtotals for Project: 9999	0.000	5.000
Congressional Add Totals for all Projects	0.000	5.000

Change Summary Explanation

The FY 2020 funding request was reduced by $2.086 million to account for the availability of prior year execution balances.

The increase in PU 2471, Integrated Power Systems, from FY 2019 to FY 2020 is to support development of the modular scalable multi-purpose Energy Magazine which enables new shipboard pulsed, high power directed energy weapons (lasers) and sensors.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603573N / *Advanced Surface Machinery Sys*	Project (Number/Name) 2471 / *Integrated Power Systems (IPS)*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
2471: *Integrated Power Systems (IPS)*	221.748	22.406	22.109	25.408	-	25.408	42.825	31.709	24.465	24.292	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This project supports the development and transition of Naval Power and Energy Systems including power generation, power conversion, power distribution, energy storage, power utilization and automation and control functions for fully integrated electric propulsion (such as T-AKE -1 class or DDG 1000 class), hybrid electric propulsion (such as LHD 8 and LHA(R) class), as well as legacy mechanical propulsion ships (such as DDG51 class). This project supports optimized integration of Directed Energy (DE) and other high powered mission systems, appropriate component and system controls, integration of components and systems into future and current ships, and providing power and energy system solution alternatives to new and existing platforms. Existing ships' power systems require optimized integration via energy storage and advanced controls techniques to withstand the effects of DE and other high powered mission systems and avoid negative impacts to power generating equipment (diesel/gas turbine engines and generators).

Project developments are aligned with the Navy's 30 year shipbuilding plan via the Naval Power and Energy Systems Technology Development Roadmap (TDR), which outlines the way ahead for future developments and provides a basis for coordinated planning and investment by the Navy and private industry.

This project develops and transitions products that electrically integrate and provide power to mission systems, integrates those components and systems into ship platforms, increases energy efficiency, and provides cybersecurity capabilities for current in-service Hull, Mechanical and Electrical (HM&E) systems as well as future systems.

The systems developed by this Project are the power and energy foundation of the ships kill chain, and are developed with efficiency requirements as part of total life cycle cost minimization. Efforts within Power and Energy Systems are to design, develop, test and integrate shipboard power systems to incorporate advanced sensors, directed energy and other advanced weapons. Design and testing includes modeling and simulation, as well as land based testing, to reduce risk and demonstrate readiness for shipboard use.

Cybersecurity: Situational Awareness, Boundary Enforcement & Response (SABER) is a joint effort between PEO Ships, NAVSEA 21, PEO Carriers, NAVSEA 05Q (Afloat Cybersecurity Engineering Division), and supported by NSWC Philadelphia Division, to protect shipboard Hull, Mechanical, and Electrical (HM&E) systems from cyber-attacks. SABER will use different sensors to monitor the HM&E network and system communications to detect potential attacks. These sensors will feed information back to the central SABER Rack where Cyber Situational Awareness (SA) software will analyze the communications and produce alerts on any anomalies. SABER will also include Boundary Defense capabilities at points where communications come into the HM&E enclave from other enclaves or functional domains (e.g., Navigation, Combat, C4I, Aviation).

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603573N / *Advanced Surface Machinery Sys*	**Project (Number/Name)** 2471 / *Integrated Power Systems (IPS)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Power and Energy Systems	15.566	13.241	16.457	0.000	16.457
Articles:	-	-	-	-	-
FY 2019 Plans: This PE has pursued an evolutionary energy storage development strategy for surface ships. Prior to FY 2019, this PE has designed, built, and tested the Energy Storage Module (ESM) prototype. Energy Magazine (EM) Prototype: Execute an Engineering Change Proposal (ECP) to update the power electronics and battery cabinets to meet Navy qualification standards for ship installation. Specific FY 2019 efforts include design, ordering Long Lead Time Material (LLTM) as required, and commencing the build of the Energy Magazine (EM) prototype; and, commencing safety testing on redesigned battery modules. Energy Magazine (EM): Develop technical specification, Acquisition Plan (AP) and Request For Proposal (RFP) for FY20 procurement of shipboard modular, scalable, multi-purpose Energy Magazine (EM) based on lessons learned from multiple related projects in energy storage, thermal management, circuit protection and controls. Complete development of EM performance simulation models that capture the behavior of the system, conduct control system analysis, generate detailed interface requirements, and generate test scenarios and sequences. Continue to identify requirements for Advanced Controls in order to take full advantage of the ship's power and energy resources to deliver to the mission systems the power and energy they require when required. Advanced controls configure the system to operate at max efficiency when appropriate and switch to max performance when necessary through three-way communication and control between the machinery control system, mission planning and pulsed high power and energy weapon systems and sensors. In FY 2019, this PE will evaluate and demonstrate the reduction in required energy storage that is achieved through the implementation of control methodologies that optimize the use and delivery of power to the mission loads. Continue to conduct PHIL demonstrations. In FY 2019 PHIL demonstrations will focus on DDG 51 FLT III and future surface combatants with multiple high pulsed power loads; derisking EM, demonstrating advanced electrical architectures, power conversion equipment, and controls for implementation into an Integrated Power and Energy System (IPES).					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603573N / *Advanced Surface Machinery Sys*	**Project (Number/Name)** 2471 / *Integrated Power Systems (IPS)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Conduct feasibility studies, cost based assessments, and begin developing technical and performance specifications for an Integrated Power & Energy System (IPES) in support of future surface combatant power and energy requirements. Identify shared energy storage and advanced controls requirements enabling an affordable, scalable and flexible power system to meet current and future needs. Refine IPES notional architectures and risk assessments through studies and industry engagement. Develop computer component models and commence system level modeling and simulation efforts. Plan for land based testing activities. Advanced Power Generation Modules (APGM): Continue to define performance requirements, explore trade space in next generation compact high power Advanced Power Generation Modules (APGM), develop characterization data used to conduct ship design studies and to establish a benchmark for performance comparison, develop a stand-alone technical description document which describes performance characteristics, evaluate the effect of large pulse loads from future electric weapons on the cycle life of gas turbine engines, and engine capability to respond to such pulse loads without an unacceptable reduction in time between overhaul. Specific FY19 efforts include utilizing previously developed Gas Turbine Generator (GTG) computer based model in a virtual IPES modeling environment with power system models. Further realistic simulations employing scaled APGM models will be run in a ship representative electrical architecture at Sandia National Laboratory to determine system interactions and stability. Advanced Power Conversion Module (APCM): Conduct feasibility studies, Cost Based Assessments, and begin developing performance and technical specifications for next generation compact high power Advanced Power Conversion Module (APCM) incorporating high band gap materials such as silicon carbide. Develop computer component models and commence system level modeling and simulation efforts.					
FY 2020 Base Plans: Increase warfighting capabilities using pulsed high power and energy weapons and sensors (i.e., lasers, advanced radars, etc.) require shipboard energy storage systems to provide a buffer between legacy ship electric distribution systems and the power and energy requirements of new generation weapons and sensors. This PE continues to pursue an evolutionary energy storage development strategy for surface ships. EM prototype: Complete safety testing on the redesigned battery modules. Complete build and commence electrical integration testing of the EM prototype. Support PEO IWS and ONR laser testing. Evaluate performance of the EM prototype and, as applicable, incorporate lessons learned into EM procurement.					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603573N / *Advanced Surface Machinery Sys*	**Project (Number/Name)** 2471 / *Integrated Power Systems (IPS)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Energy Magazine (EM): Following source selection, award Energy Magazine (EM) contracts to up to two (2) vendors to fulfill the need for at least two (2) viable sources of supply for EM with domestic lithium ion batteries and power electronics for shipboard applications. In FY 2020, selected vendors will begin design of a modular, scalable, multi-purpose Energy Magazine (EM); an energy storage system that serves as the energy resource to enable the introduction of pulsed high power and energy weapons and sensor systems. EM simultaneously supports multiple pulsed loads such as laser, electronic warfare, radars, etc. When fully integrated, EM is expected to also reduce the number of Uninterruptable Power Supply (UPS) on ships which decreases maintenance and costs. The EM buffers and protects the ship power system while providing requisite power quality (specific dynamic interfaces (how quickly power/energy is required)) to support directed energy weapons and sensors. As part of EM development, this PE is pursuing a variety of energy storage media and a common interface to these various storage media for ease of interoperability and interchangeability in the future. Examples of energy storage media include advanced batteries (i.e., lithium iron phosphate), capacitors, ultra-capacitors, and flywheels. The EM aligns with PEO IWS plans for development and deployment of shipboard high power directed energy weapons and sensors. Conduct system simulations that focus on EM performance, generate detailed interface requirements, test scenarios and sequences, and incorporate in PHIL demonstration(s). Continue to identify requirements for Advanced Controls in order to take full advantage of power and energy resources within the ship's machinery control system and to deliver mission systems the power and energy they require when required. Advanced controls configure the system to operate at max efficiently when appropriate and switch to max performance when necessary through three-way communication and control between the machinery control system, mission planning and pulsed high power and energy weapon systems and sensors. In FY20 this PE will perform advance control optimization based on impact, availability, and resources with a focus on how to use controls to optimize the amount and cost of energy storage in the system taking into consideration stability and pulse-power support for determining energy storage needs. Continue to conduct PHIL demonstrations. In FY 2020 PHIL demonstrations will focus on a modular scalable multi-purpose Energy Magazine and future surface combatants with multiple high pulsed power loads;					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603573N / *Advanced Surface Machinery Sys*	**Project (Number/Name)** 2471 / *Integrated Power Systems (IPS)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
demonstrating advanced electrical architectures, power conversion equipment, and controls for implementation into an Integrated Power and Energy System (IPES). Continue to conduct feasibility studies, cost based assessments, and develop technical and performance specifications for an Integrated Power & Energy System (IPES) in support of Future Surface Combatant power and energy requirements. Identify shared energy storage and advanced controls requirements enabling an affordable, scalable and flexible power system to meet current and future needs. Refine IPES notional architectures and risk assessments through studies and industry engagement. Draft performance specifications for IPES system, equipment and components. Execute computer component models and system level modeling and simulation efforts. Plan for land based testing activities. This PE will transition ONR Future Naval Capabilities (FNC) products, advanced circuit protection devices and Multi-Functional Energy Storage Module (MFESM). FY 2020 efforts include testing and documentation to transition into EM and APCM. Advanced Power Generation Modules (APGM): Continue to define performance requirements, explore trade space in next generation compact high power Advanced Power Generation Modules (APGM), continue to develop characterization data used to conduct ship design studies and to establish a benchmark for performance comparison, continue to develop a stand-alone technical description document which describes performance characteristics, continue to evaluate the effect of large pulse loads from future electric weapons on the cycle life of gas turbine engines, and engine capability to respond to such pulse loads without an unacceptable reduction in time between overhaul. Advanced Power Conversion Module (APCM): Continue to conduct feasibility studies, Cost Based Assessments, and developing performance and technical specifications for next generation compact high power Advanced Power Conversion Module (APCM) incorporating high band gap materials such as silicon carbide. Continue to develop computer component models and system level modeling and simulation efforts. FY 2020 efforts include evaluating the use of silicon carbide high band gap material in EM. ***FY 2020 OCO Plans:***					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603573N / *Advanced Surface Machinery Sys*	**Project (Number/Name)** 2471 / *Integrated Power Systems (IPS)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
N/A					
FY 2019 to FY 2020 Increase/Decrease Statement: The increase from FY 2019 to FY 2020 is to support development of the modular scalable multi-purpose Energy Magazine which enables new shipboard pulsed, high power directed energy weapons (lasers) and sensors.					
Title: Naval Power Technology Development / Platform Integration & Transition	1.104	1.104	1.104	0.000	1.104
Articles:	-	-	-	-	-
FY 2019 Plans: Continue to execute the Advanced Electric Power and Propulsion Systems Development Project (short title is AEP3), Project Arrangement (PA) ref DoD-MOD-N-12-0001 which is an agreement between the US and UK Governments to cooperate on a scope of work associated with characterizing, developing, modeling, and de-risking electrical power and propulsion system architectures and equipment for future surface and submarine platforms to meet the needs of both Navies. Continue to develop power and propulsion system configurations in support of future surface ship acquisition programs. Develop alternative power and propulsion solutions for future surface combatants and amphibious ships. Continue to improve baseline power system performance by performing analysis, modeling and simulation, life cycle cost analysis, producibility studies, module development, and ship integration studies and planning. Continue to analyze alternatives for supplying power to advanced radars, combat systems, and electric weapons power demands and potential interfaces to develop optimum alternative solutions. Continue assessments of Naval Power and Energy System alternate architectures to best meet emerging ship requirements. Commence biennial update of the Naval Power and Energy Systems (NPES) Technology Development Roadmap (TDR). Continue to support maturation and transition of ONR Future Naval Capabilities (FNC) products to meet NPES TDR identified gaps. Support transition from ONR of Silicon Carbon (and other high bandgap semiconductor materials) based power electronic modules. High band gap semiconductor materials operate at high speeds and temperatures as					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603573N / *Advanced Surface Machinery Sys*	**Project (Number/Name)** 2471 / *Integrated Power Systems (IPS)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
compared with silicon based materials affording more compact, thermally tolerant power conversion equipment making them highly desirable for naval applications. Continue Combat Power and Energy System Overarching Integrated Product Team (OIPT). Continue to generate strategy, technology development plan and resource requirements for future surface combatant integrated power and energy system. ***FY 2020 Base Plans:*** Continue to execute the Advanced Electric Power and Propulsion Systems Development Project (short title is AEP3), Project Arrangement (PA) ref DoD-MOD-N-12-0001 which is an agreement between the US and UK Governments to cooperate on a scope of work associated with characterizing, developing, modeling, and de-risking electrical power and propulsion system architectures and equipment for future surface and submarine platforms to meet the needs of both Navies. Continue to develop power and propulsion system configurations in support of future surface ship acquisition programs. Develop alternative power and propulsion solutions for future surface combatants and amphibious ships. Continue to improve baseline power system performance by performing analysis, modeling and simulation, life cycle cost analysis, producibility studies, module development, and ship integration studies and planning. Continue to analyze alternatives for supplying power to advanced radars, combat systems, and electric weapons power demands and potential interfaces to develop optimum alternative solutions. Continue assessments of Naval Power and Energy System alternate architectures to best meet emerging ship requirements. Complete biennial update of the Naval Power and Energy Systems (NPES) Technology Development Roadmap (TDR). Continue to support maturation and transition of ONR Future Naval Capabilities (FNC) products to meet NPES TDR identified gaps. Support transition from ONR of Silicon Carbon (and other high bandgap semiconductor materials) based power electronic modules. High band gap semiconductor materials operate at high speeds and temperatures as					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603573N / *Advanced Surface Machinery Sys*	**Project (Number/Name)** 2471 / *Integrated Power Systems (IPS)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
compared with silicon based materials affording more compact, thermally tolerant power conversion equipment making them highly desirable for naval applications. Continue Combat Power and Energy System Overarching Integrated Product Team (OIPT). Continue to generate strategy, technology development plan and resource requirements for future surface combatant integrated power and energy system. ***FY 2020 OCO Plans:*** N/A					
Title: Situational Awareness, Boundary Enforcement & Response (SABER) formerly referred to as Cybersecurity Boundary Defense Capability ***Articles:*** ***FY 2019 Plans:*** The plans for FY 2019 include monitoring the two NPCs and engaging with Ships Force to develop CONOPS for SABER. The lessons learned from the NPCs will support the continued development of the SA and BD software, along with HAVEN. Ship Change Documents and Ship Installation Drawings will be developed in support of FY 2020 installations. SABER system architectures will be developed for additional ship classes in support of installations in FY 2021. WeaselBoards for the DDG-51 class Universal Control Console and Data Interface Unit will be developed, and the Allen Bradley WeaselBoard will be re-designed based on the lessons learned from the EC and FADC designs. Contracts for the SABER Computing Hardware contract and for the SABER Taps & Aggregators will be awarded. The contractors will design the equipment and go through PDR/ CDR for each unit. Design and technical data packages for software and hardware solutions will be developed. Full-up SABER system architectures will be developed for the HM&E enclaves of the following ship classes: DDG-51 Flight III, LHD 1/7, LPD-17, LSD, LHA, and DDG 1000. R&D of a Cyber Fiber-wire Tap will begin, including light budget analysis of current HM&E fiber connections. A Job Duty Task Analysis (JDTA) and follow-on Front End Analysis (FEA) will be completed for the SABER system. ***FY 2020 Base Plans:*** The first production SABER Computing Hardware and SABER Taps & Aggregator units will be produced in FY 2020 to go through First Article Testing (FAT) to support full production for the first two installations in Q4 FY 2020 and installations scheduled for FY 2021. SA and BD software development will continue, with evaluation of additional software products to add capabilities to the overall SABER portfolio. A WeaselBoard for	5.736 -	7.764 -	7.847 -	0.000 -	7.847 -

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603573N / *Advanced Surface Machinery Sys*	**Project (Number/Name)** 2471 / *Integrated Power Systems (IPS)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Siemens PLCs will be developed. SABER system architectures will be developed for the remaining ship classes (installations in FY 2022 and beyond). ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increase is associated with testing in support of planned permanent installations.					
Accomplishments/Planned Programs Subtotals	22.406	22.109	25.408	0.000	25.408

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

This program develops and transitions higher performance and more affordable electric power and propulsion systems to both new construction and back fit ship applications using an evolutionary acquisition approach. For new contract awards, full and open competition is utilized to the maximum extent possible to provide maximum benefit to the Navy at the lowest possible cost to the taxpayer. When able to meet Navy requirements, commercial technology is leveraged to further minimize cost to the Navy. SABER efforts will maximize use of government field activity labs and HM&E equipment vendors. SABER will use SA and BD software tools with Government Purpose Rights or those which are open source as much as possible

E. Performance Metrics

This project will execute 100% of the signed Technology Deployment Agreements with ONR; complete 100% of the advanced developments currently planned for the Energy Storage Module and Power Generation Module; achieve up to 10% Specific Fuel Consumption (SFC) improvement for Advanced Power Generation Module; mature technology to Technology Readiness Level (TRL) 6 by milestone decisions for ship acquisition program; and, complete design and development of Situational Awareness, Boundary Enforcement & Response (SABER) to protect HM&E systems on surface ships from cyber-attacks in alignment with the Task Force Cyber Awareness (TFCA) goals.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603573N / *Advanced Surface Machinery Sys*	Project (Number/Name) 2471 / *Integrated Power Systems (IPS)*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Product Development	SS/FFP	Rolls Royce : Walpole, MA	36.397	1.506	Oct 2017	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Product Development	TBD	TBD : TBD	0.000	0.000		0.000		2.000	Apr 2020	-		2.000	0.000	2.000	-
Product Development	C/FFP	DRS : DRS, Milwaukee WI	45.933	2.887	Dec 2017	5.118	Mar 2019	6.607	Oct 2019	-		6.607	Continuing	Continuing	Continuing
Product Development	C/CPFF	Various : Various	41.753	5.747	Oct 2017	4.222	Oct 2018	4.000	Oct 2019	-		4.000	Continuing	Continuing	Continuing
Product Development	WR	NSWCPD : Phila, PA	56.467	4.530	Oct 2017	3.505	Oct 2018	3.370	Oct 2019	-		3.370	Continuing	Continuing	Continuing
Cybersecurity	WR	NSWCPD : Phila, PA	4.223	4.020	Nov 2017	1.250	Nov 2018	3.500	Nov 2019	-		3.500	Continuing	Continuing	Continuing
Cybersecurity	C/CPIF	Boeing : Huntington Beach, CA	0.700	0.300	Jan 2018	0.250	Feb 2019	0.250	Jan 2020	-		0.250	Continuing	Continuing	Continuing
Cybersecurity	C/FP	Various HM&E Equipment Vendors : Various	1.998	0.000		0.000		0.250	Jan 2020	-		0.250	Continuing	Continuing	Continuing
Cybersecurity	C/CPIF	Various : Various	3.000	0.266	Jan 2018	0.264	Jan 2019	0.347	Jan 2020	-		0.347	Continuing	Continuing	Continuing
Cybersecurity	C/CPFF	TBD Comp HW : TBD	0.000	0.000		4.000	Feb 2019	2.000	Nov 2019	-		2.000	0.000	6.000	-
Cybersecurity	C/CPFF	JHU APL : Laurel, MD	2.231	0.400	Jan 2018	0.250	Dec 2018	0.500	Jan 2020	-		0.500	0.000	3.381	-
Cybersecurity	C/CPFF	TBD Tap-Agg : TBD	0.000	0.000		1.250	Apr 2019	0.500	Nov 2019	-		0.500	0.000	1.750	-
Cybersecurity	MIPR	Sandia National Labs : Albuquerque, NM	0.000	0.750	Nov 2018	0.500	Nov 2018	0.500	Nov 2019	-		0.500	0.000	1.750	-
		Subtotal	192.702	20.406		20.609		23.824		-		23.824	Continuing	Continuing	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Test and Evaluation	WR	NSWCCD-SSES : Phila, PA	24.954	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
		Subtotal	24.954	0.000		0.000		0.000		-		0.000	Continuing	Continuing	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603573N / *Advanced Surface Machinery Sys*	Project (Number/Name) 2471 / *Integrated Power Systems (IPS)*	

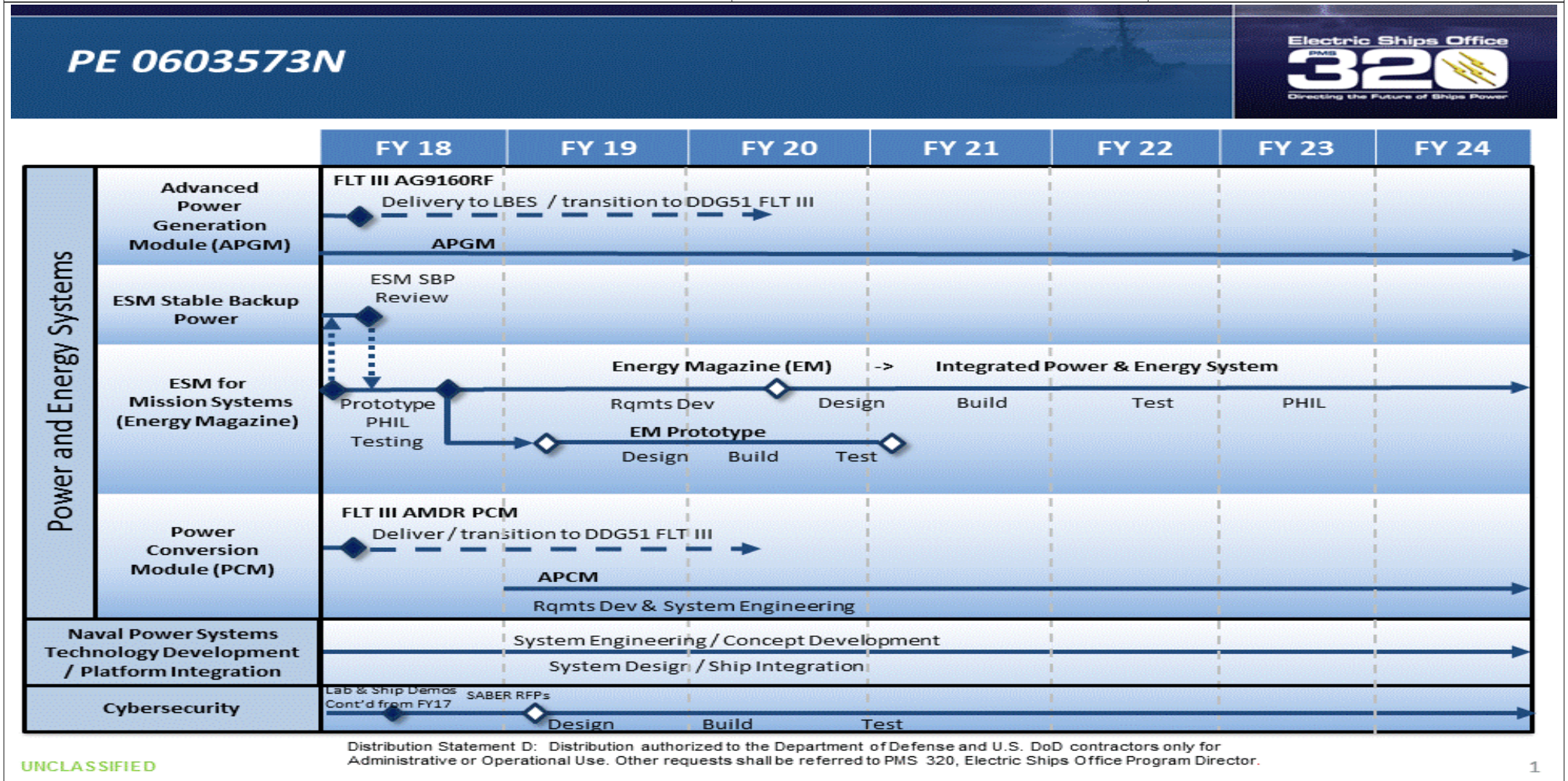
Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Management	C/CPFF	Herren Associates : Alexandria, VA	4.092	2.000	Dec 2017	1.500	Oct 2018	1.584	Oct 2019	-		1.584	Continuing	Continuing	Continuing
		Subtotal	4.092	2.000		1.500		1.584		-		1.584	Continuing	Continuing	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	221.748	22.406		22.109		25.408		-		25.408	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603573N / *Advanced Surface Machinery Sys*	**Project (Number/Name)** 2471 / *Integrated Power Systems (IPS)*



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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603573N / *Advanced Surface Machinery Sys*	**Project (Number/Name)** 2471 / *Integrated Power Systems (IPS)*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 2471				
Power and Energy Systems	1	2018	4	2024
Naval Power Technology Development / Platforms Integration & transition	1	2018	4	2024
Situational Awareness, Boundary Enforcement & Response (SABER) previously Cybersecurity BDC	1	2018	4	2024

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603573N / *Advanced Surface Machinery Sys*	Project (Number/Name) 9999 / *Congressional Adds*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
9999: *Congressional Adds*	0.000	0.000	5.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	5.000
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Silicon Carbide Power Electronics. The Committee supports the Navy's investment to develop advanced power and energy technology to meet requirements for higher electric power loads through efficient means. The Committee understands that use of silicon carbide power modules may reduce the size and weight of power conversion modules and other electronic systems necessary for advanced sensors and weapon systems. The Committee recommends $5,000,000 for silicon carbide power electronics research and encourages the Secretary of the Navy to continue to invest in advanced power and energy technology and accelerate the qualification of silicon carbide power modules to be used on high power, mission critical Navy platforms.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019
Congressional Add: Silicon Carbide Power Modules	0.000	5.000
FY 2018 Accomplishments: N/A		
FY 2019 Plans: Commence development of requirements and Silicon Carbide (SiC) Power Converter Simulation, Medium Voltage (MV) SiC Semiconductor Module Refinement and Validation, and MV SiC Semiconductor Module Endurance Test and Prototype Power Converter Development		
Congressional Adds Subtotals	0.000	5.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

Execute 100% of the intent of the FY 2019 Congressional Add to develop advanced power and energy technology to meet requirements for higher electric power loads through efficient means such as silicon carbide power modules which may reduce the size and weight of power conversion modules and other systems necessary for advanced sensors and weapon systems.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603573N / *Advanced Surface Machinery Sys*	Project (Number/Name) 9999 / *Congressional Adds*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
SiC Power Modules	C/CPFF	TBD : TBD	0.000	0.000		4.750	Feb 2019	0.000		-		0.000	0.000	4.750	-
SiC Power Modules	WR	Naval Surface Warfare Center : Phila., PA	0.000	0.000		0.250	Feb 2019	0.000		-		0.000	0.000	0.250	-
		Subtotal	0.000	0.000		5.000		0.000		-		0.000	0.000	5.000	N/A

	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	0.000		5.000		0.000		-		0.000	0.000	5.000	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603573N / *Advanced Surface Machinery Sys*	**Project (Number/Name)** 9999 / *Congressional Adds*

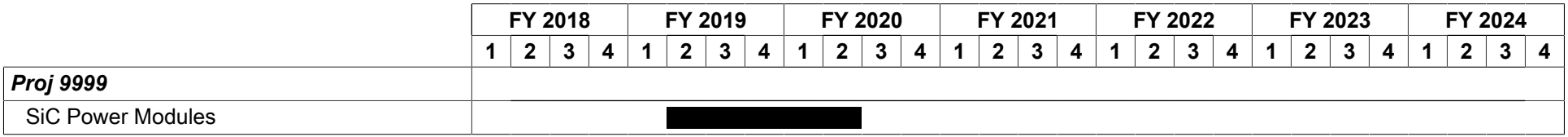


Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603573N / *Advanced Surface Machinery Sys*	**Project (Number/Name)** 9999 / *Congressional Adds*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 9999				
SiC Power Modules	2	2019	2	2020

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0603581N *I (U)LITTORAL COMBAT SHIP*

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	1,338.875	49.308	37.997	9.934	-	9.934	34.581	81.035	115.770	75.657	Continuing	Continuing
3096: *Littoral Combat Ship*	1,308.674	20.215	12.220	8.781	-	8.781	31.833	80.142	114.855	74.724	Continuing	Continuing
4506: *LCS Training*	30.201	19.442	15.777	1.153	-	1.153	2.748	0.893	0.915	0.933	Continuing	Continuing
9999: *Congressional Adds*	0.000	9.651	10.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	19.651

Program MDAP/MAIS Code:
Project MDAP/MAIS Code(s): 374

Note

The FY 2020 funding request was reduced by $2.500 million to account for the availability of prior year execution balances.

A. Mission Description and Budget Item Justification

This Program Element (PE) provides funds for detailed design, development, construction, issue resolution, certification, integration, and testing of the Littoral Combat Ship (LCS). LCS operates with focused-mission packages that deploy manned and unmanned vehicles to execute a variety of missions, including Anti-Submarine Warfare (ASW), Surface Warfare (SUW) and Mine Countermeasures (MCM). LCS also possesses inherent capabilities, regardless of the Mission package installed, including intelligence/surveillance/reconnaissance (ISR), LCS SUW will also include Maritime Interdiction/interception Operations (MIO), Anti-Terrorism/Force Protection (AT/FP), air warfare self-defense, joint littoral mobility and logistic support for movement of personnel and supplies. This relatively small, shallow-draft, high-speed surface combatant complements the U.S. Navy's Surface Fleet by operating in environments where it is impossible or undesirable to employ larger, deeper-draft, multi-mission ships. LCS can deploy independently to overseas littoral regions or remain on station for extended periods of time either with a battle group or through a forward-basing arrangement. LCS will operate with Carrier Strike Groups, Surface Action Groups, or independently as dictated by the mission and environment. Additionally, LCS can operate cooperatively with the U.S. Coast Guard and Allies.

Beginning in FY 2021, this PE also provides funds for the design, development, engineering, implementation, and testing of the combat system modifications for Lethality and Survivability (L&S) for the LCS Class. The L&S upgrades include the development of a common Combat Management System (CMS) and integration and testing of government furnished systems including the Gun Weapon System (GWS), Electronic Warfare (EW) system and Decoy Launching System (DLS) for both LCS Class Variant ships.

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0603581N *I (U)LITTORAL COMBAT SHIP*

B. Program Change Summary ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	40.991	27.997	12.577	-	12.577
Current President's Budget	49.308	37.997	9.934	-	9.934
Total Adjustments	8.317	10.000	-2.643	-	-2.643
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	10.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-1.683	0.000			
• Program Adjustments	0.000	0.000	-2.500	-	-2.500
• Rate/Misc Adjustments	0.000	0.000	-0.143	-	-0.143
• Congressional Add Adjustments	10.000	-	-	-	-

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2018	FY 2019
Project: 9999: *Congressional Adds*		
Congressional Add: *LCS Training Courseware*	9.651	10.000
Congressional Add Subtotals for Project: 9999	9.651	10.000
Congressional Add Totals for all Projects	9.651	10.000

Change Summary Explanation

In FY18, $10.0M Congressional Add increase for LCS Immersive Virtual Shipboard Environment (IVSE) courseware and a $1.683M reduction to support efforts for Small Business Innovation Research (SBIR). FY19 funding includes $10.0M Congressional Add for LCS Training Courseware. In FY20, the funding request was reduced by $2.500M to account for the availability of prior year execution balances and $0.143M due to Working Capital Fund (WCF) rate adjustments.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy											Date: March 2019	
Appropriation/Budget Activity 1319 / 4					R-1 Program Element (Number/Name) PE 0603581N / *(U)LITTORAL COMBAT SHIP*				Project (Number/Name) 3096 / *Littoral Combat Ship*			
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
3096: *Littoral Combat Ship*	1,308.674	20.215	12.220	8.781	-	8.781	31.833	80.142	114.855	74.724	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Project MDAP/MAIS Code: 374

Note

The FY 2020 funding request was reduced by $1.500 million to account for the availability of prior year execution balances.

A. Mission Description and Budget Item Justification

The RDT&E portion of the LCS Program comprises design and development efforts required to field the LCS Class Ships, including integration with the Mission Packages (MCM, ASW and SUW) activities both pre- and post-delivery. It includes the design and development effort required to support the introduction and deployment of a Flight 0+ baseline (LCS 3/4 and Follow) with incorporation of lessons learned from the design and construction of USS FREEDOM (LCS 1) and USS INDEPENDENCE (LCS 2). Additionally, it includes design, development, issue resolution, certification and testing efforts required to support the design baseline for the six year block buy in FY10-15. This baseline will include lessons learned from the LCS 1 through LCS 4.

The LCS design and development phases include platform design and development, experimentation, ship system design and integration, hull platform testing, development of Technical Data Packages (TDPs), total ship system engineering and integration, combat systems and warfare systems certification, and planning and conduct of system testing. These efforts include procurement of combat and warfare system elements and/or simulators to support production representative testing in support of design, development, and certification efforts and ordnance in support of testing.

The RDT&E portion of LCS funding also comprises formal Developmental and Operational Assessment testing of the LCS Ships and Mission Packages. Test and Evaluation (T&E) will concentrate on verifying integration and interoperability of employed technologies and systems in the LCS seaframe designs and modular mission packages to achieve the mission capabilities and performance requirements as defined in the LCS program's Flight 0 and Flight 0+ Capabilities Development Documents (CDD). T&E functions will include the evaluation of Critical Technical Parameters (CTP), Measures of Effectiveness (MOE), Measures of Suitability (MOS), and Key Performance Parameters (KPP) for the core seaframe and the focused missions.

Beginning in FY 2021, this budget provides funds for the design, development, engineering, implementation, and testing of the combat system modifications for Lethality and Survivability (L&S) for the LCS Class. The L&S upgrades include the development of a common Combat Management System (CMS) and integration and testing of government furnished systems including the Gun Weapon System (GWS), Electronic Warfare (EW) system, and Decoy Launching System (DLS) for both LCS Class Variant ships.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: LCS System-of-Systems Development, Engineering & Experimentation	14.583	9.792	6.697	0.000	6.697

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603581N / *(U)LITTORAL COMBAT SHIP*	**Project (Number/Name)** 3096 / *Littoral Combat Ship*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Articles:	-	-	-	-	-
Description: Provides for LCS Program systems engineering in support of Flight 0, Flight 0+, the FY10 Block Buy baseline design, and future procurement baseline design, development, certification, and production (including ship system design and integration); combat system and C4I design, integration, and test; aviation (manned and unmanned) integration; Mine Countermeasures (MCM), Anti-Submarine Warfare (ASW) and Surface Warfare (SUW) mission package (MP) integration; logistics product development; and various systems engineering activities required to perform risk analyses of new design and production technology concepts. ***FY 2019 Plans:*** Provide systems engineering support for Surface to Surface Mission Module (SSMM) TECHEVAL and IOT&E on the FREEDOM Variant. Provide systems engineering support and complete VTUAV Dynamic Interface testing on the FREEDOM Variant. Provide systems engineering support for Anti-Submarine Warfare (ASW) DT on the Freedom Variant. Provide systems engineering support for the Assessment and Identification of Mine Susceptibility (AIMS), Advanced Mine Simulation System (AMISS) on the FREEDOM and INDEPENDENCE Variant Ships. Provide systems engineering support for the Advanced Degaussing System Calibration (ADG) on the FREEDOM Variant. ***FY 2020 Base Plans:*** Provide systems engineering support for ASW DT on the INDEPENDENCE Variant. Provide systems engineering support for ASW DT, TECHEVAL and IOT&E Mission Package on the FREEDOM Variant. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Decrease is due to reduced LCS Test Program in FY20.					
Title: LCS Test & Evaluation	5.632	2.428	2.084	0.000	2.084
Articles:	-	-	-	-	-
Description: Execute formal LCS Developmental Testing and Operational Testing (DT/OT), including Live Fire Test & Evaluation (LFT&E), and procurement of T&E Ordnance. Execute DT and C4I integration and testing; aviation integration (manned and unmanned), Mine Countermeasures (MCM), Anti-Submarine Warfare (ASW) and Surface Warfare (SUW) Mission Package (MP) integration. ***FY 2019 Plans:***					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603581N / *(U)LITTORAL COMBAT SHIP*	**Project (Number/Name)** 3096 / *Littoral Combat Ship*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Complete LCS Final Survivability Assessment Report (FSAR). Complete ADST in support of the PRA on the INDEPENDENCE Variant. Complete SUW DT Phase I on the FREEDOM Variant. Conduct Advanced Degaussing (ADG) on the FREEDOM Variant. Conduct Assessment and Identification of Mine Susceptibility (AIMS) testing Advanced Mine Simulation System (AMISS) testing on the FREEDOM Variant. Conduct Vertical Take-off and Landing Unmanned Aerial Vehicle (VTUAV) Dynamic Interface testing on the FREEDOM Variant. Complete SUW Surface to Surface Mission Module (SSMM MP) Developmental Testing (DT), Technical Evaluation (TECHEVAL), and Initial Operational Test & Evaluation (IOT&E) on the FREEDOM Variant. Commence Anti-Submarine Warfare (ASW) DT on the FREEDOM Variant. ***FY 2020 Base Plans:*** Complete ASW DT on the INDEPENDENCE Variant. Conduct ASW DT Phase II, TECHEVAL, and IOT&E on the FREEDOM Variant. Complete planning for MCM DT on the INDEPENDENCE Variant. Begin planning MCM DT Phase I on the FREEDOM Variant. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** No significant change from FY19 to FY20.					
Accomplishments/Planned Programs Subtotals	20.215	12.220	8.781	0.000	8.781

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• SCN/2127: *Littoral Combat Ship (LCS)*	1,593.824	1,674.428	14.000	-	14.000	24.860	0.000	41.530	0.000	0.000	16,799.399

Remarks

D. Acquisition Strategy

The LCS program takes an evolutionary approach to acquisition that emphasizes competition as a key to achieving affordability. Initially, two industry teams competed against each other with two distinctly different LCS designs. The decision produced two flights with a vessel from each design: Flight 0 (LCS 1 and LCS 2); and Flight 0+ (LCS 3 and out). The Flight 0+ baseline incorporates lessons learned from the design, construction, and testing of the Flight 0 ships. The Navy conducted a limited competition amongst the existing LCS industry teams or team participants for the award of a contract for the construction of a block buy of up to ten (10) LCS Flight 0+ Class ships, with an objective of competitively awarding a single contract to a single industry team.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603581N / *(U)LITTORAL COMBAT SHIP*	**Project (Number/Name)** 3096 / *Littoral Combat Ship*

By Acquisition Decision Memorandum of December 23, 2010, the USD (AT&L) authorized execution of an alternative acquisition strategy for the FY 2010 through FY 2015 procurement of 20 seaframes through two ten-ship block buy contracts. On December 29, 2010, the Navy awarded two contracts for block buys of up to ten ships, beginning with the award to each contractor of one FY 2010 ship and associated non-recurring engineering, the development of the Technical Data Package (TDP), core class services, and associated data. This was followed by the contractual funding of one ship to each contractor in FY 2011 and two ships each funded in FY 2012 through FY 2014.

On October 17, 2014 USD(AT&L) approved the Navy's plan to procure three ships in FY 2015 and three ships in FY 2016 by modifying the current block buy contracts. The modification to each of the block buy contracts completed the previously approved 20 ship block buy procurement and added options for two FY 2016 ships for a total of 26 LCS ships. The Navy's Acquisition strategy supported the procurement of three LCS ships in FY17, FY18, and FY19.

E. Performance Metrics

The LCS Program achieved Milestone A and Program Initiation in May 2004 and Milestone B in February 2011. The LCS program conducts annual Defense Acquisition Board In-Process Reviews (DAB IPRs). The first Seaframe and Mission Module integrated program DAB IPR was conducted in January 2013 and is held in September thereafter.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603581N / *(U)LITTORAL COMBAT SHIP*	**Project (Number/Name)** 3096 / *Littoral Combat Ship*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Product Development Summary	Various	Various : Various	479.868	0.000		0.000		0.000		-		0.000	0.000	479.868	-
		Subtotal	479.868	0.000		0.000		0.000		-		0.000	0.000	479.868	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Government Engineering Support	WR	NSWC/DD : Dahlgren, VA	70.250	2.023	Feb 2018	1.460	Nov 2018	1.056	Nov 2019	-		1.056	Continuing	Continuing	Continuing
Government Engineering Support	WR	NSWC/PC : Panama City, FL	27.987	0.000		0.000		0.000		-		0.000	0.000	27.987	-
Government Engineering Support	WR	NUWC/N : Newport, RI	10.039	0.153	Nov 2017	0.110	Nov 2018	0.122	Nov 2019	-		0.122	0.000	10.424	-
Government Engineering Support	WR	NAWC/AD : Pax River, MD	25.062	0.000		0.000		0.000		-		0.000	0.000	25.062	-
Government Engineering Support	WR	NSWC/CR : Crane, IN	17.722	0.000		0.000		0.000		-		0.000	0.000	17.722	-
Government Engineering Support	WR	NSWC/PD : Philadelphia, PA	73.126	1.906	Feb 2018	1.375	Nov 2018	1.105	Nov 2019	-		1.105	Continuing	Continuing	Continuing
Government Engineering Support	Various	Government Activities : Various	52.775	2.000	Feb 2018	1.443	Nov 2018	1.180	Nov 2019	-		1.180	Continuing	Continuing	Continuing
Contractor Engineering Support	C/CPAF	Alion/CSC : Arlington, VA	49.802	0.000		0.000		0.000		-		0.000	0.000	49.802	-
Contractor Engineering Support	C/CPAF	Various : Various	22.815	1.863	Feb 2018	1.344	Mar 2019	1.070	Mar 2020	-		1.070	Continuing	Continuing	Continuing
Government Engineering Support	WR	NSWC/CD : Bethesda, MD	10.113	4.592	Jul 2018	2.131	Feb 2019	1.044	Nov 2019	-		1.044	Continuing	Continuing	Continuing
Government Engineering Support	WR	PEO IWS : Various	3.388	1.987	Jul 2018	1.886	Dec 2018	1.072	Mar 2020	-		1.072	Continuing	Continuing	Continuing

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603581N / *(U)LITTORAL COMBAT SHIP*	Project (Number/Name) 3096 / *Littoral Combat Ship*	

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Contractor Engineering Support	WR	General Dynamics Bath Iron Works : Bath, ME	0.933	0.000		0.000		0.000		-		0.000	0.000	0.933	-
Condition Based Maintenance	WR	NSWC/PHD : Port Hueneme, CA	5.180	0.000		0.000		0.000		-		0.000	0.000	5.180	-
Government Engineering Support	WR	NSWC/PHD : Port Hueneme, CA	0.858	0.059	Nov 2017	0.043	Nov 2018	0.048	Nov 2019	-		0.048	0.000	1.008	-
Frigate Government Engineering Support	WR	NSWC/CD : Carderock, MD	1.179	0.000		0.000		0.000		-		0.000	0.000	1.179	-
Frigate Government Engineering Support	WR	NSWC/PD : Philadelphia, PA	0.468	0.000		0.000		0.000		-		0.000	0.000	0.468	-
Frigate Contractor Engineering Support	C/CPAF	Alion : Arlington, VA	0.973	0.000		0.000		0.000		-		0.000	0.000	0.973	-
Frigate Contractor Engineering Support	C/CPAF	Booz Allen Hamilton : McLean, VA	0.345	0.000		0.000		0.000		-		0.000	0.000	0.345	-
		Subtotal	373.015	14.583		9.792		6.697		-		6.697	Continuing	Continuing	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Test & Evaluation	C/CPAF	Alion/CSC : Arlington, VA	31.844	0.000		0.000		0.000		-		0.000	0.000	31.844	-
Test & Evaluation	WR	NSWC/PHD : Port Hueneme, CA	57.556	0.416	Jul 2018	0.179	Nov 2018	0.079	Nov 2019	-		0.079	0.000	58.230	-
Test & Evaluation	WR	NSWC/PD : Philadelphia, PA	66.344	0.825	Nov 2017	0.000		0.000		-		0.000	0.000	67.169	-
Test & Evaluation	WR	NSWC/PC : Panama City, FL	16.473	0.000		0.000		0.000		-		0.000	0.000	16.473	-
Test & Evaluation	WR	COMOPTEVFOR : Norfolk, VA	14.893	0.000		0.757	Nov 2018	0.335	Nov 2019	-		0.335	0.000	15.985	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603581N / *(U)LITTORAL COMBAT SHIP*	Project (Number/Name) 3096 / *Littoral Combat Ship*	

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Test & Evaluation	WR	NSWC/COR : Corona, CA	18.186	0.245	Nov 2017	0.106	Nov 2018	0.401	Nov 2019	-		0.401	0.000	18.938	-
Test & Evaluation	WR	Government Activities : Various	71.066	0.500	Nov 2017	0.216	Mar 2019	0.096	Mar 2020	-		0.096	0.000	71.878	-
Test & Evaluation	C/CPAF	LM/GD/Austal : Various	80.176	0.890	Jan 2018	0.000		0.173	Mar 2020	-		0.173	0.000	81.239	-
Test & Evaluation	WR	PEO C4I : Charleston, SC	11.562	0.000		0.000		0.000		-		0.000	0.000	11.562	-
T&E Ordnance/ Ammunition	WR	PEO IWS : Various	22.544	0.000		0.000		0.000		-		0.000	0.000	22.544	-
FSST Support	WR	NAVAIR : Patuxent River, MD	4.487	0.000		0.000		0.000		-		0.000	0.000	4.487	-
Range Support	WR	NAWC/WD : Pt. Mugu, CA	3.468	0.000		0.000		0.000		-		0.000	0.000	3.468	-
Test & Evaluation	WR	NSWC/CD : Bethesda, MD	19.858	2.756	Feb 2018	1.170	Feb 2019	1.000	Nov 2019	-		1.000	0.000	24.784	-
FSST Support	C/BA	National Science Foundation : Arlington, VA	2.671	0.000		0.000		0.000		-		0.000	0.000	2.671	-
FSST Support	C/BA	NAVFAC Atlantic : Virginia Beach, VA	0.759	0.000		0.000		0.000		-		0.000	0.000	0.759	-
Test & Evaluation	C/BA	Naval Research Laboratory : Washington, DC	1.099	0.000		0.000		0.000		-		0.000	0.000	1.099	-
		Subtotal	422.986	5.632		2.428		2.084		-		2.084	0.000	433.130	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management Support- SEAPORT	C/CPAF	Alion/CSC : Arlington, VA	20.593	0.000		0.000		0.000		-		0.000	0.000	20.593	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603581N / *(U)LITTORAL COMBAT SHIP*	Project (Number/Name) 3096 / *Littoral Combat Ship*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management Support	Various	Various : Various	12.212	0.000		0.000		0.000		-		0.000	0.000	12.212	-
		Subtotal	32.805	0.000		0.000		0.000		-		0.000	0.000	32.805	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	1,308.674	20.215		12.220		8.781		-		8.781	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603581N / *(U)LITTORAL COMBAT SHIP*	**Project (Number/Name)** 3096 / *Littoral Combat Ship*

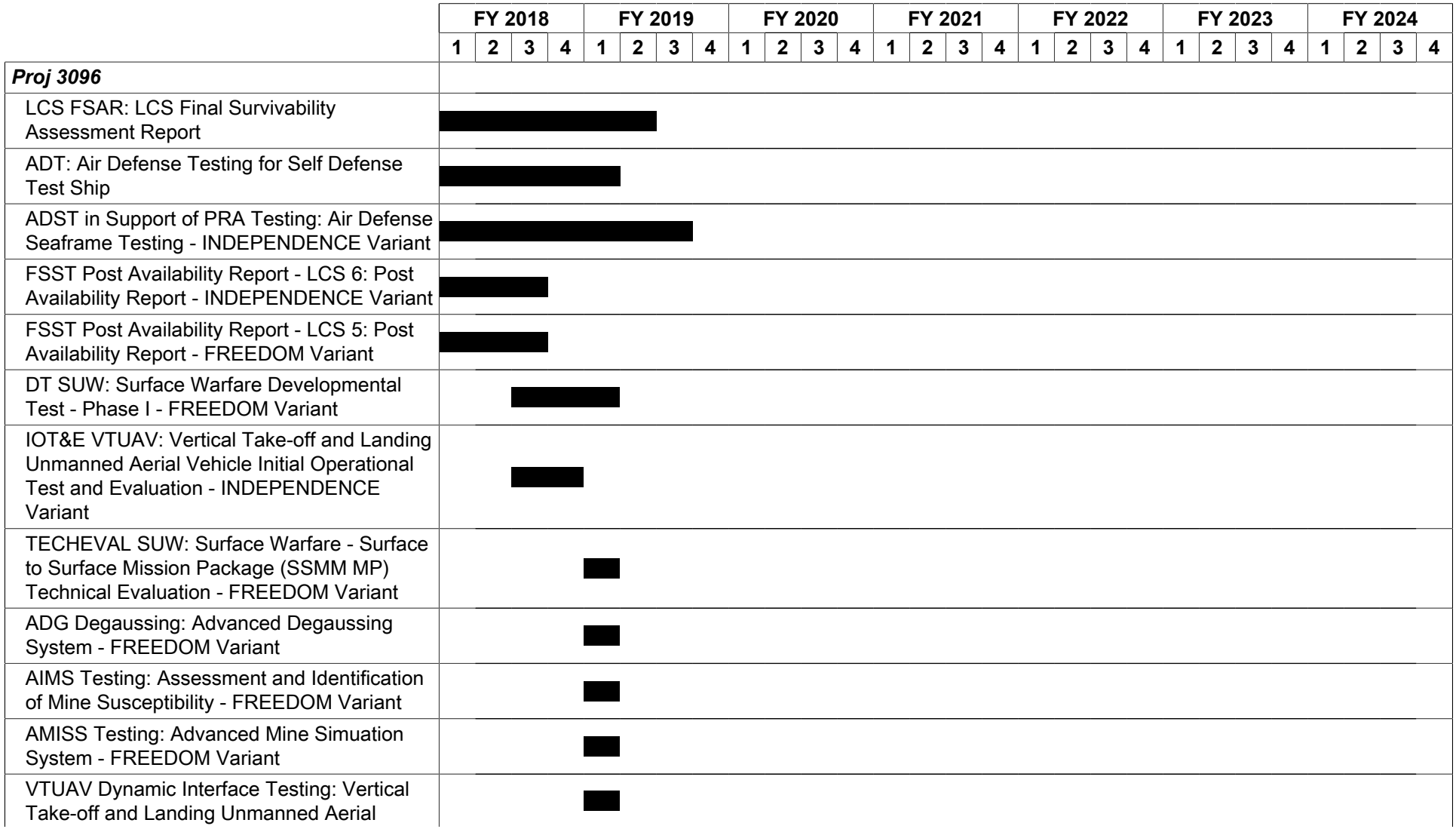


Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603581N / *(U)LITTORAL COMBAT SHIP*	**Project (Number/Name)** 3096 / *Littoral Combat Ship*

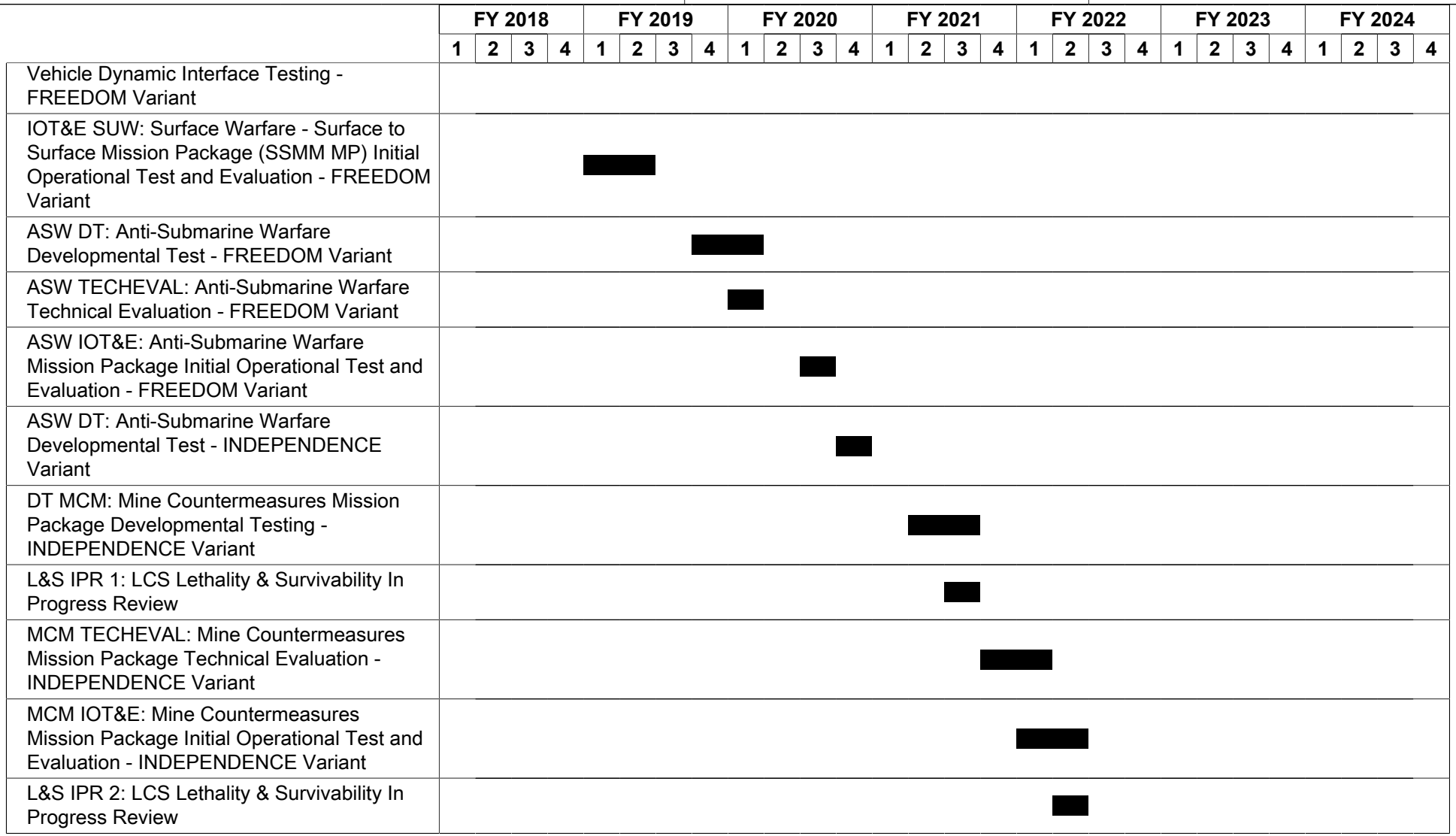


Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603581N / *(U)LITTORAL COMBAT SHIP*	**Project (Number/Name)** 3096 / *Littoral Combat Ship*

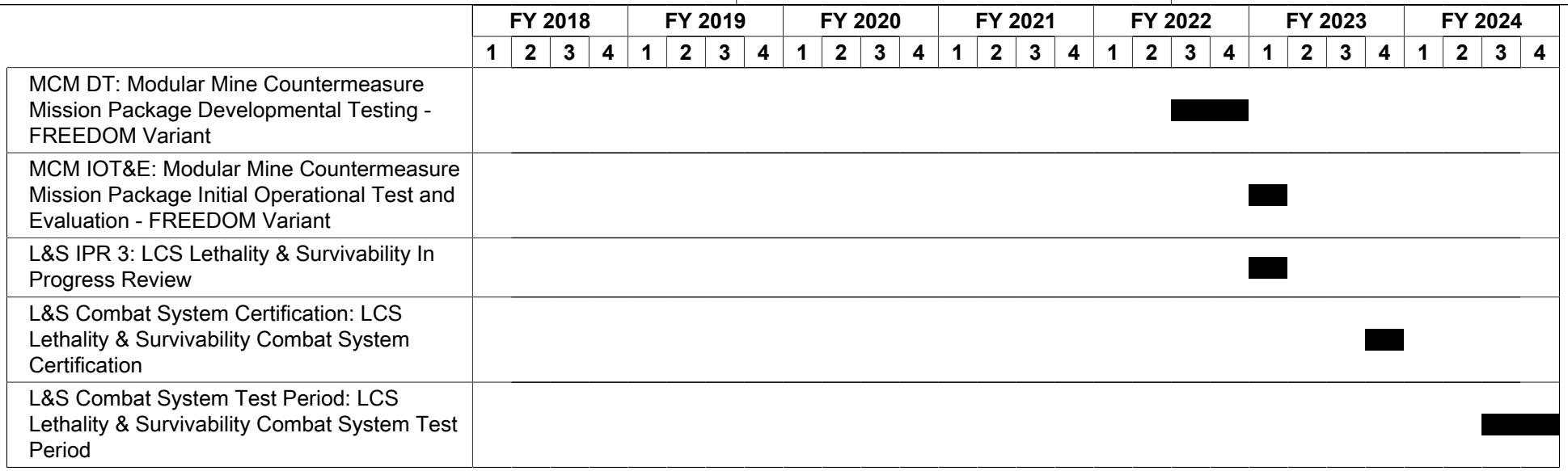


Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603581N / *(U)LITTORAL COMBAT SHIP*	**Project (Number/Name)** 3096 / *Littoral Combat Ship*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 3096				
LCS FSAR: LCS Final Survivability Assessment Report	1	2018	2	2019
ADT: Air Defense Testing for Self Defense Test Ship	1	2018	1	2019
ADST in Support of PRA Testing: Air Defense Seaframe Testing - INDEPENDENCE Variant	1	2018	3	2019
FSST Post Availability Report - LCS 6: Post Availability Report - INDEPENDENCE Variant	1	2018	3	2018
FSST Post Availability Report - LCS 5: Post Availability Report - FREEDOM Variant	1	2018	3	2018
DT SUW: Surface Warfare Developmental Test - Phase I - FREEDOM Variant	3	2018	1	2019
IOT&E VTUAV: Vertical Take-off and Landing Unmanned Aerial Vehicle Initial Operational Test and Evaluation - INDEPENDENCE Variant	3	2018	4	2018
TECHEVAL SUW: Surface Warfare - Surface to Surface Mission Package (SSMM MP) Technical Evaluation - FREEDOM Variant	1	2019	1	2019
ADG Degaussing: Advanced Degaussing System - FREEDOM Variant	1	2019	1	2019
AIMS Testing: Assessment and Identification of Mine Susceptibility - FREEDOM Variant	1	2019	1	2019
AMISS Testing: Advanced Mine Simuation System - FREEDOM Variant	1	2019	1	2019
VTUAV Dynamic Interface Testing: Vertical Take-off and Landing Unmanned Aerial Vehicle Dynamic Interface Testing - FREEDOM Variant	1	2019	1	2019
IOT&E SUW: Surface Warfare - Surface to Surface Mission Package (SSMM MP) Initial Operational Test and Evaluation - FREEDOM Variant	1	2019	2	2019
ASW DT: Anti-Submarine Warfare Developmental Test - FREEDOM Variant	4	2019	1	2020
ASW TECHEVAL: Anti-Submarine Warfare Technical Evaluation - FREEDOM Variant	1	2020	1	2020

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603581N / *(U)LITTORAL COMBAT SHIP*	**Project (Number/Name)** 3096 / *Littoral Combat Ship*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
ASW IOT&E: Anti-Submarine Warfare Mission Package Initial Operational Test and Evaluation - FREEDOM Variant	3	2020	3	2020
ASW DT: Anti-Submarine Warfare Developmental Test - INDEPENDENCE Variant	4	2020	4	2020
DT MCM: Mine Countermeasures Mission Package Developmental Testing - INDEPENDENCE Variant	2	2021	3	2021
L&S IPR 1: LCS Lethality & Survivability In Progress Review	3	2021	3	2021
MCM TECHEVAL: Mine Countermeasures Mission Package Technical Evaluation - INDEPENDENCE Variant	4	2021	1	2022
MCM IOT&E: Mine Countermeasures Mission Package Initial Operational Test and Evaluation - INDEPENDENCE Variant	1	2022	2	2022
L&S IPR 2: LCS Lethality & Survivability In Progress Review	2	2022	2	2022
MCM DT: Modular Mine Countermeasure Mission Package Developmental Testing - FREEDOM Variant	3	2022	4	2022
MCM IOT&E: Modular Mine Countermeasure Mission Package Initial Operational Test and Evaluation - FREEDOM Variant	1	2023	1	2023
L&S IPR 3: LCS Lethality & Survivability In Progress Review	1	2023	1	2023
L&S Combat System Certification: LCS Lethality & Survivability Combat System Certification	4	2023	4	2023
L&S Combat System Test Period: LCS Lethality & Survivability Combat System Test Period	3	2024	4	2024

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603581N / *(U)LITTORAL COMBAT SHIP*	Project (Number/Name) 4506 / *LCS Training*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
4506: *LCS Training*	30.201	19.442	15.777	1.153	-	1.153	2.748	0.893	0.915	0.933	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Project MDAP/MAIS Code: 374

Note

The FY 2020 funding request was reduced by $1.000 million to account for the availability of prior year execution balances.

A. Mission Description and Budget Item Justification

As a minimally-manned ship, the LCS uses a Train-to-Qualify (T2Q)/Train-to-Certify (T2C) training process in an off-ship/shore-based virtual ship trainer environment. These simulators and blended training solutions focus on tactical, equipment operations, and maintenance training. When completely developed and procured, the LCS shore-based training capability will satisfy individual, team, unit, and force training, with an objective of meeting Capability Development Document (CDD) T2Q/T2C Key Performance Parameter (KPP) requirements.

FY2020 funding will complete the development of the Immersive Virtual Ship Environment (IVSE) and Virtual Reality (VR) courseware and associated simulators to achieve the training objectives. Additionally, after fielding more of the systems and courseware, out-year funding will be utilized to upgrade training to maintain conformity with LCS configurations and approved operational technical manuals and procedures, as well as test and evaluate training devices to verify compliance with requirements.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: LCS Total System Training Architecture	19.442	15.777	1.153	0.000	1.153
Articles:	-	-	-	-	-
FY 2019 Plans: FY19 funding provides for the development and testing of multiple training courseware products which provide the fleet with required training capabilities. Funding provides NAWC TSD program management oversight while they complete the development of LCS deck operations (both variants), continue combat systems IVSE courseware and begin the development of the combat systems part task trainer. NAWC will start the development of the VTUAV visual display trainer, oversee performance of the development effort, while providing additional support efforts to the LCS Fleet Introduction Program Office (PMS 505). This funding also supports continued NAVFAC efforts preparing for additional small ship homeports required by the Strategic Laydown plan.					
FY 2020 Base Plans:					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603581N / *(U)LITTORAL COMBAT SHIP*	**Project (Number/Name)** 4506 / *LCS Training*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
FY20 funding provides the development of advanced Immersive Virtual Ship Environment (IVSE) courseware and associated simulators to achieve the training objectives. (Additionally, after fielding these systems and courseware, RDT&E funds will be utilized to upgrade training to maintain conformity with LCS configurations and approved operational technical manuals and procedures. RDT&E funds are also used to test and evaluate training devices to verify compliance with requirements.) RDT&E funding provides NAWC TSD program management oversight while they complete the LCS deck operations (both variants), continue combat systems IVSE courseware and the combat systems part task trainer. (NAWC will continue the development of the VTUAV visual display trainer, oversee performance of the development effort, while providing additional support efforts to PMS 505). This funding also supports continued NAVFAC efforts preparing for additional small ship homeports required by the Strategic Laydown plan. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** IVSE Deck courseware completes in FY2020. All planned LCS Training Courseware products have been funded so although their development continues, FY20 funding will be focused on upgrading training to maintain conformity with LCS configuration.					
Accomplishments/Planned Programs Subtotals	19.442	15.777	1.153	0.000	1.153

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• OPN/5664: *Surface Training Equipment*	81.595	227.791	233.175	-	233.175	171.634	114.680	79.313	77.409	Continuing	Continuing

Remarks

PEO USC funding accounts for only a portion of the OPN 5664 line.

D. Acquisition Strategy

Per the combined LCS Navy Training System Plan (NTSP), the LCS core crew training concept will meet Train to Qualify and Train to Certify requirements incrementally, with expected completion in FY20. In the interim, individual qualifications for LCS crew members will be accomplished through a combination of vendor training, existing Navy training, new LCS courses and trainers that are presently online, and Under Instruction (U/I) time aboard LCS ships, prior to reporting for duty. Shore-based training requirements cannot be fully met with the interim LCS training strategy. Full realization will be achieved with the completed standup of the San

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603581N / *(U)LITTORAL COMBAT SHIP*	**Project (Number/Name)** 4506 / *LCS Training*

Diego LCS Training Facility (LTF), which includes the Integrated Tactical Trainers, Bridge, Readiness Control Officer (RCO), Combat Systems and Mission Package Training System (MPTS) part-task trainers, the Common Mission Package Trainer (CMPT), Mission Bay trainer and Virtual Reality Labs to support the Train to Qualify operations and maintenance pipeline courses.

E. Performance Metrics

T2Q will succeed and support mission accomplishment in the long run only if commanders have confidence that the output is valid, reliable, and standardized. To justify that confidence, training outcomes must mirror, and therefore predict, critical mission outcomes. To achieve that result a set of objective, performance-based measures, metrics, and standards is being developed for each watch station and billet requirement. For qualifications to be truly predictive, they must be guaranteed by the application of objective measures that vary little between evaluators. New courses such as the Surface Warfare Officers School (SWOS) LCS Officer of the Deck (OOD), Junior Officer of the Deck (JOOD) and the LCS Shore-Based Trainer Capstone courses have been designed to meet T2Q standards. Ultimately, success of the training acquisition strategy will be objectively validated by accomplishment of PQS by the sailors as determined by the IVSE and achievement of all requirements in the LCS Training Manual (TRAMAN) as assessed by LCS Squadrons and appropriate Afloat Training Groups (ATG).

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603581N / *(U)LITTORAL COMBAT SHIP*	**Project (Number/Name)** 4506 / *LCS Training*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Deck/Mission Bay Courseware	C/FFP	Cubic : Orlando, FL	1.878	0.000		2.550	Nov 2018	0.150	Nov 2019	-		0.150	0.000	4.578	-
Combat Systems Courseware	C/FFP	Cubic : Orlando, FL	14.200	10.062	Nov 2017	7.316	Nov 2018	0.150	Nov 2019	-		0.150	7.800	39.528	-
Eng. Training Coursware	C/FFP	Cubic : Orlando, FL	1.092	0.000		0.000		0.000		-		0.000	0.000	1.092	-
Training Development - Support	WR	NAWC/TSD : Orlando, FL	7.750	3.375	Nov 2017	0.587	Nov 2018	0.251	Oct 2019	-		0.251	Continuing	Continuing	Continuing
VTUAV/MH60	C/FFP	TBD : TBD	0.000	0.000		1.000	Mar 2019	0.178	Nov 2019	-		0.178	6.270	7.448	-
Combat System Part Task Trainer	C/FP	TBD : TBD	0.000	0.000		1.500	Mar 2019	0.000		-		0.000	0.000	1.500	-
Mission Bay Trainer	C/CPAF	Cubic : Orlando, FL	0.822	0.000		0.000		0.000		-		0.000	0.000	0.822	-
		Subtotal	25.742	13.437		12.953		0.729		-		0.729	Continuing	Continuing	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Human Systems Integration	WR	NSWC, DD : Dahlgren Virginia	0.524	0.180	Nov 2017	0.000		0.030	Nov 2019	-		0.030	Continuing	Continuing	Continuing
Information Assurance	WR	NSWC, DN : Dam Neck, VA	1.614	1.500	Nov 2017	1.500	Nov 2018	0.000		-		0.000	Continuing	Continuing	Continuing
Training ISEA	WR	NSWC/PHD : Port Huenume, CA	0.741	0.500	Nov 2017	0.000		0.194	Nov 2019	-		0.194	Continuing	Continuing	Continuing
Warfare Center SME/ NAVFAC	WR	VARIOUS : VARIOUS	0.067	0.170	Nov 2017	0.150	Nov 2018	0.050	Nov 2019	-		0.050	Continuing	Continuing	Continuing
		Subtotal	2.946	2.350		1.650		0.274		-		0.274	Continuing	Continuing	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603581N / *(U)LITTORAL COMBAT SHIP*	Project (Number/Name) 4506 / *LCS Training*	

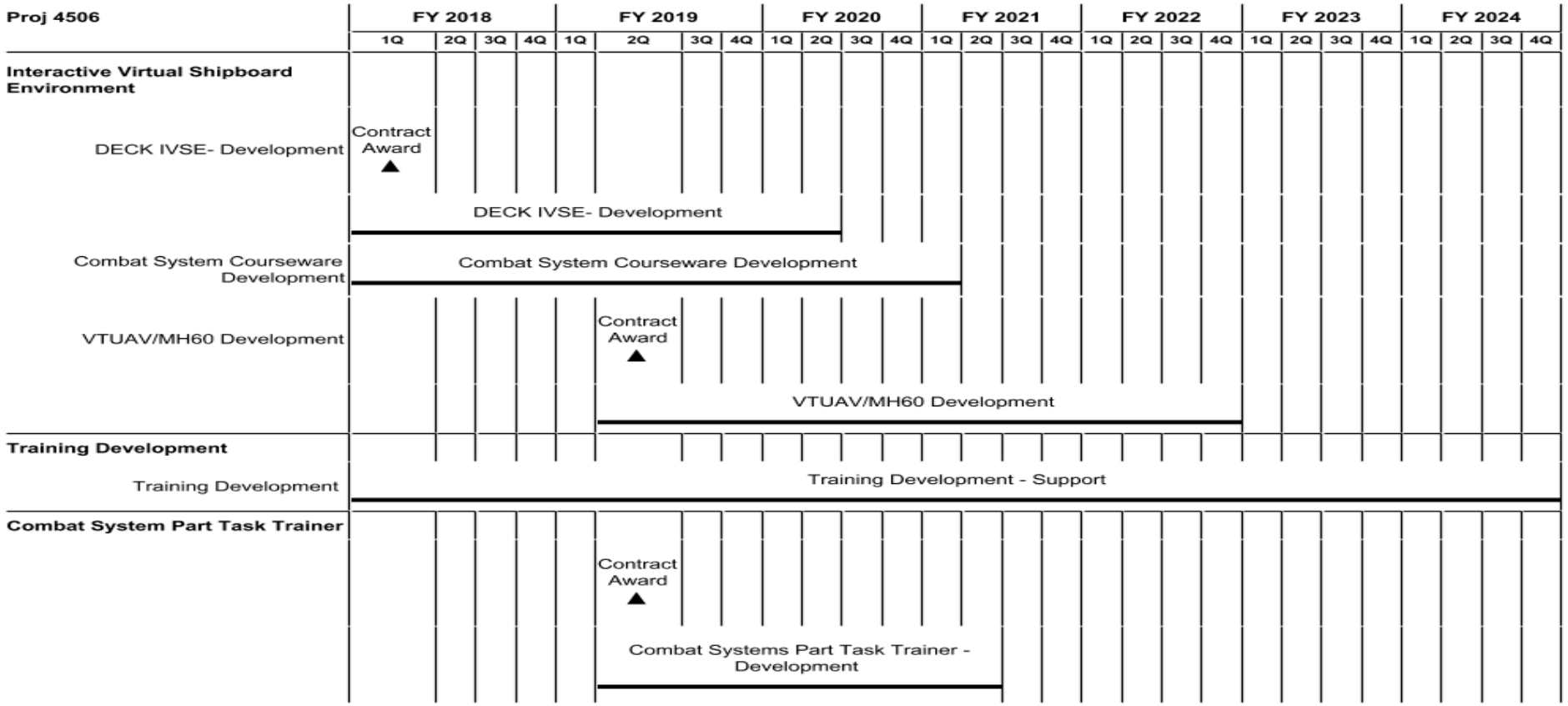
Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Management Support	C/CPAF	Various : Various	1.513	3.655	Mar 2018	1.174	Mar 2019	0.150	Nov 2019	-		0.150	Continuing	Continuing	Continuing
		Subtotal	1.513	3.655		1.174		0.150		-		0.150	Continuing	Continuing	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	30.201	19.442		15.777		1.153		-		1.153	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603581N / *(U)LITTORAL COMBAT SHIP*	**Project (Number/Name)** 4506 / *LCS Training*



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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603581N / *(U)LITTORAL COMBAT SHIP*	**Project (Number/Name)** 4506 / *LCS Training*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 4506				
Interactive Virtual Shipboard Environment: DECK IVSE- Development: DECK IVSE Contract Award	1	2018	1	2018
Interactive Virtual Shipboard Environment: DECK IVSE- Development: DECK IVSE-Development	1	2018	2	2020
Interactive Virtual Shipboard Environment: Combat System Courseware Development: Combat System Courseware Development	1	2018	1	2021
Interactive Virtual Shipboard Environment: VTUAV/MH60 Development: VTUAV/MH60 Contract Award	2	2019	2	2019
Interactive Virtual Shipboard Environment: VTUAV/MH60 Development: VTUAV/MH60 Development	2	2019	4	2022
Training Development: Training Development: Training Development - Support	1	2018	4	2024
Combat System Part Task Trainer: Combat Systems Part Task Trainer - Contract Award	2	2019	2	2019
Combat System Part Task Trainer: Combat Systems Part Task Trainer - Development	2	2019	2	2021

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603581N / *(U)LITTORAL COMBAT SHIP*	Project (Number/Name) 9999 / *Congressional Adds*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
9999: *Congressional Adds*	0.000	9.651	10.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	19.651
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Congressional Add funding will be used to develop advanced Immersive Virtual Ship Environment (IVSE)/ Virtual Reality (VR) courseware and associated simulators to achieve the training objectives. Funding will continue the Courseware development efforts of the LCS IVSE Deck Operations (both variants FREEDOM / INDEPENDENCE) and LCS IVSE Combat Systems Trouble Shooting Courseware (both variants FREEDOM / INDEPENDENCE).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019
Congressional Add: LCS Training Courseware	9.651	10.000
FY 2018 Accomplishments: Continued the Courseware development efforts of the LCS IVSE Deck Operations (both FREEDOM / INDEPENDENCE variants) and LCS IVSE Combat Systems Trouble Shooting Courseware (both FREEDOM / INDEPENDENCE variants).		
FY 2019 Plans: Continued the Courseware development efforts of the LCS IVSE Deck Operations (both FREEDOM / INDEPENDENCE variants) and LCS IVSE Combat Systems Trouble Shooting Courseware (both FREEDOM / INDEPENDENCE variants).		
Congressional Adds Subtotals	9.651	10.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

Immersive Virtual Ship Environment (IVSE) courseware development

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603581N / *(U)LITTORAL COMBAT SHIP*	**Project (Number/Name)** 9999 / *Congressional Adds*

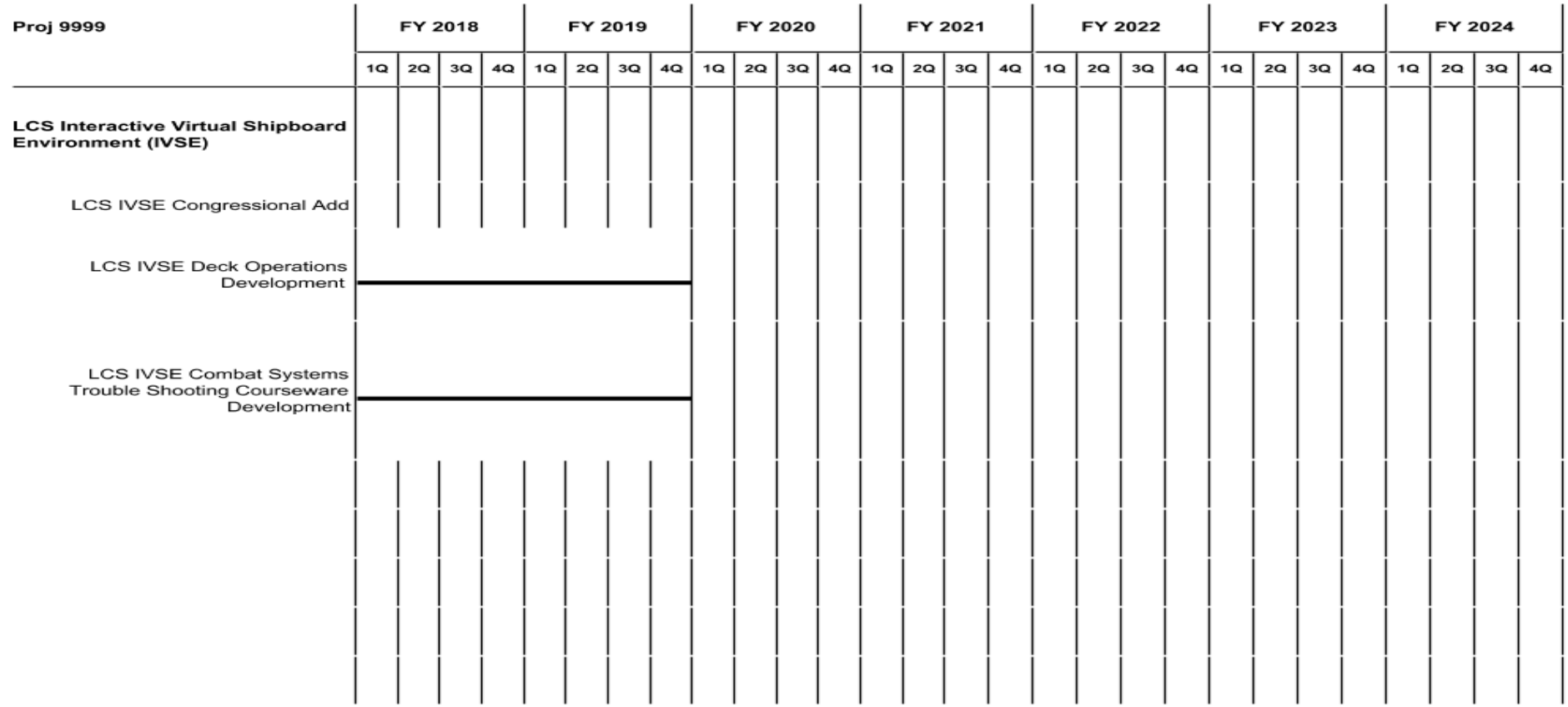
Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Deck/Mission Bay Courseware	C/FFP	Cubic : Orlando, FL	0.000	3.625	Jun 2019	3.763	Jun 2019	0.000		-		0.000	0.000	7.388	-
Combat Systems Courseware	C/FFP	Cubic : Orlando, FL	0.000	5.245	Jun 2018	5.445	Jun 2019	0.000		-		0.000	0.000	10.690	-
Training Development Support	WR	NAWC TSD : Orlando, FL	0.000	0.781	Jun 2018	0.792	Jun 2019	0.000		-		0.000	0.000	1.573	-
		Subtotal	0.000	9.651		10.000		0.000		-		0.000	0.000	19.651	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	9.651		10.000		0.000		-		0.000	0.000	19.651	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603581N / *(U)LITTORAL COMBAT SHIP*	**Project (Number/Name)** 9999 / *Congressional Adds*



2020PB - 0603581N - 9999

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603581N / *(U)LITTORAL COMBAT SHIP*	**Project (Number/Name)** 9999 / *Congressional Adds*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 9999				
LCS Interactive Virtual Shipboard Environment (IVSE): LCS IVSE Deck Operations Development: LCS IVSE Deck Operations Development	1	2018	4	2019
LCS Interactive Virtual Shipboard Environment (IVSE): LCS IVSE Combat Systems Trouble Shooting Courseware Development: LCS IVSE Combat Systems Trouble Shooting Courseware Development	1	2018	4	2019

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy											Date: March 2019	
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0603582N *I Combat System Integration*							
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
Total Program Element	408.784	15.471	16.351	17.251	-	17.251	16.015	15.509	15.826	16.142	Continuing	Continuing
0164: *Combat System Integration*	408.784	15.471	16.351	17.251	-	17.251	16.015	15.509	15.826	16.142	Continuing	Continuing

A. Mission Description and Budget Item Justification

Chief of Naval Operations (CNO) created the Navy's Strike Force Interoperability (SFI) program in 1998 in response to critical shortfalls in the introduction of integrated and interoperable System of Systems (SoS) to deploying Strike Forces. Interoperability concerns still exist today as new systems are introduced to the Fleet, interoperating with older systems, and the complexity of the Systems of Systems integration has continued to increase. These programs help prevent the situation that occurred in 1998 by catching those critical shortfalls before the systems are released to the Fleet. Warfighters depend on these programs on a daily basis to remove or reduce the interoperability risk associated with the systems they are tasked to operate. Commander, Naval Sea Systems Command (COMNAVSEA) acts as management lead for Joint System Command (SYSCOM) system certification policy and guidance and certifies platforms for interoperability within the platform and throughout the enterprise, in accordance with Commander, US Fleet Forces Command/Commander, Pacific Fleet COMUSFLTFORCOM/COMPACFLT) Ins. 4720.3C dated 18 SEP 2017 (C5ISR Modernization Policy). COMUSFLTFORCOM/COMPACFLT INST. 4720.3C also requires that COMNAVSEA act as administrative agent for Naval Information Forces (NAVIFOR) Command and Control, Communications, Computers, Combat Systems, Intelligence, Surveillance and Reconnaissance Modernization Process (C5IMP), and execution agent for Navy Command and Control, Communications, Computers, Combat Systems, Intelligence, and Surveillance and Reconnaissance Modernization Council (NCMC). This program conducts Interoperability Assessments that are required to certify Aircraft Carriers, Amphibious Assault Ships, and Surface Combatants in accordance with the Naval Warfare System Certification Policy (NWSCP) NAVSEAINST 9410.2A, NAVAIR 5230.20, AND SPAWAR 5234.1). The SFI program ensures overall Strike Force Interoperability is characterized and assessed. COMNAVSEA is assigned central United States Navy (USN) responsibility for interoperability, directing the development of policy and architecture for Strike Force Warfare Systems engineering and implementation of common warfare systems engineering processes.

There are three priorities within the Strike Force Interoperability Program:

(1) Support Fleet "as-is" state which includes Navigation System Certification (NAVCERT), Strike Group Interoperability (SGI) Capabilities & Limitations (CAPS&LIMS), and Interoperability Tactical Information Coordinator Technical Aids (TIC TECHAIDs). These functions provide the critical review, assessment and documentation to properly inform the warfighter of the status of the interoperability for the systems they operate.

(2) Support Ship's system modernization (non-HME) including warfighting capability & other C5I upgrades including C5IMP Baseline Management. These functions ensure the warfighter is provided integrated and interoperable fielded systems to fulfill mission success.

(3) Support Ship Warfare System Certification & Force Level Assessments. This includes Warfare Systems Certification, Interoperability Certification, Force Level Interoperability Analysis, & Assessments, Cybersecurity Assessments and recommendations for improvements to the program offices for implementation at the systems'

level. This critical function provides the confidence to the warfighter they are getting the best possible systems and that through the certification process the systems have been properly tested and assessed to ensure the best possible interoperability.

Project 0164 Combat System Integration:
This project consists of five key Pillars executed within the Strike Force Interoperability (SFI) Program:

(1) Command & Control, Communications, Computer, Combat Systems, Intelligence, Surveillance and Reconnaissance (C5ISR) Modernization Process (C5IMP). The C5IMP validates the introduction of new systems and upgrades to existing systems into the fleet and ensures systems' maturity prior to shipboard installation thereby reducing risk and enhancing readiness and effectiveness of deploying ships and strike groups.

(2) Warfare Systems Certification (WSCERT), which is essential to validating the maturity and operational performance of warfare systems prior to Fleet delivery and deployment.

(3) The integrated Navigation System Certification (NAVCERT) program certifies the shipboard integrated navigation suite for safe navigation using the Electronic Charting and Display Information System Navy (ECDIS-N) as the primary plot. To support Strike Force Interoperability and ship's mission requirements, it ensures that the installed integration navigation suite provides accurate and timely navigation information (position, velocity, speed, heading, roll, and pitch) to all navigation data consumers (Warfare/Weapons Systems, Control Systems, and precision approach and landing systems). This ensure the safe maneuver of naval forces to execute missions throughout the full spectrum of conflict.

(4) Interoperability Certification and Assessment (IOP C&A) is the critical independent assessment of strike group warfare systems operational performance. Interoperability assessment examines force level engagement threads, aircraft control, air battle management, and operational displays to ensure the warfighter is being provided the most interoperable systems available. Assessments of deploying ships in strike force configurations are accomplished through the use of the Navy's Distributed Integration and Interoperability Assessment Capability (DIIAC) which supports the Deputy Assistant Secretary of the Navy (DASN) "shift to the left" policy by providing early interoperability testing in the acquisition lifecycle. It is a Commander, U.S. Fleet Forces Command (CFFC) and Commander U.S. Pacific Fleet (COMPACFLT) requirement that all strike forces undergo interoperability assessment testing in the DIIAC prior to deployment. The support for DASN and requirements of the combatant commander cannot be accomplished without the full funding of these programs. Interoperability certification results are used to develop fleet tactical tools (Capabilities & Limitations (C&L) documentation and Tactical Information Coordinator Technical Aids (TIC TECHAIDS)) on which the warfighters rely daily, that ensure that systems' operators understand the interoperability capabilities and limitations of their combat systems, as well as all units within the networked architecture, and have the watch station tools necessary for the execution of their tactical responsibilities. These are Fleet desired and NAVSEA required programs that must be fully funded to ensure the warfighter awareness of Strike Force Interoperability.

(5) Cybersecurity Certification and Assessment (CYBER C&A), the assessment of systems' cybersecurity, as directed by OPNAV memorandum 5400 Ser N2N6/4U1119089, including compliance with DODi 8500.01 for each warfare system element, identifies vulnerabilities at both the element, system and enclave levels, and assesses a ship's IT/IA Cybersecurity posture in support of Warfare Systems Certification IAW the NAVSEAINST 9410.2 (series). Assessments of deploying ships in strike force configurations for its Cybersafe Readiness are accomplished through the use of the Navy's USS Secure environment leveraging existing navy labs

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0603582N *I Combat System Integration*

and DOD Cyber Ranges and Fleet exercises using the cyber table top technique, red team, blue team, and cyber specific metrics/measure analysis to evaluate the system's and enclaves' ability to detect, react and response to achieve its warfare mission requirement. System commands and programs of record also use these cyber assessments to guide their development of specific procedures for immediate response to cyber threats while maintaining maximum operational effectiveness. The cyber assessment results and ship systems and enclaves response procedures are also used to develop Fleet Cyber Tactical Tools (Capabilities & Limitations (CC&L) documentation and Cyber Tactical Technical Aids (CYBER TECHAIDS)), to ensure that systems' operators understand the capabilities and limitations of their combat systems and have the watch station tools necessary for the execution of their tactical responsibilities under various cyber threat conditions.

B. Program Change Summary ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	24.674	16.351	27.921	-	27.921
Current President's Budget	15.471	16.351	17.251	-	17.251
Total Adjustments	-9.203	0.000	-10.670	-	-10.670
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.403	0.000			
• Program Adjustments	0.000	0.000	-10.670	-	-10.670
• Rate/Misc Adjustments	0.000	0.000	0.000	-	0.000
• Congressional Directed Reductions Adjustments	-8.800	-	-	-	-

Change Summary Explanation

FY18: Funding reduced by $4.400M due to Proj 3425 Digital Warfare Office (DWO) moved to new RDT&EN PE 0604027N.
FY18: Funding reduced by $4.400M due to Digital Warfare Office (DWO) program termination within Proj 0164 Combat System Integration.
FY18: Funding reduced by $0.403M to support the Small Business Innovative Research (SBIR) program.
FY20: Program reduced to support higher departmental needs.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy											Date: March 2019	
Appropriation/Budget Activity 1319 / 4					R-1 Program Element (Number/Name) PE 0603582N / *Combat System Integration*				Project (Number/Name) 0164 / *Combat System Integration*			
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
0164: *Combat System Integration*	408.784	15.471	16.351	17.251	-	17.251	16.015	15.509	15.826	16.142	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Project 0164: Combat System Integration:

This project consists of five key Pillars executed within the Strike Force Interoperability (SFI) Program:

(1) Command & Control, Communications, Computer, Combat Systems, Intelligence, Surveillance and Reconnaissance (C5ISR) Modernization Process (C5IMP). The C5IMP validates the introduction of new systems into the fleet and ensures systems' maturity prior to shipboard installation thereby reducing risk and enhancing readiness and effectiveness of deploying ships and strike groups.

(2) Warfare Systems Certification (WSCERT), which is essential to validating the maturity and operational performance of warfare systems prior to Fleet delivery and deployment.

(3) The integrated Navigation System Certification (NAVCERT) program certifies the shipboard integrated navigation suite for safe navigation using the Electronic Charting and Display Information System Navy (ECDIS-N) as the primary plot. To support Strike Force Interoperability and ship's mission requirements, it ensures that the installed integration navigation suite provides accurate and timely navigation information (position, velocity, speed, heading, roll, and pitch) to all navigation data consumers. This supports the following mission critical functions: pre-launch aircraft alignment, safe aircraft precision approach and landing operations, and accurate warfare/weapon systems targeting.

(4) Interoperability Certification and Assessment (IOP C&A), the independent assessment of strike group warfare systems operational performance. Interoperability assessment examines force level engagement threads, aircraft control, air battle management, and operational displays. Assessments of deploying ships in strike force configurations are accomplished through the use of the Navy's Distributed Integration and Interoperability Assessment Capability (DIIAC) which supports the Deputy Assistant Secretary of the Navy (DASN) "shift to the left" policy by providing early interoperability testing in the acquisition lifecycle. It is a Commander, U.S. Fleet Forces Command (CFFC) and Commander U.S. Pacific Fleet (COMPACFLT) requirement that all strike forces undergo interoperability assessment testing in the DIIAC prior to deployment. Interoperability certification results are used to develop fleet tactical tools (Capabilities & Limitations (C&L) documentation and Tactical Information Coordinator Technical Aids (TIC TECHAIDS)), that ensure that systems' operators understand the interoperability capabilities and limitations of their combat systems and have the watch station tools necessary for the execution of their tactical responsibilities.

(5) Cybersecurity Certification and Assessment (CYBER C&A), the assessment of systems' cybersecurity, as directed by OPNAV memorandum 5400 Ser N2N6/4U1119089, including compliance with DODi 8500.01 for each warfare system element, identifies vulnerabilities at both the element, system and enclave levels, and assesses a ship's IT/IA Cybersecurity posture in support of Warfare Systems Certification IAW the NAVSEAINST 9410.2 (series). Assessments of deploying

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ships in strike force configurations for its Cybersafe Readiness are accomplished through the use of the Navy's USS Secure environment leveraging existing navy labs and DOD Cyber Ranges and Fleet exercises using the cyber table top technique, red team, blue team, and cyber specific metrics/measure analysis to evaluate the system's and enclaves' ability to detect, react and response to achieve its warfare mission requirement. System commands and programs of record also use these cyber assessments to guide their development of specific procedures for immediate response to cyber threats while maintaining maximum operational effectiveness. The cyber assessment results and ship systems and enclaves response procedures are also used to develop Fleet Cyber Tactical Tools (Capabilities & Limitations (CC&L) documentation and Cyber Tactical Technical Aids (CYBER TECHAIDS)), to ensure that systems' operators understand the capabilities and limitations of their combat systems and have the watch station tools necessary for the execution of their tactical responsibilities under various cyber threat conditions.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Navigation System Certification (NAVCERT)	1.069	1.335	1.117	0.000	1.117
Articles:	-	-	-	-	-

Description: Modern warfare systems installed in US Navy ships require accurate position and time to achieve required effects. At the strike force level, accurate position and time are required to enable interoperability of warfighting systems of systems. The Integrated Navigation Suite Certification (NAVCERT) pillar of SFI certifies the accuracy of ship's position information, and verifies that it is properly distributed to sensors and weapons systems installed in US Navy ships. Certification is required at five-year intervals, following Chief of Naval Operations Availabilities greater than six months, in support of Precision Approach and Landing System (PALS) certification, or when configuration changes have been made to the ships integrated navigation suite. Certification testing verifies the accuracy of sensors that determine heading, velocity, attitude, and position; and validates receipt of navigation data by all- consuming systems including Integrated Warfare (or Mission) Systems, Aircraft Inertial Alignment System, and Control Systems. The scope of the certification includes all inertial navigation system equipment as well as the Electronic Chart Display and Information System - Navy (ECDIS- N). Forecasting out year NAVCERT requirements is based on the projection of expiring certifications, scheduled maintenance availabilities, and modernization of installed integrated navigation systems. Wherever possible, the program leverages integrated navigation suite modernization efforts to reduce overall program costs.

FY 2019 Plans:
Conduct 36 scheduled NAVCERTs on Cruisers, Destroyers, Aircraft Carriers, and Amphibious Ships. Verify accuracy of ships heading, velocity, attitude, and position data and validated receipt by all integrated warfare systems. Document discrepancies and assess risk to safety of navigation and warfighting missions.

FY 2020 Base Plans:
Conduct 24 scheduled NAVCERTs on Cruisers, Destroyers, Aircraft Carriers, and Amphibious Ships. Verify accuracy of ships heading, velocity, attitude, and position data and validated receipt by all integrated warfare systems. Document discrepancies and assess risk to safety of navigation and warfighting missions. Conduct

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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
scheduled NAVCERTS on USN Surface ships. Continue to achieve cost efficiencies by leveraging test results from conjunctive alterations to navigation systems during modernization periods. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Decrease due to lower amount of NAVCERTs.					
Title: Command , Control, Communications, Computers, Combat Systems, Intelligence, Surveillance and Reconnaissance (C5ISR) Modernization Process (C5IMP) ***Articles:*** ***Description:*** Achieving and maintaining Strike Force Interoperability requires disciplined engineering, system integration, and configuration management at both the platform (ship or shore station) and strike force level (Carrier Strike Group/ Amphibious Readiness Group). The Command, Control, Communications, Computers, Combat Systems, Intelligence, Surveillance, Reconnaissance (C5ISR) Modernization Program (C5IMP) pillar of SFI ensures deploying strike force ships receive modernized and interoperable warfighting capabilities in order to meet theater operational requirements. This project funds engineering assessments of proposed C5I capability improvements to determine maturity for installation as well as technical and schedule risk associated with proposed hardware and software changes. This project directly supports requirements of the Fleet C5I Modernization Policy (per COMUSFLTFORCOM/COMPACFLT Inst. 4720.3) which assigns responsibilities to NAVSEA 05H to assess operational risks associated with C5ISR modernization in both afloat and ashore units in support of the Optimized Fleet Response Plan (OFRP). The deliverables of this project are created by determining the maturity, through engineering analysis, of the critical linchpins needed to achieve interoperability for each proposed C5IMP capability improvement item to be installed in a ship's baseline, developing installation recommendations of C5I system upgrades for the Fleet Commanders, and researching and analyzing installation or operating problems. Failure to achieve required maturity for one system that is part of an interoperable warfare system package can prevent this system from being installed, thus breaking the capability planned for the entire original warfare package, which will impact Strike Group warfighting capabilities. There is close coordination with the FLTCDRs and TYCOMs as well as other members of the C5IMP community to address, coordinate, and resolve C5IMP modernization issues thereby reducing risk and enhancing readiness and effectiveness of deploying ships and strike groups. Focus is on key milestones such as Baseline Locking Events (BLEs) and Planned Not Authorized (PNA) reviews, and SG/ARG Analysis Reports which are Fleet required events. The BLEs, PNA Reviews, and SG/ARG Analysis Reports are the primary work products in the C5IMP process. Additionally, due to emerging warfighting requirements and the development of required hardware and	1.834 -	2.093 -	2.208 -	0.000 -	2.208 -

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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
software changes between CNO Availability periods, an electronic change control board has been developed (BFI-CCB) to facilitate the request, review and approval of proposed Baseline changes. Forecasting C5ISR requirements and schedules is based on the projection of ships' operating/maintenance schedules at the particular point in time. Due to changing operational needs, these schedules frequently change causing availability extensions, deferrals, cancellations, or delays. The supporting C5IMP/C5ISR schedules must adjust accordingly, resulting in regular modifications to the numbers of events/requirements projected for C5IMP/C5ISR from period to period. C5ISR Configuration Control is maintained and updated continuously for every ship. Maintenance of the Afloat Master Planning System (AMPS) data for the approximately 285 active Battle Force ships, along with establishing initial configurations for the New Construction ships entering the Fleet each year is essential and a major effort. This data is extracted and formatted to develop the BLE and PNA Review presentations which enable the Fleet commanders and TYCOMs to make informed modernization decisions. Additionally, numerous data calls are requested each month to answer configuration queries and perform studies utilizing AMPS data. CUSFFC/CPF Instruction 4720.3C designates NAVSEA 05H4 as the executing agent for the two NCMCs held each year. This requires C5IMP personnel to make all logistical and administrative arrangements for the 150+ attendees, collect and present all briefs, set up VTC and phone centers for remote attendees, and maintain all associated records for these councils. Fleet Commanders, TYCOMs, SYSCOMs and supporting personnel gather at NCMCs to discuss advance plans, coordinate near term modernization plans, coordinate shore and shipboard installations to ensure support prior to deployments, resolve schedule issues and establish priorities. Action items are recorded and tracked by NAVSEA, and major issues are reported to a joint FFC/CPF flag/SES panel. ***FY 2019 Plans:*** 1. Facilitate reviews, assessments, and execution of C5ISR installations during approximately 76 CNO Availabilities. 2. Review approximately 700 warfare system Ship Change Documents. Assess impact to Strike Force Interoperability. Create and maintain database entries for approximately 1,000 new software and hardware upgrades to be entered and tracked in the Afloat Master Planning System (AMPS), the fleets authoritative database for C5I modernization. 3. Plan and execute two 2 NCMCs. Identify and resolve fleet warfare system modernization issues. 4. Conduct 12 Monthly Baseline Locking Events where 92 Ships' Baselines will be reviewed and locked and 12 monthly PNA Review Meetings where the PNA status of 82 Ships will be reviewed.					

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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
5. Provide 2 SG/ARG Analysis Reports. Analyze assigned strike force mission areas. Identify misalignments in warfare system modernization planning that result in strike force interoperability issues that degrade primary/ secondary missions and develop recommendations to resolve. 6. Evaluate, comment on, and process approximately 2300 proposed Baseline changes via the Electronic Change Control Board process (BFI-CCB). These changes will include requests for addition of new hardware and software to ships, deletion from planned installations, and TCD Waiver requests. 7. Establish initial warfare system baselines for 9 new construction ships.					
FY 2020 Base Plans: 1. Facilitate reviews, assessments, and execution of C5ISR installations during approximately 81 CNO Availabilities. 2. Review approximately 820 warfare system Ship Change Documents. Assess impact to Strike Force Interoperability. Create and maintain database entries for approximately 1,300 new software and hardware upgrades to be entered and tracked in the Afloat Master Planning System (AMPS), the fleets authoritative database for C5I modernization. 3. Plan and execute 2 NCMCs. Identify and resolve fleet warfare system modernization issues. 4. Conduct 12 Monthly Baseline Locking Events where 105 Ships' Baselines will be reviewed and locked and 12 monthly PNA Review Meetings where the PNA status of 94 Ships will be reviewed. 5. Provide 2 SG/ARG Analysis Reports. Analyze assigned strike force mission areas. Identify misalignments in warfare system modernization planning that result in strike force interoperability issues that degrade primary/ secondary missions and develop recommendations to resolve. 6. Evaluate, comment on, and process approximately 2500 proposed Baseline changes via the Electronic Change Control Board process (BFI-CCB). These changes will include requests for addition of new hardware and software to ships, deletion from planned installations, and TCD Waiver requests. 7. Establish initial warfare system baselines for 8 new construction ships.					
FY 2020 OCO Plans: N/A					
FY 2019 to FY 2020 Increase/Decrease Statement: Increase due to increase in size of fleet as well as increase in number of C5I changes planned/proposed. CNO availabilities increase by 5%, C5I Ship Change Documents increases by 17%, and proposed C5I changes to ships warfare systems increases by 13%. Additionally, revised COMUSFLTFORCOM/COMPACFLT Instruction 4720.3 tasks NAVSEA to perform Strike Group/ Amphibious Readiness Group (SG/ARG) Analysis to identify					

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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
misalignments in warfare system modernization planning that result in strike force interoperability issues that degrade primary/secondary missions.					
Title: Interoperability Certification and Assessment	8.870	10.469	11.336	0.000	11.336
Articles:	-	-	-	-	-
Description: This warfare critical project funds interoperability assessments via the Distributed Integration & Interoperability Assessment Capability (DIIAC), the technical assessment of interoperable systems to meet mission requirements, the updating of Strike Group Capabilities and Limitations (C&L) and the updating of the Tactical Information Coordinator Technical Aids (TIC TECHAIDs). The project ensures NAVSEA/PEOs are delivering mature and interoperable warfare systems at the platform and Strike Group levels to the warfighter, with NAVSEA providing Strike Force interoperability certification and assessments. This project focuses on force-level impact of new systems and platforms under development. Interoperability Assessments of deploying ships in Strike Force configurations are accomplished through the utilization of the Navy's DIIAC, located at multiple Navy land-based sites located across the country and connected via networking technology, and that provides operational configurations for all naval combat systems. It is a U.S. Fleet Forces Command requirement that all Strike Forces undergo Interoperability Assessment Testing in the DIIAC prior to deployment. The DIIAC provides the only opportunity for comprehensive interoperability testing of combat system and C5I configuration items prior to shipboard delivery for operational use in surface combatant platforms and Strike Groups. DIIAC, with its ability to test systems in a Strike Group environment, is funded to support the warfare system's acquisition community to test their developmental items for interoperability. However, in this instance, while funds are provided to test the item in a Strike Group environment, funds are not provided for subsequent data analysis and risk assessment, as this is the cognizant acquisition program's responsibility. When the acquisition development is complete and corrections are made, DIIAC will then fund for the full interoperability certification testing of the baseline to include the requisite warfare system analysis and risk assessments needed to obtain an Interoperability Certification. Note, this effort also supports and feeds into the development of Fleet Tactical Tools such as Capabilities & Limitations (C&L) and Tactical Information Coordinator Technical Aids (TIC TECHAIDs), which are relied on daily to ensure that operators/warfighters understand the interoperability capabilities and limitations of their combat and C5I systems. C&Ls are published for all Strike Groups, Independent Deployers, and (when funded) their Coalition and Joint partners. TIC TECHAIDS are delivered to deploying Carrier Strike Groups (CSG's), Amphibious Ready Group (ARG's) and Independent Deployers prior to workups and then a final copy is provided prior to deployment. C&L and TIC TECHAIDS are the final report-out to Fleet operators/warfighters of the acquisition community's efforts. They are used on a daily basis and relied upon in every operational theater,					

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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
as well as in every Navy and Joint Schoolhouse. Note, the DIIAC infrastructure is available, but not funded to support the surface Navy's participation in the Joint Testing Environments as well as the Maritime Theater Missile Defense (MTMD) Coalition Forces interoperability testing. ***FY 2019 Plans:*** 1. Conduct 3 Interoperability Land-Based test events including the following: -Development interoperability test to support for ACS 7.2.3 (IFF Mode 5 only); AEGIS 5.4; ACS 9.C2.1 (B27); ACS 9.A2.1 (B27); ACS 9.C2.2 (B30); SSDS 10.11.00; SSDS 6.06.04 (IFF Mode 5 only); SSDS 9.08.06 (IFF Mode 5 only); LCS Freedom BL 3.1 QA8 (IFF Mode 5 only); and DDG 1000 (B8.5) -Certification Interoperability test for ACS 9.C2.1 (B27); ACS 9.A2.1 (B27); SSDS 10.11.01; and DDG 1000 (B8.5) -Certification Interoperability Risk assessment & Report for ACS 9.C2.0 (B24) and ACS 7.2.2 (IFF Mode 4 Inoculation); ACS 7.2.3 (IFF Mode 5) 2. Complete C&L and TIC TECHAIDS, normally a near constant yearly demand requirement, also addressed AEGIS Ashore. This will result in updates to Interoperability C&L for: -23 Deploying Strike Group Ships (from a database containing 185 U.S. Surface Ships), -10 Naval Air Squadrons (covering F/A-18s, F-35, E-2Cs, E-2Ds, MH-60Ss, MH-60Rs, EA-6Bs, EA-18Gs, P-3Cs and P-8As), -AEGIS Ashore (Romania, Poland(update) and Pacific Missile Range Facility(update). 3. Provide annual deliveries of Initial/Draft/Final TIC TECHAIDS to: -3 Carrier Strike Groups (CSG's) Sixteen (16) Ships -4 Amphibious Ready Group's (ARG's) Eight (8) Ships -31 BMD Ships -14 Forward Deployed Naval Force (FDNF) Ships -53 Independent Deploying Ships (CVN, CG, DDG, LCCS and LCS) -Aegis Ashore Site (Romania) -Four (4) Fleet Area Control and Surveillance Facilities (FACSFAC's) -Six (6) Fleet Maritime Operations Centers (MOC's) sites. 4. Plan to conduct engineering to support two (2) systems Verification and Validation Tests. ***FY 2020 Base Plans:*** 1. Conduct 3 Interoperability Land-Based test events including the following: -Development interoperability test to support for ACS 9.C2.2 (B30); SSDS 10.11.02 (CVN Configuration); SSDS B/L 11.X (ACB 20); and DDG 1000 (B8.7)					

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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
-Certification Interoperability test for ACS 9.C2.2 (B30); AEGIS 5.4; SSDS 10.11.02 (CVN Configuration); and DDG 1000 (B8.7) -Certification Interoperability Risk assessment & Report for ACS 9.C2.1 (B27); ACS 9.A2.1 (B27); AEGIS 5.4; SSDS 10.11.01; SSDS 6.06.04 (IFF Mode 5 only); SSDS 9.08.06 (IFF Mode 5 only); LCS Freedom BL 3.1 QA8 (IFF Mode 5 only); and DDG 1000 (B8.5) (Note: Testing of all new Combat Systems will include IFF Mode 5 testing) ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increase due to requirement growth in full baselines receiving test and IOP Certification (two full IOP certs completing in FY19, five full IOP certs completing in FY20) and increase in test and IOP certification of back fit installs of IFF Mode 5 (one IFF Mode 5 IOP Cert completes in FY19, three IFF Mode 5 IOP certs complete in FY20).					
Title: Warfare Systems Certification	2.725	2.454	2.590	0.000	2.590
Articles:	-	-	-	-	-
Description: Strike Force Interoperability (SFI) begins with properly engineered warfare systems installed in US Navy Ships. The Warfare Systems Certification (WSCERT) pillar of SFI certifies that modernized warfare systems are ready for installation, properly installed, and meet warfighting mission area requirements, to include the systems' interoperability and functional integration within the Strike Force that enables successful mission accomplishment. It funds the collection and independent technical assessment of that interoperability and integration using empirically derived Objective Quality Evidence (OQE) that installed warfare systems meet required performance specifications. Using established evaluation criteria, the project assesses the maturity of proposed warfare system modernizations prior to installation and certifies readiness of modernized warfare systems for operational deployment in ships, either independently or as components of Carrier/Expeditionary Strike Groups. When evaluation criteria are not met, the program funds the development and approval of operational risk assessments. This includes conducting an analysis of all work-arounds documented in Tactics, Techniques, and Procedures (TTPs), Capabilities & Limitations (C&L), and Trouble Reports (TR) to ensure that aggregate deficiencies and work-arounds do not render the warfare system, to include the operator, ineffective. NAVSEA accomplishes these efforts through a sequential series of technical reviews that begin 18-36 months prior to a scheduled modernization of a ship's warfare system, which includes development of a Warfare System Certification Plans (WSCP), conduct of Warfare Systems Certification Readiness Reviews (WSCRR), conduct					

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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
of Warfare Systems Installation Assessments (WSIA), and prior to deployment, conduct of a Warfare Systems Certification Decisions (WSCD). ***FY 2019 Plans:*** 1. Develop, analyze and maintain scheduling and installation data required for the conduct of Warfare Systems Certification events for a subset of 20 Criteria for 101 ships, including efforts for the conduct of approximately 163 Warfare Systems Certification Events (WSIAs, and WSCDs), and development of 77 WSCPs for applicable ship classes. (Planned Certification Event increases enabled by efficiencies developed and implemented in FY18.) 2. Update the current NWSCP instruction and implement the resulting revised Naval Warfare Systems Certification Policy. 3. Continue to strive for further WSCERT execution efficiencies through workforce streamlining initiatives, criteria management and consolidation of WSCERT events, and improved knowledge management tools. FY19 Goal is to achieve efficiencies of 5%. ***FY 2020 Base Plans:*** 1. Develop, analyze and maintain scheduling and installation data required for the conduct of Warfare Systems Certification events for a subset of 20 criteria for 110 ships, including efforts for the conduct approximately 130 Warfare Systems Certification Events (WSIAs, and WSCDs) and development of WSCPs for applicable ship classes. 2. Full implementation and assessment of efficiencies identified in FY19. 3. Continue to strive for WSCERT execution efficiencies through workforce streamlining initiatives, criteria management and consolidation of WSCERT events. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increase due to 10% increase in number of ships requiring certification events, and maintaining the associated configuration, installation schedules, and Strike Group composition associated with that increase along with the other 101 ships. Related, but less significant are the annual events' costs adjustments from the previous year. Full impact of increased number of certification events mitigated in part through efficiencies identified in FY19.					
Title: Warfare Systems Cybersecurity	0.973	0.000	0.000	0.000	0.000
Articles:	-	-	-	-	-

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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Description: The required assessment and characterization of aggregate levels of risk for ships is specified to be accomplished at the Warfare Systems System of Systems (SoS) level and will be part of the requirements identified in the Naval Warfare Systems Certification of Navy Aircraft Carriers and Surface Combatants. Cybersecurity assessment activities began FY16. Cybersecurity Assessment at the SoS level will entail: 1. Establishing and collecting metrics to characterize Warfare Systems ability to protect, detect, react, and restore capabilities, as well as analyze the mission effects induced by the cyber threat activity. 2. Maintain, improve and refine the methodologies, tools, and techniques used to conduct such risk assessments appropriate to ship warfare systems baselines and representative strike group interoperability requirements. 3. Conduct an assessment of developmental and operational warfare systems. ***FY 2019 Plans:*** N/A ***FY 2020 Base Plans:*** N/A ***FY 2020 OCO Plans:*** N/A					
Accomplishments/Planned Programs Subtotals	15.471	16.351	17.251	0.000	17.251

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• OPN 2960: *ICSTF: Integrated Combat System Test Facility*	5.019	6.251	6.167	-	6.167	5.981	6.135	6.276	0.000	0.000	79.751

Remarks

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D. Acquisition Strategy

RDTEN funding under this line supports independent certification of the integration of major capability upgrades acquired by Program Executive Offices (PEOs) into host Navy Platforms and Strike Forces. The RDTEN engineering and certification activities at field sites do not involve direct procurement of equipment or engineering services, and hence no acquisition strategy is required. The major capability upgrades evaluated under this program fall under their associated PEOs' acquisition strategies.

E. Performance Metrics

Quarterly Program Reviews and Baseline Assessments

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
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Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
SF Requirements Engineering & Analysis	WR	NSWCs : DN/PHD/ Corona	5.157	0.000		0.000		0.000		-		0.000	0.000	5.157	-
SF Requirements Engineering & Analysis	WR	Non-NSWCs : Various	5.295	0.000		0.000		0.000		-		0.000	0.000	5.295	-
Platform/Strike Force Certification	WR	NSWCs : DD/ICSTD/ DN/Corona	39.732	0.000		0.000		0.000		-		0.000	0.000	39.732	-
Platform/Strike Force Certification	WR	Non-NSWCs : Various	27.843	0.000		0.000		0.000		-		0.000	0.000	27.843	-
Fleet Response Plan (FRP)	WR	NSWCs : DD/PHD/ DN	27.030	0.000		0.000		0.000		-		0.000	0.000	27.030	-
Fleet Response Plan (FRP)	WR	Non-NSWCs : Various	3.793	0.000		0.000		0.000		-		0.000	0.000	3.793	-
Combat Systems Cert ISO Platform Cert	WR	NSWCs : DN/DD/ PHD/Corona	24.640	0.000		0.000		0.000		-		0.000	0.000	24.640	-
Combat Systems Cert ISO Platform Cert	WR	Non-NSWCs : Various	1.853	0.000		0.000		0.000		-		0.000	0.000	1.853	-
C5IMP & Fleet Readiness	WR	NSWCs : PHD	12.262	1.834	Nov 2017	2.700	Nov 2018	2.407	Nov 2019	-		2.407	Continuing	Continuing	Continuing
C5IMP & Fleet Readiness	C/CPFF	Non-NSWCs : Various	0.000	0.240	Dec 2017	0.209	Dec 2018	0.366	Dec 2019	-		0.366	0.000	0.815	-
Warfare Systems Certification	WR	NSWCs : DD/Crane	18.132	0.371	Nov 2017	0.308	Nov 2018	0.342	Nov 2019	-		0.342	Continuing	Continuing	Continuing
Warfare Systems Certification	WR	Non-NSWCs : Various	3.500	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
CNI/Design Agent	SS/CPAF	General Dynamics : Not Specified	47.926	0.000		0.000		0.000		-		0.000	0.000	47.926	-
CNI/Software Engineering	WR	NSWC : Dahlgren	8.383	0.000		0.000		0.000		-		0.000	0.000	8.383	-
CNI/Test and Evaluation	WR	CDSA : Not Specified	3.922	0.000		0.000		0.000		-		0.000	0.000	3.922	-
CNI/Systems Engineering	WR	NSWC : PHD	2.645	0.000		0.000		0.000		-		0.000	0.000	2.645	-
CNI/Miscellaneous	WR	Various : Not Specified	7.529	0.000		0.000		0.000		-		0.000	0.000	7.529	-
OA Automated Test and Retest	WR	NSWCs : Various	17.500	0.000		0.000		0.000		-		0.000	0.000	17.500	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603582N / *Combat System Integration*	Project (Number/Name) 0164 / *Combat System Integration*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Contract Engineering Support	C/CPFF	Gryphon Technology : VA	35.984	0.991	Jan 2018	4.410	Jan 2019	0.000		-		0.000	Continuing	Continuing	Continuing
Contract Program Management Support	C/CPFF	Delta Resources Inc. : VA	8.141	0.325	Jan 2018	0.000		0.377	Jan 2020	-		0.377	0.000	8.843	-
Travel	Allot	NAVSEA HQ : Washington, DC	2.351	0.020	Jan 2018	0.019	Jan 2019	0.025	Jan 2020	-		0.025	0.000	2.415	-
Interoperability Fixes	WR	NSWCs : Various	1.500	0.000		0.000		0.000		-		0.000	0.000	1.500	-
TIC TECHAIDS	WR	CSC : VA	0.000	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Warfare Systems Cybersecurity	WR	NSWCs : PHD, Dahlren & Corna	4.435	0.973	Jan 2018	0.000	Jan 2019	0.000		-		0.000	0.000	5.408	-
Capabilities & Limitations	WR	NSWCs : PHD	8.624	2.510	Nov 2017	2.642	Nov 2018	2.994	Nov 2019	-		2.994	0.000	16.770	-
Cybersecurity IA	C/CPFF	CSC : VA	0.544	0.000		0.000		0.000		-		0.000	0.000	0.544	-
Contract Engineering Support	C/CPFF	Delta Resources Inc. : VA	0.000	1.110	Jan 2018	0.000		3.612	Jan 2020	-		3.612	0.000	4.722	-
		Subtotal	318.721	8.374		10.288		10.123		-		10.123	Continuing	Continuing	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Combat System Integration Testing (CSIT)	WR	NSWCs : DD/ICSTF	5.736	0.000		0.000		0.000		-		0.000	0.000	5.736	-
Interoperability Certification Assessment	WR	NSWCs : DD/ SPAWAR/San Diego	26.804	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Navigation System Certification	WR	SPAWAR : Charleston, SC	10.914	1.247	Nov 2017	1.282	Nov 2018	1.322	Nov 2019	-		1.322	0.000	14.765	-
DIIAC Engineering and Operations	WR	NSWCs : DD/DN/ SPAWAR	21.819	2.063	Jan 2018	1.779	Jan 2019	1.974	Jan 2020	-		1.974	Continuing	Continuing	Continuing
DEP Engineering and Operations	WR	NSWCs : Various	12.623	0.000		0.000		0.000		-		0.000	0.000	12.623	-
Interoperability Cert Assessment	WR	NSWCs : DD/DN/ Corona	6.183	2.242	Nov 2017	2.058	Nov 2018	2.418	Nov 2019	-		2.418	0.000	12.901	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603582N / *Combat System Integration*	Project (Number/Name) 0164 / *Combat System Integration*	

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Interoperability Cert Assessment	C/CPFF	Non-NSWCS : CNA	2.517	1.258	Jan 2018	0.730	Jan 2019	1.414	Jan 2020	-		1.414	0.000	5.919	-
Interoperability Cert Assessment	C/CPFF	CSC : Washington, DC	0.776	0.287	Jan 2018	0.214	Jan 2019	0.000		-		0.000	0.000	1.277	-
Interoperability Cert Assessment	WR	NUWCs : Keyport	1.268	0.000	Jun 2018	0.000	Jun 2019	0.000		-		0.000	0.000	1.268	-
Interoperability Cert Assessment	WR	NSWCs : Crane/ Dahlgren	0.771	0.000	Jun 2018	0.000	Jun 2019	0.000		-		0.000	0.000	0.771	-
Interoperability Cert Assessment	C/CPFF	Various : Various	0.652	0.000	Sep 2018	0.000	Sep 2019	0.000		-		0.000	0.000	0.652	-
		Subtotal	90.063	7.097		6.063		7.128		-		7.128	Continuing	Continuing	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	408.784	15.471		16.351		17.251		-		17.251	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603582N / *Combat System Integration*	**Project (Number/Name)** 0164 / *Combat System Integration*

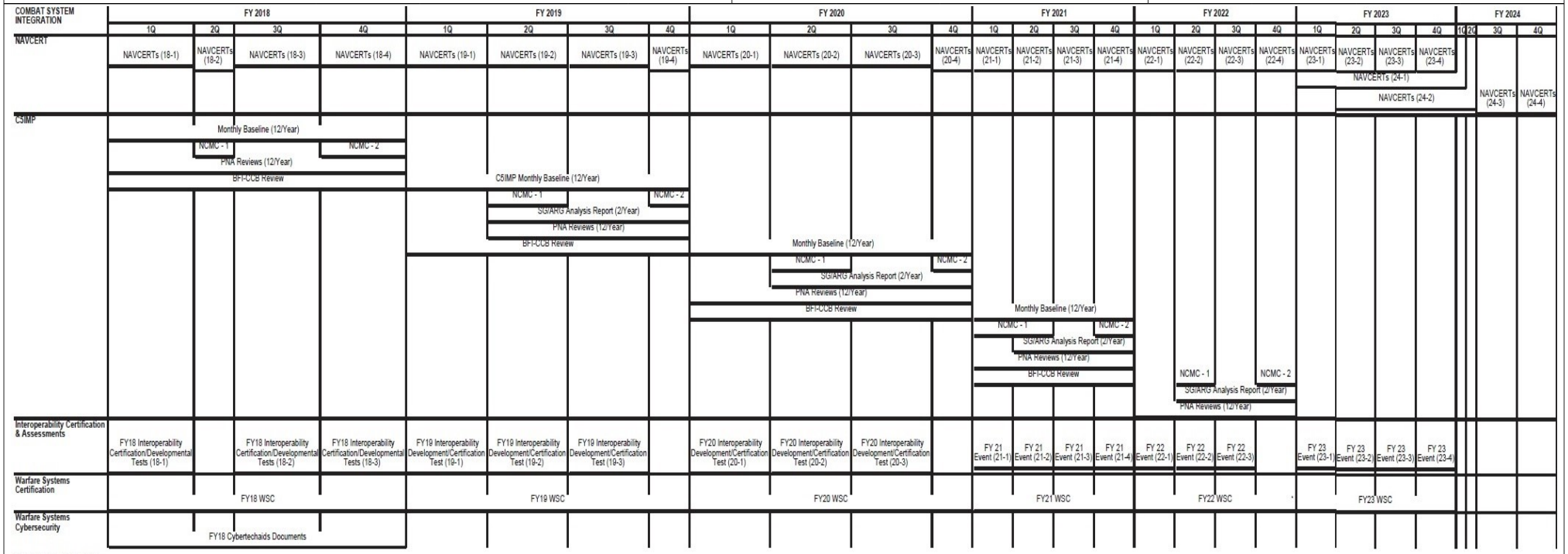


Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603582N / *Combat System Integration*	**Project (Number/Name)** 0164 / *Combat System Integration*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
COMBAT SYSTEM INTEGRATION				
NAVCERT: FY18 NAVCERTS (CG 53, DDG 63, DDG 84, MCM 6, MCM 4)	1	2018	1	2018
NAVCERT: FY18 NAVCERT (DDG 75, DDG 87,DDG 101, DDG 110)	2	2018	2	2018
NAVCERT: FY18 NAVCERT (CG 56, DDG 55, DDG 59, DDG 82, DDG 85, DDG 87, LPD 25, LPD 26)	3	2018	3	2018
NAVCERT: FY18 NAVCERT (CG 59 ,CG 73, DDG 53, DDG 71, DDG 103 , LHD 4)	4	2018	4	2018
NAVCERT: FY19 NAVCERTs (CVN 69, CVN 71, DDG 78, DDG 90, DDG 91, LCC 19, LCS 1, LCS 3, LHA 6,LHD 5. LPD 17, LPD 18,LSD 41, LSD 45 LSD 50, MCM 10)	1	2019	1	2019
NAVCERT: FY19 NAVCERTs (CG 58, CG 61, CG 67, LHD 8, LPD 22, MCM 9)	2	2019	2	2019
NAVCERT: FY19 NAVCERTs (CVN 68, CVN 76, DDG 89, DDG, 97, DDG 104, LCS 4, LCS 14, LHD 7, LPD 19, LSD 52, MCM 7, MCM 8)	3	2019	3	2019
NAVCERT: FY19 NAVCERTs (DDG 51. DDG 68)	4	2019	4	2019
NAVCERT: FY20 NAVCERTs (CG 57, DDG 105, LHD 2, LHD 6, LSD 43, LSD 44)	1	2020	1	2020
NAVCERT: FY20 NAVCERTs (CVN 75, CVN 77, DDG 54, LCS 1, LPD 21)	2	2020	2	2020
NAVCERT: FY20 NAVCERTs (CG 53, CVN 70, DDG 65, DDG 107, DDG 108, LHD 1, LPD 23, LSD 47)	3	2020	3	2020
NAVCERT: FY20 NAVCERTs (CVN 78, DDG 111, LPD 20, LPD 24, MCM 14)	4	2020	4	2020
NAVCERT: FY21 NAVCERTs (CVN 72, DDG 55, LCS 2, LHD 5, LPD 17, LPD 18, MCM 11)	1	2021	1	2021
NAVCERT: FY21 NAVCERTs (CVN 69, DDG 95, DDG 110, LHD 4, LHD 5, LSD 49, LSD 51)	2	2021	2	2021
NAVCERT: FY21 NAVCERTs (CG 54, CVN 76, LHD 8, LPD 17B	3	2021	3	2021
NAVCERT: FY21 NAVCERTs (CVN 73, DDG 53, DDG 97, LSD 45, LSD 48)	4	2021	4	2021
NAVCERT: FY22 NAVCERTs (CG 72, CVN 78, LSD 50, MCM 13)	1	2022	1	2022

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603582N / *Combat System Integration*	**Project (Number/Name)** 0164 / *Combat System Integration*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
NAVCERT: FY22 NAVCERTs (CG 70, LPD 18, LSD 52)	2	2022	2	2022
NAVCERT: FY22 NAVCERTs (CVN 77, DDG 54, LHD 2, LHD 7, LPD 27)	3	2022	3	2022
NAVCERT: FY22 NAVCERT (DDG 52, DDG 57, DDG 112, LCS 1, LSD 44, LSD 46)	4	2022	4	2022
NAVCERT: FY23 NAVCERT (LHD 1, LPD 21)	1	2023	1	2023
NAVCERT: FY23 NAVCERT (CG 60, CG 73, CVN78, DDG 55, DDG 60, DDG 90, DDG 96)	2	2023	2	2023
NAVCERT: FY23 NAVCERT (CVN 73, DDG 74,LHD 6, LPD 23)	3	2023	3	2023
NAVCERT: FY23 NAVCERT (DDG 61, LHD 3, LSD 43)	4	2023	4	2023
NAVCERT: FY24 NAVCERT (CVN 71 , CVN 78, DDG 78, LHA 6)	1	2023	1	2024
NAVCERT: FY24 NAVCERT (CG 58, CG, 61, CG67, DDG 58, DDG 81, DDG 102, MCM 9)	2	2023	2	2024
NAVCERT: FY24 NAVCERT (CVN 68, CVN 72, DDG 67, DDG 79, DDG 83, DDG 89. DDG 97, DDG104., DDG 116, DDG 1000. LCS 4, LCS 14,LJD 7, LSD 48, LSD 52, MCM 7, MCM 8)	3	2024	3	2024
NAVCERT: FY24 NAVCERT (CG 63, CG 64, DDG 51, DDG 68, DDG 76, LSD, 46)	4	2024	4	2024
C5IMP: FY18 C5IMP Monthly Baseline (12/Year) (84 BLs planned)	1	2018	4	2018
C5IMP: FY18 NCMC - 1	2	2018	2	2018
C5IMP: FY18 NCMC - 2	4	2018	4	2018
C5IMP: FY18 PNA Reviews (12/Year) (Supports Approx 72 ship availabilities with total 75 PNAs conducted)	1	2018	4	2018
C5IMP: FY18 BFI-CCB Review,comment on and process approximately 2000 proposed changes throughout the year.	1	2018	4	2018
C5IMP: FY19 C5IMP Monthly Baseline (12/Year) 92 BL's planned	1	2019	4	2019
C5IMP: FY19 NCMC - 1	2	2019	2	2019
C5IMP: FY19 NCMC - 2	4	2019	4	2019
C5IMP: FY19 SG/ARG Analysis Report (2/Year - Presented at NCMC)	2	2019	4	2019
C5IMP: FY19 PNA Reviews (12/Year) (Supports Approx 76 ship availabilities with total 82 PNAs planned)	2	2019	4	2019

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603582N / *Combat System Integration*	**Project (Number/Name)** 0164 / *Combat System Integration*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
C5IMP: FY19 BFI-CCB Review,comment on and process approximately 2300 proposed changes throughout the year.	1	2019	4	2019
C5IMP: FY20 C5IMP Monthly Baseline (12/Year) 105 BL's planned	1	2020	4	2020
C5IMP: FY20 NCMC - 1	2	2020	2	2020
C5IMP: FY20 NCMC - 2	4	2020	4	2020
C5IMP: FY20 SG/ARG Analysis Report (2/Year - Presented at NCMC)	2	2020	4	2020
C5IMP: FY20 PNA Reviews (12/Year) (Supports 81 ship availabilities with 94 PNAs planned)	1	2020	4	2020
C5IMP: FY20 BFI-CCB Review,comment on and process approximately 2500 proposed changes throughout the year.	1	2020	4	2020
C5IMP: FY21 C5IMP Monthly Baseline (12/Year) 115 BL's planned	1	2021	4	2021
C5IMP: FY21 NCMC - 1	1	2021	2	2021
C5IMP: FY21 NCMC - 2	4	2021	4	2021
C5IMP: FY21 SG/ARG Analysis Report (2/Year - Presented at NCMC)	2	2021	4	2021
C5IMP: FY21 PNA Reviews (12/Year) (Supports 85 ship availabilities with 105 PNAs planned)	1	2021	4	2021
C5IMP: FY21 BFI-CCB Review,comment on and process approximately 2500 proposed changes throughout the year.	1	2021	4	2021
C5IMP: FY22 C5IMP Monthly Baseline (12/Year) 123 BL's planned	1	2021	4	2021
C5IMP: FY22 NCMC - 1	2	2022	2	2022
C5IMP: FY22 NCMC - 2	4	2022	4	2022
C5IMP: FY22 SG/ARG Analysis Report (2/Year - Presented at NCMC)	2	2022	4	2022
C5IMP: FY22 PNA Reviews (12/Year) (Supports 87 ship availabilities with 112 PNAs planned)	1	2022	4	2022
C5IMP: FY22 BFI-CCB Review,comment on and process approximately 2800 proposed changes throughout the year.	1	2022	4	2022
C5IMP: FY23 C5IMP Monthly Baseline (12/Year) 130 BL's planned	1	2023	4	2023
C5IMP: FY23 NCMC - 1	2	2023	2	2023

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603582N / *Combat System Integration*	**Project (Number/Name)** 0164 / *Combat System Integration*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
C5IMP: FY23 NCMC - 2	4	2023	4	2023
C5IMP: FY23 SG/ARG Analysis Report (2/Year - Presented at NCMC)	2	2023	4	2023
C5IMP: PNA Reviews (12/Year) (Supports 90 ship availabilities with 120 PNAs planned)	1	2023	1	2024
C5IMP: FY23 BFI-CCB Review,comment on and process approximately 3000 proposed changes throughout the year.	1	2023	4	2023
C5IMP: FY24 C5IMP Monthly Baseline (12/Year) 130 BL's planned	1	2024	4	2024
C5IMP: FY24 PNA Reviews (12/Year) (Supports 90 ship availabilities with 120 PNAs planned)	1	2024	4	2024
C5IMP: FY24 NCMC - 1	2	2024	2	2024
C5IMP: FY24 NCMC - 2	4	2024	4	2024
C5IMP: FY24 SG/ARG Analysis Report (2/Year - Presented at NCMC)	2	2024	4	2024
C5IMP: FY24 BFI-CCB Review,comment on and process approximately 3000 proposed changes throughout the year.	1	2024	4	2024
Interoperability Certification & Assessments: FY18 IOP CERT/DEV Tests (18-1): SSDS 10.10.05, AEGIS B/L 9C2.0 (Build 24); ACS 9.A2.0A (B24); ACS 5.3.11/12; ACS 7.2.2 ; LCS Independence BL 1	1	2018	1	2018
Interoperability Certification & Assessments: FY18 IOP CERT/DEV Tests (18-2): AEGIS B/L 9A2.1/9C2.1 (Build 27); SSDS 10.11.00; ACS 9.C2.0 (B24); ACS 7.2.2	3	2018	3	2018
Interoperability Certification & Assessments: FY18 IOP CERT/DEV Tests (18-3): AEGIS B/L 9A2.1/9C2.1 (Build 27); SSDS 10.11.01	4	2018	4	2018
Interoperability Certification & Assessments: FY19 IOP CERT/DEV Tests (19-1): ACS 7.2.3 (IFF Mode 5 only); AEGIS B/L 9A2.1/9C2.1 (Build 27); SSDS 10.11.00	1	2019	1	2019
Interoperability Certification & Assessments: FY19 IOP CERT/DEV Tests (19-2): AEGIS B/L 9A2.1/9C2.1 (Build 27); AEGIS 5.4	2	2019	2	2019
Interoperability Certification & Assessments: FY19 IOP CERT/DEV Tests (19-3): AEGIS B/L 9C2.2 (Build 30); AEGIS 5.4	3	2019	3	2019
Interoperability Certification & Assessments: FY20 IOP CERT/DEV Tests (20-1): ACS 9.C2.2 (B30); AEGIS 5.4	1	2020	1	2020

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603582N / *Combat System Integration*	**Project (Number/Name)** 0164 / *Combat System Integration*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Interoperability Certification & Assessments: FY20 IOP CERT/DEV Tests (20-2): AEGIS B/L 9C2.2 (Build 30); SSDS 10.11.02 (CVN Configuration); SSDS B/L 11.X (ACB 20); and DDG 1000 (B8.7)	2	2020	2	2020
Interoperability Certification & Assessments: FY20 IOP CERT/DEV Tests (20-3): AEGIS B/L 9C2.2 (Build 30); SSDS 10.11.02 (CVN Configuration); SSDS B/L 11.X; and DDG 1000 (B8.7)	3	2020	3	2020
Interoperability Certification & Assessments: FY21 Event (21-1)	1	2021	1	2021
Interoperability Certification & Assessments: FY21 Event (21-2)	2	2021	2	2021
Interoperability Certification & Assessments: FY21 Event (21-3)	3	2021	3	2021
Interoperability Certification & Assessments: FY21 Event (21-4)	4	2021	4	2021
Interoperability Certification & Assessments: FY22 Event (22-1)	1	2022	1	2022
Interoperability Certification & Assessments: FY22 Event (22-2)	2	2022	2	2022
Interoperability Certification & Assessments: FY22 Event (22-3)	3	2022	3	2022
Interoperability Certification & Assessments: FY22 Event (22-4)	4	2022	4	2022
Interoperability Certification & Assessments: FY22 Event (23-1)	1	2023	1	2023
Interoperability Certification & Assessments: FY22 Event (23-2)	2	2023	2	2023
Interoperability Certification & Assessments: FY22 Event (23-3)	3	2023	3	2023
Interoperability Certification & Assessments: FY22 Event (23-4)	4	2023	4	2023
Interoperability Certification & Assessments: FY24 Event (24-1)	1	2024	1	2024
Interoperability Certification & Assessments: FY24 Event (24-2)	2	2024	2	2024
Interoperability Certification & Assessments: FY24 Event (24-3)	3	2024	3	2024
Interoperability Certification & Assessments: FY24 Event (24-4)	4	2024	4	2024
Warfare Systems Certification: FY18 Warfare Systems Cert (134 Certification Events + 41 WSCPs)	1	2018	4	2018
Warfare Systems Certification: FY19 Warfare Systems Cert (163 Certification Events + 77 WSCPs)	1	2019	4	2019
Warfare Systems Certification: FY20 Warfare Systems Cert (130 Certification Events + 64 WSCPs)	1	2020	4	2020

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603582N / *Combat System Integration*	**Project (Number/Name)** 0164 / *Combat System Integration*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Warfare Systems Certification: FY21 Warfare Systems Cert (146 Certification Events + 73 WSCPs)	1	2021	4	2021
Warfare Systems Certification: FY22 Warfare Systems Cert (131 Certification Events + 12 WSCPs)	1	2022	4	2022
Warfare Systems Certification: FY23 Warfare Systems Cert (140 Certification Events + 20 WSCPs)	1	2023	4	2023
Warfare Systems Certification: FY24 Warfare Systems Cert (132 Certification Events +35 WSCPs)	1	2018	1	2024
Warfare Systems Cybersecurity: FY18 Cybertechaids Documents (2)	1	2018	4	2018

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy											Date: March 2019	
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0603595N *I (U)SSBN New Design*							
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
Total Program Element	2,425.751	775.624	542.846	419.051	-	419.051	313.582	196.261	171.766	187.173	Continuing	Continuing
3220: *COLUMBIA Class Submarine Development*	2,425.751	751.497	514.846	419.051	-	419.051	313.582	196.261	171.766	187.173	Continuing	Continuing
9999: *Congressional Adds*	0.000	24.127	28.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	52.127
Program MDAP/MAIS Code: **Project MDAP/MAIS Code(s):** P444												

A. Mission Description and Budget Item Justification

The FY2020 funding request was reduced by $2.5M to account for the availability of prior year execution balances.

This program element supports innovative research and development in submarine Hull, Mechanical and Electrical (HM&E) and combat systems technologies and the subsequent evaluation, demonstration, and validation for submarine platforms. It will increase the submarine technology base and provide subsystem design options not currently feasible. The program element also supports programs transitioning from Science and Technology (S&T), Defense Advanced Research Projects Agency (DARPA), Independent Research and Development, and Small Business Innovation Research (SBIR) projects.

The funding applies to the design, systems engineering, prototyping, and vendor qualification activities needed to execute the schedule for Common Missile Compartment (CMC) design, whole ship design, and component technologies development for the next generation U.S. ballistic missile submarine (SSBN), the COLUMBIA Class.

Project Unit 3220:

The objective of the SSBN New Design project, the COLUMBIA Class is to design and prepare for construction of the replacement of the OHIO Class SSBN.

Project Unit 9999:

This Congressional Add project funds efforts for the Advanced Materials Propeller Program and Naval Propulsion Foundry Center Facility Power Upgrades.

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0603595N *I (U)SSBN New Design*

B. Program Change Summary ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	776.158	514.846	433.296	-	433.296
Current President's Budget	775.624	542.846	419.051	-	419.051
Total Adjustments	-0.534	28.000	-14.245	-	-14.245
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	28.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-25.538	0.000			
• Program Adjustments	0.000	0.000	-11.016	-	-11.016
• Rate/Misc Adjustments	0.004	0.000	-3.229	-	-3.229
• Congressional Add Adjustments	25.000	-	-	-	-

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2018	FY 2019
Project: 9999: *Congressional Adds*		
Congressional Add: *Advanced Materials Propeller Program*	24.127	15.000
Congressional Add: *Naval Propulsion Foundry Center Facility Power Upgrades*	0.000	13.000
Congressional Add Subtotals for Project: 9999	24.127	28.000
Congressional Add Totals for all Projects	24.127	28.000

Change Summary Explanation

The FY 2020 funding request was reduced by $14.245M due to the following program adjustments: -$5.950M to support COLUMBIA MILCON requirements; + $4.5M to support lead ship non-recurring engineering; -$2.5M to account for the availability of prior year execution balances; -$4.9M for classified issues; -$2.166 for Contract Services reform; and -$3.229M for rate/misc adjustments.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603595N / *(U)SSBN New Design*	Project (Number/Name) 3220 / *COLUMBIA Class Submarine Development*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
3220: *COLUMBIA Class Submarine Development*	2,425.751	751.497	514.846	419.051	-	419.051	313.582	196.261	171.766	187.173	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Project MDAP/MAIS Code: P444

A. Mission Description and Budget Item Justification

The COLUMBIA Submarine Class Program (previously the OHIO Replacement Class) is developing the next generation sea-based strategic deterrent. The funding applies to the design, systems engineering, prototyping, and vendor qualification activities needed to execute the schedule for Common Missile Compartment (CMC) design, whole ship design, and component technologies development for the next generation U.S. ballistic missile submarine (SSBN). This RDT&E program supports cooperation with the United Kingdom (UK) to maintain strategic deterrence, based on a single effort to develop a CMC as agreed by the UK Secretary of State for Defense and the U.S. Secretary of Defense in 2009.
The COLUMBIA program strategy is to leverage the re-use of existing Submarine systems (as applicable), focus on lifecycle Total Ownership Cost (TOC) affordability, and meet the military requirements established for this SSBN to achieve mission success in a challenging environment. The requested funding levels provide for the Technology Development, Design, Engineering, and Integration efforts necessary to support the COLUMBIA Class SSBN lead ship construction start in FY 2021 along with continued development efforts for the class.

The following key activities support the COLUMBIA Class SSBN Program:
1. Design and development of a missile compartment, launch system, and Strategic Weapons Support Systems (SWSS) to meet U.S. strategic requirements while cooperating with the UK on modernizing its strategic deterrent in accordance with Presidential direction (December 2006).
2. Concept Definition, System Definition, and Detailed Design for remaining portions of the ship will be accomplished through a Design/Build/Sustain approach modeled after the approach used by the VIRGINIA Class program.
3. Engineering and integration of existing technologies and development of new technologies required to provide the capabilities necessary to ensure platform operational effectiveness and minimize life cycle cost.

COLUMBIA Class SSBN concept study, system definition prototyping, and technology development efforts support design, systems engineering, component development and vendor qualification activities needed to develop the CMC design and the COLUMBIA whole ship design. The COLUMBIA design timelines are based on a design approach proven on the VIRGINIA Class Program, adjusted for the additional complexity of a missile compartment and Strategic Weapons Systems (SWS). Planned technical studies and prototyping are necessary to reduce risks associated with updating SSBN system designs for current technical standards and demonstrating design feasibility of developmental technology to meet the ship design and construction schedule.

The Navy continues to invest in program funded affordability initiatives similar to those employed successfully for VIRGINIA Class, but tailored to the unique SSBN mission and operational tempo of COLUMBIA Class to drive down overall program costs. Efforts focus on reducing ship construction costs through implementing

more effective design features and fabrication and assembly methods for a more affordable submarine. As part of this effort, alternative procurement and contracting strategies are also being examined to include Multi-Program Material Procurement (MPMP) and Economic Order Quantity (EOQ).

FY18 activities were executed for the first article quad pack (FAQP) prototype of the CMC to support the UK DREADNOUGHT Program and COLUMBIA Program, and to continue validation of the Integrated Tube and Hull (ITH) build strategy. These activities included the continuation of the construction of the FAQP, which began August 2016, with a planned completion in 2019. The CMC program will mature required technologies and re-host the TRIDENT II D5 SWS (Launcher, Fire Control and Navigation) while ensuring no degradation to D5 security, safety, and performance. In addition, whole ship design efforts are focused on technologies requiring significant engineering, integration, and development time as well as those technologies that are required to support ship design and construction schedules such as the propulsor and maneuvering/ship control. These technologies are critical for stealth capability for a ship class that will be in service until the 2080s. Ship detailed design efforts include important pre-construction activities such as finalizing ship arrangements, development of design disclosures to support build products, risk characterization, and mitigation, improvement and validation of performance prediction tools and improvement of design tools. Technology development will address engineering and integration of existing technologies as well as maturation of developmental technologies.
On 14 December 2016, the Secretary of the Navy announced the lead ship of the OHIO Replacement Program will be USS COLUMBIA (SSBN 826) which officially designates this program the COLUMBIA Class Submarine Program.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Common Missile Compartment Design and Prototyping, and Whole Ship Design	274.315	165.730	155.121	0.000	155.121
Articles:	-	-	-	-	-
FY 2019 Plans: The combination of CMC Design and Prototyping and Ship Study and Design represents the required LDY Shipbuilder effort for the COLUMBIA Program. NOTE - The Design Completion percentage in the PB18 submission inadvertently reported the FY19 goal; it should have been what is reflected here. Design is on schedule. CMC Design and Prototyping: CMC Design and Prototyping: This funding applies to the design, systems engineering, prototyping, and vendor qualification activities needed to execute the schedule for CMC design and component / technology development for the COLUMBIA submarine. Included in this effort is continued development of CMC design products. Specific planned efforts in FY 2019 include: - The completion of approximately 20 percent of logistics technical documentation, and supportability assessments (360 CMC logistics technical documents) - 95 percent of CMC Design Disclosures (964 design disclosures) - Continued fabrication of MTs					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603595N / *(U)SSBN New Design*	**Project (Number/Name)** 3220 / *COLUMBIA Class Submarine Development*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
- Completion of manufacturing of the FAQP and continued manufacturing in support of the Missile Tube Module - Continued development and delivery of SWSS systems for the land based test facility Whole Ship Study and Design: This funding applies to the shipbuilder design, systems engineering, prototyping, and vendor qualification activities needed to execute the schedule for whole ship design and component / technology development for the COLUMBIA submarine. Specific efforts in FY 2019 include: - The completion of 97 percent of total Arrangements (approximately 4000 arrangement disclosures including CMC arrangement) -58 percent of total Design Disclosures (approximately 2698 design disclosures including CMC design disclosures) -Approximately 7 percent of logistics technical documentation, and supportability assessments (approximately 900 logistics technical documents including CMC technical documentation) - Efforts will also continue towards integration of all CMC interfaces with Rest of Ship and progressing ship integration of the Propulsor design Funding profile was adjusted from PB19 budget values in FY18 and FY19 to align with negotiated Integrated Product and Process Development (IPPD) requirements.					
FY 2020 Base Plans: The combination of CMC Design and Prototyping with Whole Ship Study and Design represents the required LDY Shipbuilder effort for the COLUMBIA Program. CMC Design and Prototyping: This funding applies to the design, systems engineering, prototyping, and vendor qualification activities needed to execute the schedule for CMC design and component / technology development for the COLUMBIA submarine. Included in this effort is continued development of CMC design products. Specific planned efforts in FY 2020 include: -30 percent of logistics technical documentation, and supportability assessments (approximately 550 CMC logistics technical documents) - The completion of all CMC Design Disclosures (approximately 1053 design disclosures) in support of the MTM build					

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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
- Formal start of Lead Ship Construction in October 2020 which includes continued fabrication of MTs, manufacture of the MTM and final delivery, and integration and test of SWSS systems for the land based test facility Whole Ship Study and Design: This funding applies to the shipbuilder design, systems engineering, prototyping, and vendor qualification activities needed to execute the schedule for whole ship design and component / technology development for the COLUMBIA submarine. Specific efforts in FY 2020 include: - The completion of all Arrangements (approximately 4100 arrangement disclosures including CMC arrangement) - 83 percent of total Design Disclosures (approximately 3861 design disclosures including CMC design disclosures) - Approximately 20 percent of logistics technical documentation, and supportability assessments (approximately 2050 logistics technical documents including CMC technical documentation) Lead Ship Construction efforts commence in October 2020. Efforts will also continue towards integration of all CMC interfaces with Rest of Ship and progressing ship integration of the Propulsor design. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Overall efforts transitioning to Detailed Design and construction efforts.					
Title: NAVSEA R&D and Prototyping	241.029	171.940	153.667	0.000	153.667
Articles:	-	-	-	-	-
FY 2019 Plans: This funding applies to the Government combat systems, component and technology development for the COLUMBIA submarine essential to achieving required survivability, combat and communications capabilities. Efforts planned in FY 2019 include: Combat Systems: - Continue refinement and T1-20 updates to GFI to support detailed design, production, and manufacturing integration					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603595N / *(U)SSBN New Design*	**Project (Number/Name)** 3220 / *COLUMBIA Class Submarine Development*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
- Continued assessment of AN/BRR-6 reliability based updates, including land based system development and test - Early environmental qualification testing of Government Furnished Equipment supporting Columbia technical insertion Component Development: - Continue Government support and oversight of development of over 101 engineered components - Continue qualification testing of prototype diesel generator for delivery to compatibility test facility for integration testing - Complete prototype manufacturing and commence critical qualification testing of the air conditioning unit - Complete ACRU qualification testing and restoration - Submit ACRU OPALT package for approval, and award contract for lead ship ACRU procurement - Continue operation of prototype ACRU at NSWC Philadelphia to gather reliability and performance data Propulsor and Shafting: - Complete full scale mechanical propulsor designs for fixed portion of propulsor. - Complete generation 2 propulsor LSV testing in support of fixed down-selection. - Complete final rotor hydrodynamic design - Down-select design for fixed portion of propulsor - Test candidate COLUMBIA Class propulsor bearing liner materials at the FSBTF - Facilitization efforts at NFPC will continue in FY19 and NFPC will continue manufacturing prototype demonstrations in FY2019 Shock, Structures and Composites: - Continue fabrication of combined shock and submergence scale models - Complete fabrication of the forward pressure hull confirmation model - Continue forward pressure hull need to repair procedures - Continue out-of-autoclave bow dome fabrication - Begin navigation sonar system window fabrication Signatures: - Continue to acquire and evaluate data from PIKE model testing with stern section - Complete fabrication of the forward structure on DOLLY VARDEN model and begin confirmation testing					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603595N / *(U)SSBN New Design*	**Project (Number/Name)** 3220 / *COLUMBIA Class Submarine Development*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Maneuvering, Ship Control and Hydrodynamic: - Deliver steering and diving, assisted ballast and trim, and anomaly detector algorithms to shipbuilder for incorporation into ship control software - Start developing CLB Submerged Operating Envelope by characterization of near-surface behavior for various sea states Funding profile was adjusted from PB19 budget values in FY18 and FY19 to align with refined estimates for prototyping					
FY 2020 Base Plans: This funding applies to the Government combat systems, component and technology development for the COLUMBIA submarine essential to achieving required survivability, combat and communications capabilities. Efforts planned in FY 2020 include: Combat Systems: - Complete revisions to any GFI required to support construction and continue to deliver remaining GFI - Execute non-recurring engineering development activities required for Columbia unique combat system components - Initiate AN/BRR-6 reliability based engineering changes - Deliver developmental Structurally Integrated Enclosures to combat systems vendor sites - Initiate early environmental qualification testing of Government Furnished Equipment Component Development: - Continue Government support and oversight of development of the approximately 43 of 101 remaining engineered components - Support diesel generator at compatibility test facility for integration testing - Complete critical qualification testing for the air conditioning unit, commence COLUMBIA production unit build, and install ACRU OPALT Propulsor and Shafting:					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603595N / *(U)SSBN New Design*	**Project (Number/Name)** 3220 / *COLUMBIA Class Submarine Development*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
- Complete down-select for the rotating portion of the propulsor after completing LSV testing and associated analysis - Begin reconfiguration of the FSBTF and installation of a propulsor bearing engineering demonstration model - Complete facilitization at NFPC Shock, Structures and Composites: - Complete Out of Autoclave bow dome fabrication and inspection - Continue navigation sonar system window fabrication Signatures: - Continue evaluation of data from PIKE model testing with stern section and update models as appropriate - Complete confirmation testing of the forward area design on DOLLY VARDEN and continue analysis of data - Continue to acquire DOLLY VARDEN and Anochoic Flow Facility Data as needed to support updates to Flow Source Acoustic Model - Support Shipbuilder qualification testing of machinery components and devices Maneuvering, Ship Control and Hydrodynamic: - Continue developing CLB Submerged Operating Envelope by characterization of near-surface behavior for various sea states ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Overall efforts transitioning to Detailed Design and construction efforts.					
Title: Systems Engineering/Program Management	57.279	57.986	54.965	0.000	54.965
Articles:	-	-	-	-	-
FY 2019 Plans: The Program will release the Construction Request for Proposal (RFP) in the first half of the year and conduct efforts throughout the year in preparation for the Critical Design Review (CDR) set for FY20. Other efforts include: - Program Office continued efforts to manage, coordinate, and oversee all effort of the program including shipbuilder and government activities					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
- Management of Sonar, Combat, (Imaging System) COTS in support of FY 2020 COTS DSSM testing at Naval Surface Warfare Center Philadelphia - Leveraging ongoing sea-testing by other programs, COLUMBIA Survivability M&S maturation will continue at NUWC with the objective of assuring that the suite will support accreditation by COMOPTEVFOR before Initial Operational Test and Evaluation in FY2028 - Test the COLUMBIA Class Shock Isolated Deck high capacity mounts and fluid viscous dampers as part of the COLUMBIA LFT&E program - Complete and validate the USS COLUMIBA (SSBN 826) Program Validated Online Lifecycle Threat (VOLT) report - Complete the Joint COLUMBIA Class and VIRGINIA Class SWFTS TI-16 Cybersecurity Early Developmental Test (EDT) 18-1 test event by the National Cyber Range (NCR) and the NAVSEA Red Team - The COLUMBIA Class Program Office will continue to report on results of developmental testing being conducted to DD(DT&E) in accordance with the TEMP - Delivery of approximately 7 percent of all ILS products - Cyber Risk assessments to support continual cyber security development - Early Strategic Program System Integration into NPES Systems - Development of COLUMBIA Electronics Integration Plan to support shore side Command and Control integration and test, and execution of integration risk mitigations as identified by the IWG - Continue multi-year GAIUS to determine CLB unique maintenance facility requirements for Trident Refit Facilities - Continue non-MILCON studies and preparations at affected shore facilities, such as Utility and Mooring assessments - Receive stakeholder concurrence on maintenance product development processes, including roles and responsibilities ultimately resulting in an approved Class Maintenance Plan to support Lead Ship Delivery					
FY 2020 Base Plans: Continue Program Management and System Engineering activities including: - Program Office continued efforts to manage, coordinate, and oversee all effort of the program including shipbuilder and government activities - The NPES division of the program office management staff will apply resources to obtain technical support from government laboratories and sub-system Participating Area Managers (PARMs) to begin detailed design of the SSBN827 TI-24 NPES configuration					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
- Engineering rigor will be applied across all systems engineering disciplines to validate that the design of the TI-24 COATS configuration can be retrofit on lead ship during PSA with acceptable risk - The COLUMBIA LFT&E program will conduct COTS fragility testing of Sonar, Combat, and Imaging (and potentially SWS) components on the DSSM - HCM testing will be conducted if it was not completed in FY20 - Maturation of COLUMBIA survivability M&S and reporting of developmental test results will continue at NUWC Newport to support COMOPTEVFOR accreditation before Initial Operational Test and Evaluation (IOT&E) in FY 2028 - Continue multi-year GAIUS to determine CLB unique maintenance facility requirements for Trident Refit Facilities -Continue non-MILCON studies and preparations at affected shore facilities - Delivery of approximately 20 percent of all ILS products will be expected ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Overall efforts transitioning to Detailed Design and construction efforts.					
Title: Strategic Weapons Systems Integration	178.874	119.190	55.298	0.000	55.298
Articles:	-	-	-	-	-
FY 2019 Plans: - Continuing system engineering efforts required for the re-hosting and integration of the TRIDENT II (D5) SWS on the COLUMBIA submarine including review and modification of SWS Coordination, Interface and Arrangement Drawings for SWS equipment within the CMC and performing associated Logistic Support activities - Complete launcher evaluation and qualification testing at the LTF - Commence full utilization of the SWS Fire Control and Navigation Engineering Test Systems within the land-based test berths / facilities for SWS Subsystem hardware and software integration, verification and validation - Continue development of special test vehicles and SWS Ashore test capability development - Continue SWS training capability/requirements development - Continue systems engineering design related to the COLUMBIA guidance handling cart - Conduct a Missile system Critical Verification Review (CVR) - Conduct Production Readiness Reviews for SWS Launcher components and SWS Fire Control and Navigation Subsystems					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603595N / *(U)SSBN New Design*	**Project (Number/Name)** 3220 / *COLUMBIA Class Submarine Development*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
- Continue Reentry Body Simulator pre-production activities - Continue efforts of the Integration Working Group for the integration of NPES with the SWS ***FY 2020 Base Plans:*** - Continuing system engineering efforts required for the re-hosting and integration of the TRIDENT II (D5) SWS on the COLUMBIA submarine including review, modification and update of SWS Coordination, Interface and Arrangement Drawings for SWS equipment within the CMC and performing associated Logistic Support activities - Complete the launcher qualification report - Continue utilization of the SWS Fire Control and Navigation Engineering Test Systems within the land-based test berths / facilities for SWS Subsystem hardware and software integration, verification and validation - Continue development of special test vehicles - Complete installation of the COLUMBIA Launch Tube at SWS Ashore and achieve COLUMBIA configuration Initial Operating Capability (IOC) - Commence Strategic Weapon Support Systems (SWSS) Verification and Validation (V&V) testing at SWS Ashore - Conduct SWS Training System-level CDR involving both the SWS Fire Control and Navigation Subsystems - Conduct Strategic Weapon Training System (SWTS) Preliminary Design Review (PDR) - Deliver a Guidance Handling Cart prototype to SWS Ashore - Conduct Production Readiness Reviews for SWS Launcher, Fire Control and Guidance Subsystems - Conduct Navigation Software Qualification Test, Pre-Production performance testing and Navigation Trainer Production Readiness Review - Deliver Reentry Body Simulator Assemblies - Continue efforts of the Integration Working Group for the integration of NPES with the SWS - The FY 2020 funding request was reduced by $(2.500) million to account for the availability of prior year execution balances ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Overall efforts transitioning to Detailed Design and construction efforts.					
Accomplishments/Planned Programs Subtotals	751.497	514.846	419.051	0.000	419.051

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603595N / *(U)SSBN New Design*	**Project (Number/Name)** 3220 / *COLUMBIA Class Submarine Development*	

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• RDTEN/0603570N/3219: *SBSD Nuclear Technology Development*	265.462	190.100	114.006	-	114.006	80.085	60.142	56.841	54.400	Continuing	Continuing
• RDTEN/0101221N/0951: *Joint Warhead Fuze Sustainment Program*	108.199	62.203	23.226	-	23.226	25.100	2.227	0.000	0.000	0.000	725.069
• OPN/5358: *Strategic Missile Systems Equip*	238.675	256.817	280.510	-	280.510	241.396	254.053	259.020	264.201	0.000	3,189.691
• WPN/1250: *TRIDENT II Mods*	1,131.910	1,056.750	0.000	1,177.251	1,177.251	1,215.624	1,204.762	1,288.753	1,318.818	3,215.106	26,124.279
• OMN/1D2D: *Fleet Ballistic Missile*	1,273.184	1,361.516	1,423.339	-	1,423.339	1,403.796	1,451.154	1,468.150	1,507.360	0.000	11,129.594
• SCN/1045: *COLUMBIA Class Submarine*	861.853	3,173.400	1,698.907	-	1,698.907	3,921.212	4,196.024	3,871.536	4,789.491	85,685.907	108,971.468
• MCN/32414106: *Submarine Propulsor Manufacturing Support Facility*	0.000	30.243	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	30.243
• MCN/64482044: *MCON Design*	2.416	0.000	0.006	-	0.006	1.309	1.310	0.000	1.410	0.000	6.451
• MCN/42237676: *Trident Training Facility Phase I*	0.000	0.000	0.000	-	0.000	0.000	0.000	31.500	0.000	0.000	31.500

Remarks

D. Acquisition Strategy

The Common Missile Compartment (CMC) is designed and developed to support the U.S. and UK in development of the COLUMBIA and DREADNOUGHT SSBN programs enabling a common U.S.-UK CMC and maximizing the benefit of the ongoing U.S.-UK partnership in strategic deterrence. The COLUMBIA Class Program RDT&E efforts will incentivize cost reduction initiatives in the design, construction and operations & support portions of the program. RDT&E efforts will be performed by Navy laboratories, shipyards, private industry, and University Affiliated Research Centers.

E. Performance Metrics

Updated Integrated Master Schedule and CMC build strategy down-select. Development of signature management efforts to address knowledge gap, concepts for propulsor and shafting, and design guidance and interface control requirements.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
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Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Product Development	SS/CPFF	Ship Design Contractor-EB : Groton, CT	1,173.417	274.315	Oct 2017	165.730	Oct 2018	155.121	Oct 2019	-		155.121	Continuing	Continuing	Continuing
Product Development	WR	NSWC : Carderock, MD	388.351	96.117	Oct 2017	76.397	Oct 2018	69.465	Oct 2019	-		69.465	Continuing	Continuing	Continuing
Product Development	WR	NSWC : Philadelphia, PA	27.142	31.791	Oct 2017	24.276	Oct 2018	22.580	Oct 2019	-		22.580	0.000	105.789	-
Product Development	WR	NUWC : Newport, RI	55.823	23.270	Oct 2017	28.014	Oct 2018	32.129	Oct 2019	-		32.129	Continuing	Continuing	Continuing
Product Development	Various	NAVSEA : Various	99.920	89.852	Oct 2017	43.253	Oct 2018	29.493	Oct 2019	-		29.493	Continuing	Continuing	Continuing
Product Development	SS/CPFF	ARL Penn State University : State College, PA	1.361	0.900	Oct 2017	0.950	Oct 2018	1.300	Oct 2019	-		1.300	Continuing	Continuing	Continuing
Product Development	SS/CPFF	NGMS : Sunnyvale, CA	134.236	37.552	Oct 2017	16.551	Oct 2018	3.526	Oct 2019	-		3.526	Continuing	Continuing	Continuing
Product Development	SS/CPFF	JHU/APL : Laurel, MD	14.498	5.598	Jan 2018	5.310	Jan 2019	2.582	Jan 2020	-		2.582	Continuing	Continuing	Continuing
Product Development	WR	NUWC : Keyport, WA	0.652	0.000	Oct 2017	0.000	Oct 2018	0.000		-		0.000	Continuing	Continuing	Continuing
Product Development	SS/CPFF	CSDL : Cambridge, MA	9.081	0.857	Oct 2017	0.230	Oct 2018	0.069	Oct 2019	-		0.069	Continuing	Continuing	Continuing
Product Development	SS/CPFF	LMRMS : Mitchel Field, NY	49.807	21.572	Dec 2017	14.031	Oct 2018	4.176	Oct 2019	-		4.176	Continuing	Continuing	Continuing
Product Development	C/CPFF	EMCUBE : Alexandria, VA	2.359	0.840	Oct 2017	0.492	Oct 2018	0.221	Oct 2019	-		0.221	Continuing	Continuing	Continuing
Product Development	SS/CPFF	LMMSC : Sunnyvale, CA	75.250	20.052	Oct 2017	14.092	Feb 2019	4.260	Feb 2020	-		4.260	Continuing	Continuing	Continuing
Product Development	SS/CPFF	JRC : Washington, DC	2.996	0.521	Oct 2017	1.952	Oct 2018	0.836	Oct 2019	-		0.836	Continuing	Continuing	Continuing
Product Development	C/CPFF	GDMS : Pittsfield, MA	94.333	33.848	Nov 2017	13.877	Nov 2018	4.387	Nov 2019	-		4.387	Continuing	Continuing	Continuing
Product Development	WR	CNSW : China Lake, CA	49.729	19.972	Nov 2017	17.879	Nov 2018	14.562	Nov 2019	-		14.562	Continuing	Continuing	Continuing

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
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Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Product Development	SS/CPFF	IEC : Anaheim, CA	2.869	0.450	Oct 2017	0.430	Oct 2018	0.209	Oct 2019	-		0.209	Continuing	Continuing	Continuing
Product Development	WR	NSWC : Dahlgren, VA	13.135	7.559	Oct 2017	7.675	Oct 2018	5.036	Oct 2019	-		5.036	Continuing	Continuing	Continuing
Product Development	SS/CPFF	BAE : Rockville, MD	27.815	8.925	Oct 2017	6.612	Oct 2018	2.880	Oct 2019	-		2.880	Continuing	Continuing	Continuing
Product Development	SS/CPFF	BNA : Huntington Beach, CA	3.217	0.000	Oct 2017	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Product Development	WR	NSWC Crane : Crane, IN	44.072	10.041	Nov 2017	9.071	Nov 2018	7.914	Nov 2019	-		7.914	Continuing	Continuing	Continuing
Product Development	SS/CPFF	GDEB : Groton, CT	0.000	4.670	Oct 2017	2.192	Oct 2018	0.436	Oct 2019	-		0.436	0.000	7.298	-
Product Development	Various	SSP : Various	11.568	3.778	Oct 2017	6.158	Oct 2018	2.145	Oct 2019	-		2.145	Continuing	Continuing	Continuing
Product Development	SS/CPFF	SPA : Alexandria, VA	8.132	1.739	Oct 2017	1.688	Oct 2018	0.759	Oct 2019	-		0.759	Continuing	Continuing	Continuing
		Subtotal	2,289.763	694.219		456.860		364.086		-		364.086	Continuing	Continuing	N/A

Remarks

The funding values in FY18 and FY19 was adjusted from PB19 budget values in order to properly align the execution of funding within Product Development. The overall funding requirement has not increased and there is no cost growth.

Increased funding from FY19 to FY20 at NUWC Newport reflects increased efforts related to the Columbia Class Common Submarine Radio Room and Submarine Communication Antenna technical design.

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Contractor Management Support	C/CPFF	Various : Multiple Awards	72.167	30.758	Nov 2017	31.066	Nov 2018	30.043	Nov 2019	-		30.043	Continuing	Continuing	Continuing
Government Management Support	WR	Various: NSWC : Carderock, MD	52.324	15.725	Oct 2017	15.959	Oct 2018	16.102	Oct 2019	-		16.102	Continuing	Continuing	Continuing
Government Management Support	WR	Various: NSWC : Philadelphia, PA	3.240	3.289	Oct 2017	3.338	Oct 2018	3.257	Oct 2019	-		3.257	0.000	13.124	-
Government Management Support	WR	Various: NUWC : Newport, RI	5.034	5.109	Oct 2017	5.186	Oct 2018	4.911	Oct 2019	-		4.911	0.000	20.240	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603595N / *(U)SSBN New Design*	**Project (Number/Name)** 3220 / *COLUMBIA Class Submarine Development*

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Government Management Support	WR	Vairous: SUPSHIP : Groton, CT	1.744	1.770	Oct 2017	1.797	Oct 2018	0.000		-		0.000	0.000	5.311	-
Travel	WR	NAVSEA HQ : Washington, D.C.	1.479	0.627	Nov 2017	0.640	Nov 2018	0.652	Nov 2019	-		0.652	Continuing	Continuing	Continuing
		Subtotal	135.988	57.278		57.986		54.965		-		54.965	Continuing	Continuing	N/A

Remarks

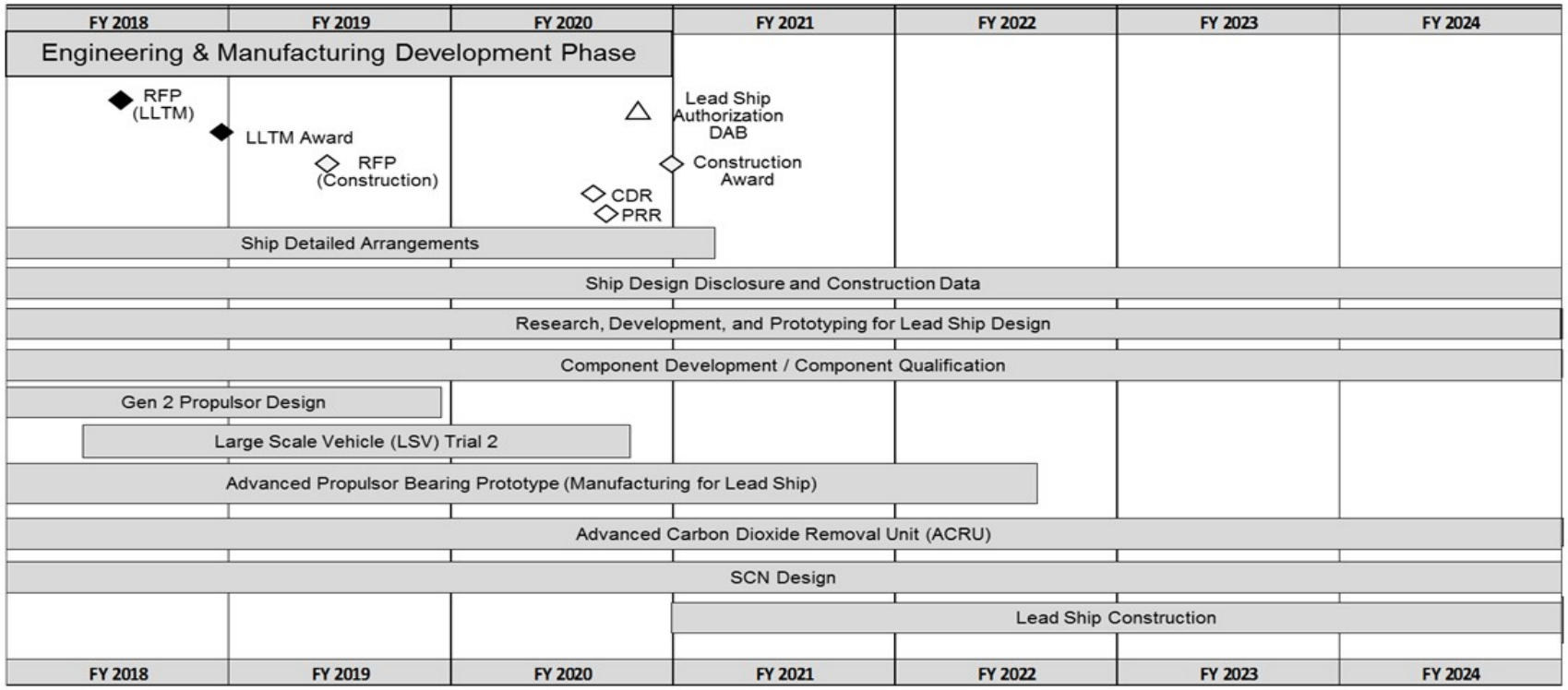
The program analyzed the Management Services which were originally planned in SCN beginning in FY17, and determined it was more appropriately funded with R&D through lead ship construction start in FY21. This submission reflects those changes for FY18 and FY19.

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	2,425.751	751.497		514.846		419.051		-		419.051	Continuing	Continuing	N/A

Remarks

The listed Award Dates represent the date on which initial obligations occur for the effort.

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603595N / *(U)SSBN New Design*	**Project (Number/Name)** 3220 / *COLUMBIA Class Submarine Development*



CDD - Capabilities Development Document
CDR - Critical Design Review
CPD - Capability Production Document
DAB - Defense Acquisition Board
IPR - In Progress Review
JROC - Joint Requirements Oversight Council
LLTM - Long Lead Time Material
PDR - Preliminary Design Review
PRR – Production Readiness Review
RDT&E - Research, Development, Test, & Evaluation
RFP - Request for Proposal
SCN - Shipbuilding and Conversion, Navy
SRR - System Requirements Review

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603595N / *(U)SSBN New Design*	**Project (Number/Name)** 3220 / *COLUMBIA Class Submarine Development*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Notes: * Effort began prior to 1st Quarter FY 2018. ** Effort continues past 4th Quarter FY 2024				
Ship Detailed Arrangements*	1	2018	1	2021
Ship Design Disclosure and Construction Data*, **	1	2018	4	2024
Research, Development, and Prototyping for Lead Ship*, **	1	2018	4	2024
Component Development/Component Qualification* , **	1	2018	4	2024
Gen 2 Propulsor Design*, **	1	2018	4	2019
Large Scale Vehicle (LSV) Trials*	2	2018	4	2020
Advanced Propulsor Bearing Prototype (Manufacturing for Lead Ship)*	1	2018	3	2022
Advanced Carbon Dioxide Removal Unit (ACRU)*, **	1	2018	4	2024
SCN Design*, **	1	2018	4	2024
Lead Ship Construction**	1	2021	4	2024

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603595N / *(U)SSBN New Design*	Project (Number/Name) 9999 / *Congressional Adds*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
9999: *Congressional Adds*	0.000	24.127	28.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	52.127
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

FY18 Congressional Add supporting the development of composite materials for COLUMBIA Class Propulsion. FY19 Congressional Add supports the continued development of composite materials and also provides funding for the Naval Propulsion Foundry Center Facility Power Upgrades.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019
Congressional Add: Advanced Materials Propeller Program ***FY 2018 Accomplishments:*** This funding was used to design and fabricate composite Advanced Propulsor Bearing shaft components, Advanced Composite Control Surfaces, as well as composite CNC (Computer Numerical Controlled) machining and inspection/handling fixturing for propulsor components. This effort will build on the success of current efforts for composite propulsor ducts and tail cones, composite shafting and HYSHMA (Hydrodynamic Shaping Material) propulsion applications. ***FY 2019 Plans:*** Continue the design and fabrication of composite Advanced Propulsor Bearing shaft components, Advanced Composite Control Surfaces, as well as composite CNC machining and inspection/ handling fixturing for propulsor components.	24.127	15.000
Congressional Add: Naval Propulsion Foundry Center Facility Power Upgrades ***FY 2018 Accomplishments:*** N/A ***FY 2019 Plans:*** Complete initial Power/Utility upgrades, and support power/utility work and execute procurement of large, high speed milling machines contracted via Defense Logistics Agency (Aviation). These new machines will make use of the additional power provided to the Naval Foundry and Propeller Center (NFPC). Installation, acceptance and turnover to production for the machines will complete in early FY20.	0.000	13.000
Congressional Adds Subtotals	24.127	28.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603595N / *(U)SSBN New Design*	**Project (Number/Name)** 9999 / *Congressional Adds*

E. Performance Metrics

Development of concepts for the use of composite materials in submarine propulsor applications, including fixtures, hydrodynamic surfaces, and supporting structures.

Completion of power/utility and machine upgrades per schedule to support NFPC work.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603595N / *(U)SSBN New Design*	Project (Number/Name) 9999 / *Congressional Adds*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Product Development	SS/CPFF	Seeman Composites : Gulfport, MS	0.000	1.171	Sep 2018	0.000		0.000		-		0.000	0.000	1.171	-
Product Development	TBD	Seeman Comp : Gulfport, MS	0.000	21.763	Jan 2019	10.138	Jun 2019	0.000		-		0.000	0.000	31.901	-
Product Devlopment	WR	NSWC : Carderock, MD	0.000	1.193	Jul 2018	4.862	Nov 2019	0.000		-		0.000	0.000	6.055	-
Product Development	C/FFP	DLA Aviation : Richmond, VA	0.000	0.000		13.000	Nov 2018	0.000		-		0.000	0.000	13.000	-
		Subtotal	0.000	24.127		28.000		0.000		-		0.000	0.000	52.127	N/A

Remarks

Seeman Composites follow on contract plan award date February 2019.

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	24.127		28.000		0.000		-		0.000	0.000	52.127	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603595N / *(U)SSBN New Design*	**Project (Number/Name)** 9999 / *Congressional Adds*

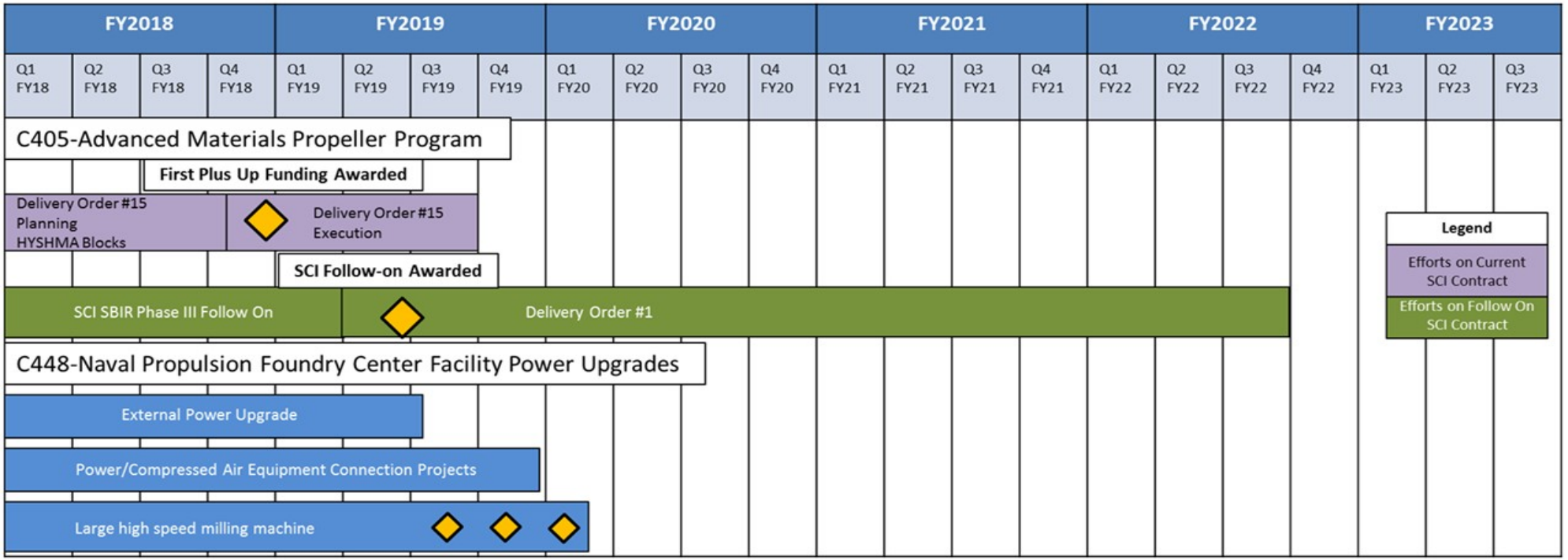


Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603595N / *(U)SSBN New Design*	**Project (Number/Name)** 9999 / *Congressional Adds*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 9999				
Initial Award on Current Vehicle (Delivery Order #15)	4	2018	2	2019
Follow-On Award (Delivery Order #1)	2	2019	4	2022
External Power Upgrade	1	2018	3	2019
Power/Compressed Air Equipment Connection Projects	1	2018	4	2019
First large high speed milling machine	1	2018	3	2019
Second large high speed milling machine	1	2018	4	2019
Third large high speed milling machine	1	2018	1	2020

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy											Date: March 2019	
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0603596N *I (U)LCS Mission Modules*							
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
Total Program Element	525.214	100.470	103.559	108.505	-	108.505	44.694	45.690	28.349	28.914	Continuing	Continuing
2550: *Mine Countermeasure (MCM) Mission Package*	0.000	0.000	41.813	39.499	-	39.499	26.419	27.878	10.793	11.009	Continuing	Continuing
2551: *Anti-Submarine Warfare (ASW) Mission Package*	0.000	0.000	41.553	41.580	-	41.580	9.282	8.884	8.500	8.670	Continuing	Continuing
2552: *Surface Warfare (SUW) Mission Package*	0.000	0.000	11.368	17.558	-	17.558	0.000	0.000	0.000	0.000	0.000	28.926
3129: *LCS Mission Package Development*	525.214	100.470	8.825	9.868	-	9.868	8.993	8.928	9.056	9.235	Continuing	Continuing
Program MDAP/MAIS Code: **Project MDAP/MAIS Code(s):** 443												

A. Mission Description and Budget Item Justification

This Program Element (PE) provides funds for detailed design, development, issue resolution, certification, integration, and testing of the Littoral Combat Ship (LCS) Mission Modules (MM). LCS is a fast, agile, and networked surface combatant with capabilities optimized to defeat asymmetric threats, and ensure naval and joint force access into contested littoral regions. It uses open-systems architecture design, modular weapons, sensor systems, and a variety of manned and unmanned vehicles to expand the battle space and project offensive power into the littoral.

The LCS MM Program employs an incremental development approach to deliver capability, which allows for insertion of mature capabilities throughout the life of the program without the need for modifications to the sea frames. Future capabilities will be considered when joint warfighting objectives or changing threats create new operational capability requirements that cannot be met by current mission package designs, or when new technological opportunities allow significant progress toward delivering cost effective, enhanced capabilities. Future mission module increments can be tested, constructed, and incorporated into existing mission packages, one of the most important benefits of LCS modular design.

Beginning in FY 2019, Mission Package funding is realigned into four (4) projects:
2550 Mine Countermeasures (MCM) Mission Package
2551 Anti-Submarine Warfare (ASW) Mission Package
2552 Surface Warfare (SUW) Mission Package
3129 LCS Mission Package Development

Prior to FY 2019 all Mission Package funding was in Project 3129.

MCM MP: Counters bottom, tethered, near surface, and surface mines in the littorals without putting sailors in the minefield.

SUW MP: Increases firepower and offensive/defensive capabilities against large numbers of highly maneuverable, fast, small craft threats, giving LCS the ability to protect the sea lanes while moving a force quickly through a choke point or other strategic waterway, and to conduct maritime security missions.

ASW MP: Enables the LCS to conduct detect-to-engage operations against modern submarines that pose a threat.

C5I: Enabling products required by all MPs such as common hardware interfaces, computer operating environment (Mission Package Computing Environment (MPCE)), communications systems (Multi-Vehicle Communications System (MVCS)), aviation interface systems, and Mission Package Portable Control Stations (MPPCS). MPCE provides common services and an Operating Environment to support all Mission Package Application Software (MPAS) and Open Architecture Products. MVCS enables the simultaneous control and data exchange between unmanned mission vehicles and the Ship. Aviation interface systems include integration and management of data communications, data processing, and physical hardware interfaces such as common equipment and containers used by all mission packages. MPPCS provides a mobile operating environment installed in a 20ft ISO container and serves as a surrogate Ship during mission package development and integration test events at test ranges.

B. Program Change Summary ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	116.871	103.633	70.548	-	70.548
Current President's Budget	100.470	103.559	108.505	-	108.505
Total Adjustments	-16.401	-0.074	37.957	-	37.957
• Congressional General Reductions	-	-0.074			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-1.151	0.000			
• Program Adjustments	0.000	0.000	38.265	-	38.265
• Rate/Misc Adjustments	0.000	0.000	-0.308	-	-0.308
• Congressional Directed Reductions Adjustments	-15.250	-	-	-	-

Change Summary Explanation

FY 2020: +$38.400M due to increased ASW MP and SUW MP test scope as defined in the updated LCS TEMP and provides funding for the ASW ACB/TI development process for the ASW MP's sonar signal processing, -$0.135M Contractor Services Reform reduction, and -$0.308M in various rate adjustments.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603596N / *(U)LCS Mission Modules*	Project (Number/Name) 2550 / *Mine Countermeasure (MCM) Mission Package*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
2550: *Mine Countermeasure (MCM) Mission Package*	0.000	0.000	41.813	39.499	-	39.499	26.419	27.878	10.793	11.009	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Project MDAP/MAIS Code: 443

A. Mission Description and Budget Item Justification

Beginning in FY 2019, Mission Package funding is realigned into four (4) projects:

2550 Mine Countermeasures (MCM) Mission Package
2551 Anti-Submarine Warfare (ASW) Mission Package
2552 Surface Warfare (SUW) Mission Package
3129 LCS Mission Package Development

Prior to FY 2019 all Mission Package funding was in Project 3129.

The LCS MM program employees an incremental development approach to deliver capability, which allows the continued insertion of mature capabilities throughout the life of the program without the need for modifications to the sea frames. The focus is to minimize service life extensions to both MCM-1 ships and the MH-53E Helicopters. Future MCM MP capabilities will be considered when joint warfighting objectives or changing threats create new operational capability requirements that cannot be met by current mission package designs, or when new technological opportunities allow significant progress toward delivering cost effective, enhanced capabilities. Future mission module increments can be tested, constructed, and incorporated into existing mission packages, one of the most important benefits of LCS modular design.

The MCM MP will counter deep, shallow, and tethered mines in the littoral without putting Sailors in the minefield. When the MCM MP is embarked, LCS is capable of conducting detect-to-engage operations (hunting, sweeping, and neutralization) against very shallow to deep-water sea mine threats. The MCM MP provides these capabilities through the use of sensors and weapons deployed from an MH-60S multi-mission helicopter, unmanned offboard vehicles, and support equipment/ containers. The MCM MP consists of the following modules:
- Remote Minehunting (RMH) Module: Unmanned Surface Vehicle (USV) + AN/AQS-20 Minehunting Sonar
- Coastal Mine Reconnaissance (CMR) Module: Coastal Battlefield Reconnaissance & Analysis (COBRA) + MQ-8B Fire Scout Vertical Take-off and Landing Tactical Unmanned Aerial Vehicle (VTUAV)
- Near Surface Detection (NSD) Module: Airborne Laser Mine Detection System (ALMDS) + MH-60S Helicopter
- Airborne Mine Neutralization (AMN) Module: Airborne Mine Neutralization System (AMNS) + MH-60S Helicopter
- Unmanned Minesweeping (UMS) Module: Unmanned Influence Sweeping System (UISS) (USV + Unmanned Surface Sweep System)

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603596N / *(U)LCS Mission Modules*	**Project (Number/Name)** 2550 / *Mine Countermeasure (MCM) Mission Package*

- Buried Minehunting (BMH) Module: Knifefish Unmanned Underwater Vehicle (UUV)
- Near Surface Mine Neutralization: Barracuda Mine Neutralization System

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Mine Countermeasures (MCM) Mission Modules	0.000	41.813	39.499	0.000	39.499
Articles:	-	-	-	-	-
FY 2019 Plans: For the Mine Countermeasures (MCM) Mission Package (MP) Airborne Mine Neutralization (AMN) Module, the program will integrate and conduct at-sea integration/tests on Freedom variant to certify the AMN module for use on the Freedom variant hulls. Testing requires placement and removal of exercise mines in a minefield along with 24 hour monitoring of the minefield with an at-sea chase boat for the duration of the test event. For the MCM MP Near Surface Detection (NSD) Module, the program will integrate and conduct integration/tests on Freedom variant to certify the NSD module for use on the Freedom variant hulls. Testing requires placement and removal of exercise mines in a minefield along with 24 hour monitoring of the minefield with an at-sea chase boat for the duration of the test event. For the MCM MP Coastal Mine Reconnaissance (CMR) Module, the program will integrate the CMR Post Mission Analysis (PMA) workstation and conduct at-sea integration/tests on Freedom variant to certify the CMR module for use on the Freedom variant hulls. For the MCM MP Unmanned Minesweeping (UMS) module, the program will begin integration of the Unmanned Influence Sweep System (UISS) into the MCM MP. Will conduct launch and recovery (L&R) capture line mechanism testing on LCS Independence variant. Conduct UISS at-sea IOT&E / UMS DT on LCS Independence variant to support UISS mission system IOC in FY 2019. Testing requires placement and removal of exercise mines in a minefield along with 24 hour monitoring of the minefield with an at-sea chase boat for the duration of the test event. Testing also requires procurement of test spares and test support equipment. The Program will also deliver and install common Post Mission Analysis (PMA) hardware onto LCS. For the MCM MP Buried Minehunting (BMH) Module, the program will begin integration of the Knifefish System into the MCM MP. Conduct pier-side Knifefish Launch and Recovery demonstration. Conduct integration and at-sea Knifefish DT and Knifefish BMH DT on Independence variant to support Knifefish mission system IOC in FY 2019. Testing requires placement and removal of exercise mines in a minefield along with 24 hour monitoring of the minefield with an at-sea chase boat for the duration of the test event. Testing also requires procurement of					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603596N / *(U)LCS Mission Modules*	**Project (Number/Name)** 2550 / *Mine Countermeasure (MCM) Mission Package*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
test spares and test support equipment. The Program will also deliver and install common PMA hardware onto LCS. For the MCM MP Remote Minehunting (RMH) Module, the program will support integration of the AN/AQS-20C onto the USV in preparation for an User Operational Evaluation System (UOES) employment, developmental test, and an Operational Assessment in FY 2020. Will develop an RMH Module Specification, integrate MVCS v1.2 into the USV, and will support contractor at-sea testing. The program will complete development and deliver MPAS Build 2.1. This version of MPAS incorporates correction of software Problem Trouble Reports (PTRs) identified during AMN, NSD, CMR, UMS, and BMH integration/testing. Integrate MPAS v2.1 into the Common Mission Package Trainer (CMPT). Continue development of MPAS Build 3.0 to add USV and AN/AQS-20C capability. Due to FY 2018 Congressional reduction to training procurements, vendor training for MCM MP crews will be provided until outfitting of LCS Training Facilities is completed in FY 2023, to include crew travel to facilities. The tactics team will conduct test analysis for both the Freedom and Independence hull variants and will update the CLASS Tactical Publications and the Integrated Program Execution Guide (IPEG). Will execute test scenarios on the Naval Mine Warfare Simulator (NMWS) to support certification events, Mission Package Readiness Assessments (MPRAs), and the Tactical Action Working Group meetings. The program will perform systems engineering (risk management, information assurance, human systems integration, safety), configuration management and Integrated Logistics Support (ILS)). Continue to compile system and package level Reliability and Maintainability (RAM-C) data to support reliability engineering and a prioritized initial spares list. Initiate Full Operational Capability (FOC) RAM-C analysis with updated data and update RAM-C Rationale Report. Continue MCM MP Failure Reporting, Analysis, and Corrective Action System (FRACAS) effort. ***FY 2020 Base Plans:*** For the MCM MP Remote Minehunting (RMH) Module, the program will support the UOES Employment, conduct at-sea developmental testing, and an Operational Assessment (OA) in preparation for testing the MCM MP on the Independence variant in FY 2021. Testing requires placement and removal of exercise mines in a minefield					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603596N / *(U)LCS Mission Modules*	**Project (Number/Name)** 2550 / *Mine Countermeasure (MCM) Mission Package*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
along with 24 hour monitoring of the minefield with an at-sea chase boat for the duration of the test event. Testing also requires procurement of test spares and test support equipment. The program will complete development and incorporation of PTRs into MCM MPAS Build 3.0 to support formal MCM MP Developmental and Operational Testing. Integrate MPAS Build 3.0 into the Common Mission Package Trainer. Due to FY 2018 Congressional reduction to training procurements, continue vendor training for MCM MP crews until outfitting of LCS Training Facilities is completed in FY 2023, to include crew travel to facilities. The program will conduct work-ups and test plan for execution of at-sea MCM MP developmental testing (DT-B10 Phase I and II) to be conducted in FY 2021. The tactics team will continue to conduct test analysis for both the Freedom and Independence hull variants and will update the CLASS Tactical Publications and the Integrated Program Execution Guide (IPEG). Will execute test scenarios on the Naval Mine Warfare Simulator (NMWS) to support certification events, Mission Package Readiness Assessments (MPRAs), and the Tactical Action Working Group meetings. The program will perform systems engineering (risk management, information assurance, human systems integration, safety), configuration management and Integrated Logistics Support (ILS)). Continue to compile system and package level Reliability and Maintainability (RAM-C) data to support reliability engineering and a prioritized initial spares list. Initiate Full Operational Capability (FOC) RAM-C analysis with updated data and update RAM-C Rationale Report. Continue MCM MP Failure Reporting, Analysis, and Corrective Action System (FRACAS) effort. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** The slight decrease from FY 2019 to FY 2020 is a result of completing the development, integration and Module level testing in FY 2019 of Unmanned Minesweeping (UMS) module and the Buried Minehunting (BMH) module. The focus in FY 2020 will be to complete integration of the Remote Minehunting Module into the MCM MP.					
Accomplishments/Planned Programs Subtotals	0.000	41.813	39.499	0.000	39.499

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603596N / *(U)LCS Mission Modules*	**Project (Number/Name)** 2550 / *Mine Countermeasure (MCM) Mission Package*

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• OPN 1600: *LCS Common Mission Modules Equipment*	18.760	33.237	51.553	-	51.553	36.657	55.776	29.787	30.382	727.684	1,424.901
• OPN 1601: *LCS MCM Mission Modules*	45.146	98.901	197.129	-	197.129	222.831	222.523	233.151	243.503	1,213.078	2,655.367

Remarks

D. Acquisition Strategy

The LCS MM Acquisition Strategy employs an incremental procurement approach to allow for the rapid introduction of additional capabilities as system technology matures. This phased plan provides incremental fielding of capability as technology is matured, into the MCM MP until the full baseline capability defined in the Capability Development Document (CDD) is reached.

E. Performance Metrics

Program Completed Milestone B January 2014
Complete MCM MP DT, TECHEVAL, and IOT&E on Independence variant
Achieve MCM MP Initial Operational Capability (IOC) on Independence variant
Conduct MCM MP DT, TECHEVAL, and IOT&E on Freedom variant

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603596N / *(U)LCS Mission Modules*	Project (Number/Name) 2550 / *Mine Countermeasure (MCM) Mission Package*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
MCM MP	WR	NSWC PCD : Panama City, FL	0.000	0.000		21.242	Nov 2018	13.487	Nov 2019	-		13.487	Continuing	Continuing	Continuing
MCM MP	Sub Allot	PMS 406 : Various	0.000	0.000		5.000	Feb 2019	2.650	Nov 2019	-		2.650	6.400	14.050	-
MCM MP	Sub Allot	PMS 495 : Various	0.000	0.000		1.000	Feb 2019	0.000		-		0.000	2.400	3.400	-
MCM MP	WR	NSWC PHD : Port Hueneme, CA	0.000	0.000		4.571	Dec 2018	5.000	Mar 2020	-		5.000	12.800	22.371	-
MCM MP	C/CPIF	Northrop Grumman : Bethpage, NY	0.000	0.000		9.600	Jan 2019	3.700	Jan 2020	-		3.700	4.800	18.100	-
		Subtotal	0.000	0.000		41.413		24.837		-		24.837	Continuing	Continuing	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
MCM MP Test Support	WR	NSWC PCD : Panama City, FL	0.000	0.000		0.000		14.162	Nov 2019	-		14.162	0.000	14.162	-
		Subtotal	0.000	0.000		0.000		14.162		-		14.162	0.000	14.162	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
MCM Program Management	C/CPFF	Booz Allen Hamilton : Washington, DC	0.000	0.000		0.400	Oct 2018	0.500	Oct 2019	-		0.500	1.680	2.580	-
		Subtotal	0.000	0.000		0.400		0.500		-		0.500	1.680	2.580	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	0.000		41.813		39.499		-		39.499	Continuing	Continuing	N/A

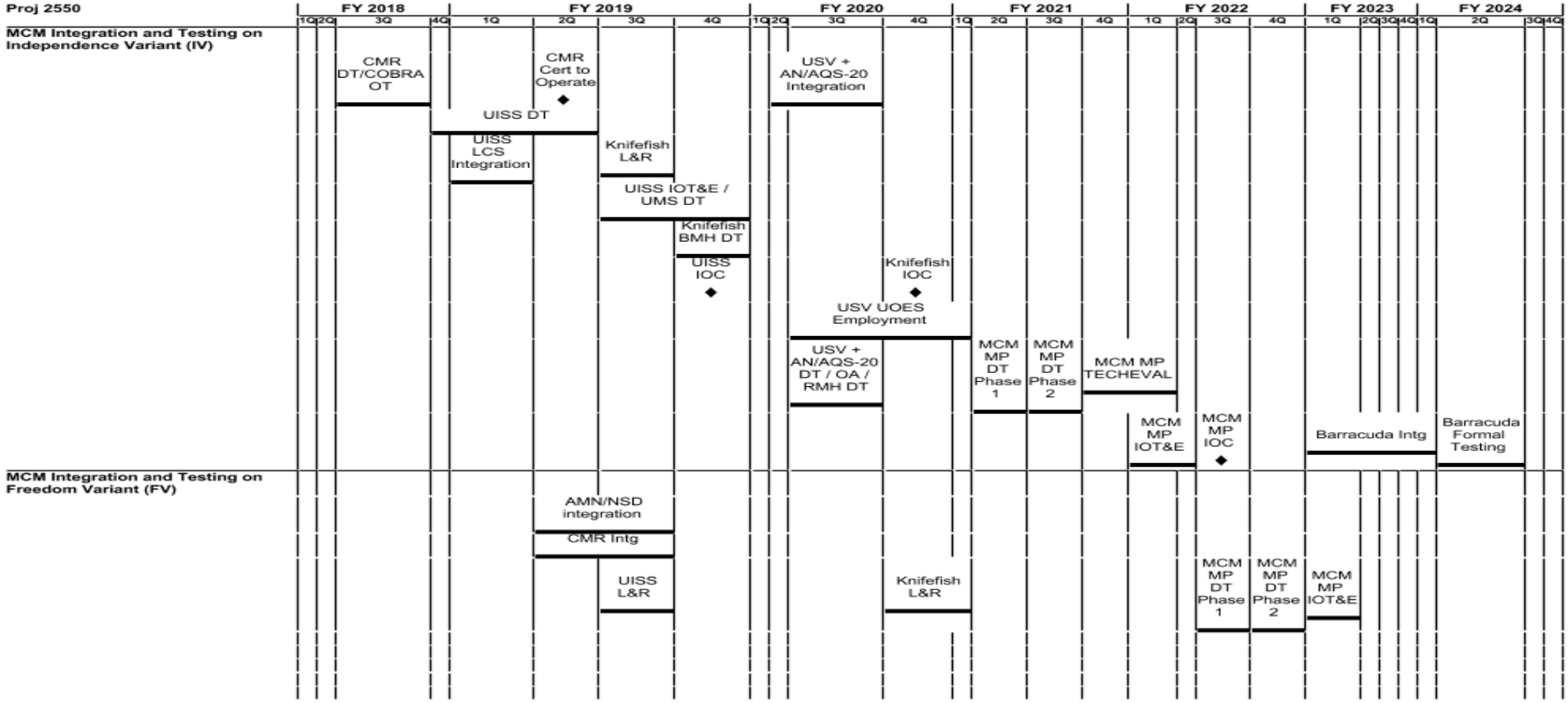
Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603596N / *(U)LCS Mission Modules*	Project (Number/Name) 2550 / *Mine Countermeasure (MCM) Mission Package*	

	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract

Remarks

FY 2018 and prior funding in Project 3129.

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603596N / *(U)LCS Mission Modules*	**Project (Number/Name)** 2550 / *Mine Countermeasure (MCM) Mission Package*



2020PB - 0603596N - 2550

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603596N / *(U)LCS Mission Modules*	**Project (Number/Name)** 2550 / *Mine Countermeasure (MCM) Mission Package*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 2550				
MCM Integration and Testing on Independence Variant (IV): CMR DT/COBRA at-Sea OT	3	2018	3	2018
MCM Integration and Testing on Independence Variant (IV): CMR Mission Module Certified for Operations	2	2019	2	2019
MCM Integration and Testing on Independence Variant (IV): USV + AN/AQS-20 Integration	2	2020	3	2020
MCM Integration and Testing on Independence Variant (IV): UISS Mission System DT	4	2018	2	2019
MCM Integration and Testing on Independence Variant (IV): UISS LCS Integration	1	2019	1	2019
MCM Integration and Testing on Independence Variant (IV): Knifefish L&R	3	2019	3	2019
MCM Integration and Testing on Independence Variant (IV): UISS Mission System IOT&E / UMS DT	3	2019	4	2019
MCM Integration and Testing on Independence Variant (IV): Knifefish Mission System BMH DT	4	2019	4	2019
MCM Integration and Testing on Independence Variant (IV): UISS Mission System IOC	4	2019	4	2019
MCM Integration and Testing on Independence Variant (IV): Knifefish Mission System IOC	4	2020	4	2020
MCM Integration and Testing on Independence Variant (IV): USV + AN/AQS-20 UOES Employment	3	2020	1	2021
MCM Integration and Testing on Independence Variant (IV): USV + AN/AQS-20 DT / OA / RMH DT	3	2020	3	2020
MCM Integration and Testing on Independence Variant (IV): DT-B10 (Phase 1)	2	2021	2	2021
MCM Integration and Testing on Independence Variant (IV): DT-B10 (Phase 2)	3	2021	3	2021
MCM Integration and Testing on Independence Variant (IV): DT-C10 TECHEVAL	4	2021	1	2022

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603596N / *(U)LCS Mission Modules*	**Project (Number/Name)** 2550 / *Mine Countermeasure (MCM) Mission Package*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
MCM Integration and Testing on Independence Variant (IV): OT-C10 IOT&E	1	2022	2	2022
MCM Integration and Testing on Independence Variant (IV): MCM MP IOC on Independence Variant	3	2022	3	2022
MCM Integration and Testing on Independence Variant (IV): Barracuda Integration	1	2023	1	2024
MCM Integration and Testing on Independence Variant (IV): Barracuda Testing MCM Mission Package	2	2024	2	2024
MCM Integration and Testing on Freedom Variant (FV): AMN/NSD integration	2	2019	3	2019
MCM Integration and Testing on Freedom Variant (FV): CMR Integration	2	2019	3	2019
MCM Integration and Testing on Freedom Variant (FV): UISS L&R	3	2019	3	2019
MCM Integration and Testing on Freedom Variant (FV): Knifefish L & R	4	2020	1	2021
MCM Integration and Testing on Freedom Variant (FV): DT-B9 (Phase 1)	3	2022	3	2022
MCM Integration and Testing on Freedom Variant (FV): DT-B9 (Phase 2)	4	2022	4	2022
MCM Integration and Testing on Freedom Variant (FV): OT-C9 IOT&E	1	2023	1	2023
MCM Integration and Testing on Freedom Variant (FV): Barracuda Integration	1	2023	4	2023
MCM Integration and Testing on Freedom Variant (FV): Barracuda Testing on Indy	4	2024	4	2024

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603596N / *(U)LCS Mission Modules*	Project (Number/Name) 2551 / *Anti-Submarine Warfare (ASW) Mission Package*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
2551: *Anti-Submarine Warfare (ASW) Mission Package*	0.000	0.000	41.553	41.580	-	41.580	9.282	8.884	8.500	8.670	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Project MDAP/MAIS Code: 443

A. Mission Description and Budget Item Justification

Beginning in FY 2019, Mission Package (MP) funding is realigned into four (4) projects:

2550 Mine Countermeasures (MCM) MP
2551 Anti-Submarine Warfare (ASW) MP
2552 Surface Warfare (SUW) MP
3129 LCS MP Development

Prior to FY 2019 all MP funding was in Project 3129.

Due to an FY 2018 Congressional reduction, all efforts associated with the development, integration, and testing of the Torpedo Defense Module have stopped. The requirement for a torpedo defense capability is currently unfunded and no longer in the ASW MP baseline.

The ASW MP enables LCS to conduct detect-to-engage operations against submarines. Specific ASW capabilities include protecting forces in transit, protecting joint operating areas, and establishing ASW barriers. The ASW MP provides the warfighter capabilities that can be employed for ASW area search as well as high value unit escort missions. Key components of the ASW MP include a Variable Depth Sonar, a Multi-Function Towed Array and sonar signal processing. These individual systems are combined into modules: an ASW Escort Mission Module (EMM) that provides High Value Unit (HVU) escort capability and an Aviation Module that offers airborne threat localization and engagement capability through a MQ-8B Fire Scout VTUAV and an MH-60R with MK54 torpedoes.

This project delivered the ASW EMM Pre-Production Test Article (PPTA) and the Aviation Module in Q1 FY 2019. Following the delivery of the PPTA, the ASW MP will be installed on board a Freedom variant hull to support Developmental Testing (DT) and Initial Operational Test & Evaluation (IOT&E) to support Initial Operational Capability (IOC) in FY 2020. Following integration and testing onboard a Freedom variant, this project will transition to production in FY 2020. This project will initiate shipboard integration of the Independence variant in FY 2020.

The ASW MP will take advantage of improvements developed under the submarine Advanced Processing Build (APB), Advanced Surveillance Build (ASB) and Advanced Capability Build (ACB) and will in turn share unique improvements developed under this program with the submarine, surface combatants, and surveillance ASW communities. All programs (ACB, ASB, and APB) are managed under a common development process and titled AxB. This will contribute to the development of

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603596N / *(U)LCS Mission Modules*	**Project (Number/Name)** 2551 / *Anti-Submarine Warfare (ASW) Mission Package*

LCS ASW MPs and the Guided Missile Frigate FFG(X) Program. While the LCS ASW MP will retains its uniqueness and focus in functional domains essential to mission package success, a premium is placed on development of common capabilities and modular architecture technologies to maximize commonality and cost effectiveness.

The Open System Architecture (OSA) and high performance COTS sonar processing hardware, provided as an adjunct to the Mission Package Computing Environment (MPCE), will be fielded with the ASW MP and will provide an opportunity to integrate emergent, transformational ASW technological improvements that were previously unachievable. The ASW MP will require periodic upgrades to remain effective well into the 21st century and to pace the threat. Software upgrades target capability increases in high interest areas as prescribed by the Fleet and captured in campaign analysis. To achieve this, this project will package and deliver incremental upgrades every four years to the ASW MP production program via an ACB development process by inserting maturing USW technologies and addressing hardware technology obsolescence.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Anti-Submarine Warfare (ASW) Mission Modules	0.000	41.553	41.580	0.000	41.580
Articles:	-	-	-	-	-
FY 2019 Plans: PREPARE FOR AND CONDUCT FORMAL TESTING ON FREEDOM VARIANT: 1.) Complete Escort Mission Module (EMM) pier-side System Qualification Testing (SQT) 2.) Government acceptance of the EMM Pre-Production Test Article (PPTA) 3.) Conduct end-to-end integration testing at the Land Based Integration Test Site (LBITS) 4.a.) Conduct at-sea end-to-end integration testing of the EMM on a white-ship hull at AUTEC to characterize at-sea acoustic performance 4.b.) While conducting white-ship testing, execute Ship Alteration (SHIPALT) on LCS 3 to support formal testing 5.) Conduct Crew Training 6.) Embark and conduct Installation Check Out (INCO) procedures for the ASW MP onto LCS 3 7.) Finalize safety analysis of the ASW equipment on the Freedom variant 8.) Conduct ASW MP Weapon System Explosives Safety Review Board (WSESRB) to support ASW MP certification 9.) Conduct ASW MP Readiness Assessment (MPRA) /Mission Readiness Assessment (MRA) and certify the package to start formal testing on Freedom variant 10.) Continue development of ASW MP logistics products 11.) Finalize testing objectives, performance prediction modeling, and test plans to support ASW MP testing 12.) Conduct developmental testing (DT-B3 Phase I) on LCS 3 to support ASW MP Initial Operational Capability (IOC) in FY 2020					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603596N / *(U)LCS Mission Modules*	**Project (Number/Name)** 2551 / *Anti-Submarine Warfare (ASW) Mission Package*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Continue development of EMM acoustic processing software and hardware (ACB-19 software and TI-18 sonar signal processing hardware) which is a four-year cycle to address both software and hardware obsolescence. Continue development of ASW MP operator training materials and course curriculum to support Train to Qualify and Train to Certify requirements. Continue development of component and system level modeling and simulation capabilities to enable high fidelity virtual reality training. Conduct vendor training events in support of formal courseware development. Continue development of Common Skills, ASW Skills, and O&M training to incorporate ASW MP capabilities for delivery to the LCS Training Facility and ASW Fleet Training Center in support of ready for training in FY 2022. Provide initial training to LCS Sailors in support of key test events to ensure Sailors are receiving adequate ASW MP operation and maintenance training until formal Navy training is fully established. Provide travel costs for Sailors to attend initial and vendor training. Complete the development of the Torpedo Defense Module (TDM) in Q1 FY 2019. Due to FY 2018 Budget Enactment all efforts associated with the integration and testing of the TDM have stopped. The requirement for a Torpedo Defense capability is unfunded and no longer in the ASW MP IOC baseline. ***FY 2020 Base Plans:*** COMPLETE FORMAL TESTING ON FREEDOM VARIANT: 1.) Complete DT-B3 Phase II, DT-C3 (TECHEVAL), and OT-C3 (IOT&E) to achieve ASW MP IOC 2.) Complete development of ASW MP logistics products INITIATE INTEGRATION OF ASW MP ON INDEPENDENCE VARIANT IN PREPARATION FOR FORMAL TESTING: 1.) Develop requirements for the Independence variant SHIPALT 2.) Complete the Ship Installation Drawings (SIDs) and Ship Change Documents (SCDs) 3.) Conduct ship checks 4.) Complete development of ASW MP SHIPALT for Independence variant in preparation for MP embark/debark 5.) Execute SHIPALT on LCS 4 to support formal testing 6.) Conduct Crew Training 7.) Embark and conduct Installation Check Out (INCO) procedures for the ASW MP onto LCS 4 8.) Finalize safety analysis of the ASW equipment on the Independence variant 9.) Conduct ASW MP Weapon System Explosives Safety Review Board (WSESRB) to support ASW MP certification					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603596N / *(U)LCS Mission Modules*	**Project (Number/Name)** 2551 / *Anti-Submarine Warfare (ASW) Mission Package*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
10.) Finalize testing objectives, performance prediction modeling, and test plans to support ASW MP testing 11.) Conduct at-sea end-to-end integration testing on Independence variant hull to include ASW MP and combat system performance validation testing 12.) Prepare for formal developmental and operational testing beginning in FY 2021 Due to FY 2019 Budget Enactment for Common and ASW MP procurement funds (BLI 1600 and BLI 1602), program has moved from fielding ACB-19 / TI-18 to ACB-19 / TI-20 to allow the program to procure and field a common sonar signal processing baseline across the eight ASW division ships. This is a four-year cycle to address both software and hardware obsolescence. In support of transitioning EMM to production, will complete System Qualification Testing (SQT), System Verification Review (SVR), Functional Configuration Audit (FCA), Physical Configuration Audit (PCA), and validation of sonar acoustic performance, shipboard interfaces, and launch, handling and recovery. The project will conduct a Production Readiness Review (PRR) in Q2 FY 2020. Continue development of ASW MP operator training materials and course curriculum to support Train to Qualify and Train to Certify requirements. Continue development of component and system level modeling and simulation capabilities to enable high fidelity virtual reality training. Conduct vendor training events in support of formal courseware development. Continue development of Common Skills, ASW Skills, and O&M training to incorporate ASW MP capabilities for delivery to the LCS Training Facility and ASW Fleet Training Center in support of ready for training in FY 2022. Continue to provide initial training to LCS Sailors in support of key test events as well as temporary vendor training to ensure Sailors are receiving adequate ASW MP operation and maintenance training until formal Navy training is fully established. Provide travel costs for Sailors to attend initial and vendor training. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increase from FY 2019 to FY 2020 due to completion of development of the ASW MP in FY 2019 to support a transition to formal testing on the Freedom variant and initiation of integration and testing on the Independence variant hull in FY 2020.					
Accomplishments/Planned Programs Subtotals	0.000	41.553	41.580	0.000	41.580

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603596N / *(U)LCS Mission Modules*	**Project (Number/Name)** 2551 / *Anti-Submarine Warfare (ASW) Mission Package*

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• OPN 1600: *LCS Common Mission Modules Equipment*	18.760	33.237	51.553	-	51.553	36.657	55.776	29.787	30.382	727.684	1,424.901
• OPN 1602: *LCS ASW Mission Modules*	0.000	0.000	27.754	-	27.754	63.181	34.104	34.777	35.473	149.221	344.510

Remarks

D. Acquisition Strategy

The LCS MM Acquisition Strategy is employing an incremental procurement approach to allow for the rapid introduction of additional capabilities as system technology matures. This phased plan provides incremental fielding of capability through the introduction of mature programs of record into the respective Mission Packages until the full baseline capability defined in the Capability Development Document (CDD) is reached.

E. Performance Metrics

Program Completed Milestone B January 2014
Complete ASW MP DT, TECHEVAL, and IOT&E on Freedom variant
Achieve ASW MP IOC on Freedom variant
Complete ASW MP DT and IOT&E on Independence variant

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603596N / *(U)LCS Mission Modules*	Project (Number/Name) 2551 / *Anti-Submarine Warfare (ASW) Mission Package*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
2.0 ASW MP	Sub Allot	PEO IWS 5E : Various	0.000	0.000		1.500	Nov 2018	0.000		-		0.000	0.000	1.500	-
2.0 ASW MP	WR	NUWC NPT : Newport RI	0.000	0.000		2.380	Nov 2018	1.600	Nov 2019	-		1.600	Continuing	Continuing	Continuing
2.0 ASW MP	WR	SSC PAC : San Diego, CA	0.000	0.000		0.750	Dec 2018	0.000		-		0.000	0.000	0.750	-
2.0 ASW MP	WR	NUWC KPT : Keyport, Wa	0.000	0.000		0.500	Nov 2018	0.800	Nov 2019	-		0.800	0.000	1.300	-
2.0 ASW MP	C/CPFF	Northrop Grumman : Bethpage, NY	0.000	0.000		2.800	Jan 2019	0.000		-		0.000	0.000	2.800	-
2.0 ASW MP	Sub Allot	PEO IWS 5A : Various	0.000	0.000		13.800	Mar 2019	12.200	Mar 2020	-		12.200	Continuing	Continuing	Continuing
2.0 ASW MP	C/CPFF	CSRA : Washington, DC	0.000	0.000		0.255	Jan 2019	0.000		-		0.000	0.000	0.255	-
2.0 ASW MP	WR	NSWC DD : Dahlgren, VA	0.000	0.000		0.225	Nov 2018	0.000		-		0.000	0.000	0.225	-
2.0 ASW MP	WR	SUPSHIP Bath : Bath, Me	0.000	0.000		1.550	Oct 2018	3.500	Oct 2019	-		3.500	0.000	5.050	-
2.0 ASW MP	MIPR	NAWC WD : Point Mugu, CA	0.000	0.000		0.410	Dec 2018	0.000		-		0.000	0.000	0.410	-
2.0 ASW MP	C/FFP	Raytheon : Portsmouth, RI	0.000	0.000		0.000	Nov 2018	0.000		-		0.000	0.000	0.000	-
		Subtotal	0.000	0.000		24.170		18.100		-		18.100	Continuing	Continuing	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
2.0 ASW MP Test and Evaluation (Freedom)	WR	COMOPTEVFOR : Norfolk, VA	0.000	0.000		0.550	Oct 2018	0.550	Oct 2019	-		0.550	0.000	1.100	-
2.0 ASW MP Test and Evaluation (Freedom)	WR	NSWC PHD : Port Hueneme, Ca	0.000	0.000		1.766	Dec 2018	5.730	Dec 2019	-		5.730	0.000	7.496	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603596N / *(U)LCS Mission Modules*	**Project (Number/Name)** 2551 / *Anti-Submarine Warfare (ASW) Mission Package*

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
2.0 ASW MP Test and Evaluation (Freedom)	WR	Range Service : Var*	0.000	0.000		3.154	Oct 2018	4.300	Oct 2019	-		4.300	0.000	7.454	-
2.0 ASW MP Test and Evaluation (Freedom)	WR	NUWC NPT : Newport, RI	0.000	0.000		7.362	Dec 2018	8.400	Dec 2019	-		8.400	0.000	15.762	-
2.0 ASW MP Test and Evaluation (Freedom)	WR	NUWC KPT : Keyport, Wa	0.000	0.000		2.600	Nov 2018	2.500	Nov 2019	-		2.500	0.000	5.100	-
2.0 ASW MP Test and Evaluation (Freedom)	C/CPFF	Raytheon : Portsmouth, RI	0.000	0.000		1.400	Jan 2019	1.400	Jan 2020	-		1.400	0.000	2.800	-
		Subtotal	0.000	0.000		16.832		22.880		-		22.880	0.000	39.712	N/A

Management Services ($ in Millions)

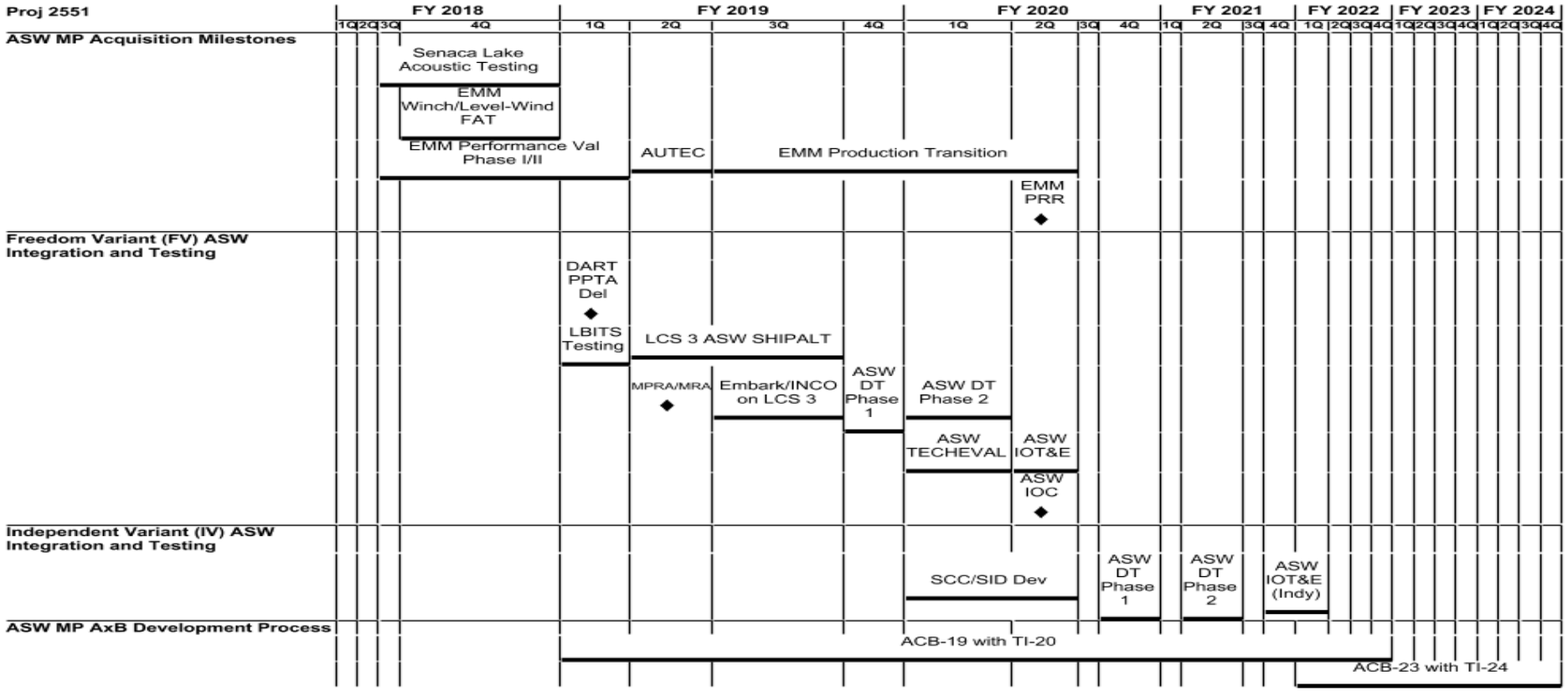
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
2.0 ASW MP	C/CPIF	Booz Allen Hamilton : Washington, DC	0.000	0.000		0.551	Jan 2019	0.600	Jan 2020	-		0.600	0.000	1.151	-
		Subtotal	0.000	0.000		0.551		0.600		-		0.600	0.000	1.151	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	0.000		41.553		41.580		-		41.580	Continuing	Continuing	N/A

Remarks

FY 2018 and prior funding in Project 3129.

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603596N / *(U)LCS Mission Modules*	**Project (Number/Name)** 2551 / *Anti-Submarine Warfare (ASW) Mission Package*



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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603596N / *(U)LCS Mission Modules*	**Project (Number/Name)** 2551 / *Anti-Submarine Warfare (ASW) Mission Package*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 2551				
ASW MP Acquisition Milestones: EMM Acoustic Characterization Seneca Lake	3	2018	4	2018
ASW MP Acquisition Milestones: EMM Winch and Level-Wind First Article Test	4	2018	4	2018
ASW MP Acquisition Milestones: EMM Component and System Level Performance Validation Dock Side Testing	3	2018	1	2019
ASW MP Acquisition Milestones: White Ship Testing AUTEC	2	2019	2	2019
ASW MP Acquisition Milestones: EMM Production Transition	3	2019	2	2020
ASW MP Acquisition Milestones: EMM Production Readiness Review	2	2020	2	2020
Freedom Variant (FV) ASW Integration and Testing: DART Pre-Production Test Article Delivery	1	2019	1	2019
Freedom Variant (FV) ASW Integration and Testing: ASW MP Land Based Integration and Testing	1	2019	1	2019
Freedom Variant (FV) ASW Integration and Testing: ASW MP SHIPALT Execution on LCS 3	2	2019	3	2019
Freedom Variant (FV) ASW Integration and Testing: ASW MP Readiness Assessment (MPRA)/Mission Readiness Assessment	2	2019	2	2019
Freedom Variant (FV) ASW Integration and Testing: ASW MP Embark and INCO on LCS 3	3	2019	3	2019
Freedom Variant (FV) ASW Integration and Testing: ASW MP DT-B3 Phase 1	4	2019	4	2019
Freedom Variant (FV) ASW Integration and Testing: ASW MP DT-B3 Phase 2	1	2020	1	2020
Freedom Variant (FV) ASW Integration and Testing: ASW MP DT/IT-C3 TECHEVAL	1	2020	1	2020
Freedom Variant (FV) ASW Integration and Testing: ASW MP OT-C3	2	2020	2	2020
Freedom Variant (FV) ASW Integration and Testing: ASW MP IOC	2	2020	2	2020

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603596N / *(U)LCS Mission Modules*	**Project (Number/Name)** 2551 / *Anti-Submarine Warfare (ASW) Mission Package*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Independent Variant (IV) ASW Integration and Testing: ASW Mission Package SCD/ SID development for LCS 4	1	2020	2	2020
Independent Variant (IV) ASW Integration and Testing: ASW MP SHIPALT Execution on LCS 4	3	2020	3	2020
Independent Variant (IV) ASW Integration and Testing: ASW MP Embark and INCO on LCS 4	3	2020	3	2020
Independent Variant (IV) ASW Integration and Testing: ASW MP DT-B6 Phase 1	4	2020	4	2020
Independent Variant (IV) ASW Integration and Testing: ASW MP DT-B6 Phase 2	2	2021	2	2021
Independent Variant (IV) ASW Integration and Testing: ASW MP OT-C6	4	2021	1	2022
ASW MP AxB Development Process: ACB-19 with TI-20	1	2019	4	2022
ASW MP AxB Development Process: ACB-23 with TI-24	1	2022	4	2024

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603596N / *(U)LCS Mission Modules*	Project (Number/Name) 2552 / *Surface Warfare (SUW) Mission Package*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
2552: *Surface Warfare (SUW) Mission Package*	0.000	0.000	11.368	17.558	-	17.558	0.000	0.000	0.000	0.000	0.000	28.926
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Project MDAP/MAIS Code: 443

A. Mission Description and Budget Item Justification

Beginning in FY 2019, Mission Package funding is realigned into four (4) projects:

2550 Mine Countermeasures (MCM) Mission Package (MP)
2551 Anti-Submarine Warfare (ASW) MP
2552 Surface Warfare (SUW) MP
3129 LCS MP Development

Prior to FY 2019 all MP funding was in Project 3129.

The SUW MP increases firepower and offensive/defensive capabilities against large numbers of highly maneuverable, fast, small craft threats, giving LCS the ability to protect the sea lanes and move a force quickly through a choke point or other strategic waterway. The SUW MP is comprised of several modules including the Gun Mission Module (GMM), the Aviation Module, the Maritime Security Module (MSM), and the Surface-to-Surface Missile Module (SSMM). The GMM is comprised of two high velocity 30mm cannons and is augmented with the ship's 57mm gun to counter close in to mid-range threats. The Aviation Module uses the embarked MH-60R helicopter with Hellfire missile and the MQ-8B Fire Scout VTUAV for the detection, identification, and classification of surface contacts and to engage long range threats. The MSM supports the embarkation of a Visit, Board, Search, and Seizure (VBSS) team. The SSMM is a self-contained module consisting of 2 Missile Exhaust Containment Structures (MECS), integrated articulating hatch covers, a fire control system, and 12 two-rail M299 launchers to support load out and firing of 24 longbow hellfire missiles. SSMM provides missile coverage for mid-range threats and small boats.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Surface Warfare (SUW) Mission Modules	0.000	11.368	17.558	0.000	17.558
Articles:	-	-	-	-	-
FY 2019 Plans: Complete IOT&E and establish IOC of the Surface-to-Surface Missile Module in Q2 FY 2019.					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603596N / *(U)LCS Mission Modules*	**Project (Number/Name)** 2552 / *Surface Warfare (SUW) Mission Package*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Conduct Find, Fix, Repair efforts of SSMM EDM-2 to resolve issues found during Freedom variant testing and complete test reports. Continue integration of SSMM with Independence variant Combat Management System (CMS), obtain WSESRB/SSSTRP approvals, and IA approvals necessary for formal shipboard testing on Independence variant. Conduct developmental testing (DT-B12 Phase I) on Independence variant. Conduct analysis of test objectives and associated Measures of Effectiveness (MOEs) targeted for SSMM testing onboard Independence variant in support of developmental testing. Complete updates to Common Skills, SUW Skills, and O&M training to incorporate SSMM and VTUAV capabilities in support of ready for training in FY 2020. ***FY 2020 Base Plans:*** Complete integration of SSMM with Independence variant Combat Management System (CMS), obtain WSESRB/SSSTRP approvals, and IA approvals necessary for formal shipboard testing on Independence variant. Complete formal DT-B12 Phase II, DT-C12 (TECHEVAL), and OT-C12 (IOT&E) on the Independence variant. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increases from FY 2019 to FY 2020 is to fund the completion of shipboard integration, Combat System Certification, and formal shipboard developmental and operational testing on the Independence variant.					
Accomplishments/Planned Programs Subtotals	0.000	11.368	17.558	0.000	17.558

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• OPN 1600: *LCS Common Mission Module Equipment*	18.760	33.237	51.553	-	51.553	36.657	55.776	29.787	30.382	727.684	1,424.901

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603596N / *(U)LCS Mission Modules*	**Project (Number/Name)** 2552 / *Surface Warfare (SUW) Mission Package*

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• OPN 1603: *LCS SUW Mission Module*	20.925	13.025	26.566	-	26.566	15.342	15.711	28.711	4.961	32.604	278.669
• WPN 4221: *LCS Module Weapons*	10.610	11.350	0.000	14.585	14.585	14.417	13.825	14.103	14.385	37.555	133.606

Remarks

D. Acquisition Strategy

The LCS MM Acquisition Strategy is employing an incremental procurement approach to allow for the rapid introduction of additional capabilities as system technology matures. This phased plan provides incremental fielding of capability through the introduction of mature programs of record into the respective Mission Packages until the full baseline capability defined in the Capability Development Document (CDD) is reached.

E. Performance Metrics

Program Completed Milestone B January 2014
Complete SUW MP DT, TECHEVAL, and IOT&E on Freedom variant
Complete SUW MP DT, TECHEVAL, and IOT&E on Independence variant

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603596N / *(U)LCS Mission Modules*	Project (Number/Name) 2552 / *Surface Warfare (SUW) Mission Package*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
3.0 SUW MP	MIPR	JAMS PO : Various	0.000	0.000		1.350	Jan 2019	0.400	Jan 2020	-		0.400	0.000	1.750	-
3.0 SUW MP	WR	NSWC DD : Dahlgren, VA	0.000	0.000		5.098	Nov 2018	3.100	Nov 2019	-		3.100	0.000	8.198	-
3.0 SUW MP	C/CPIF	Northrop Grumman : Bethpage, NY	0.000	0.000		0.800	Dec 2018	0.000		-		0.000	0.000	0.800	-
		Subtotal	0.000	0.000		7.248		3.500		-		3.500	0.000	10.748	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
3.0 SUW MP	Sub Allot	NSWC PHD : Port Hueneme, CA	0.000	0.000		1.970	Jan 2019	3.058	Jan 2020	-		3.058	0.000	5.028	-
3.0 SUW MP	WR	NSWC Corona : Corona, CA	0.000	0.000		0.950	Jan 2019	1.000	Jan 2020	-		1.000	0.000	1.950	-
3.0 SUW MP	WR	NSWC DD : Dahlgren, VA	0.000	0.000		0.750	Jan 2019	9.500	Jan 2020	-		9.500	0.000	10.250	-
		Subtotal	0.000	0.000		3.670		13.558		-		13.558	0.000	17.228	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
3.0 SUW MP	C/CPIF	Booz Allen Hamilton : Washington, DC	0.000	0.000		0.450	Jan 2019	0.500	Jan 2020	-		0.500	0.000	0.950	-
		Subtotal	0.000	0.000		0.450		0.500		-		0.500	0.000	0.950	N/A

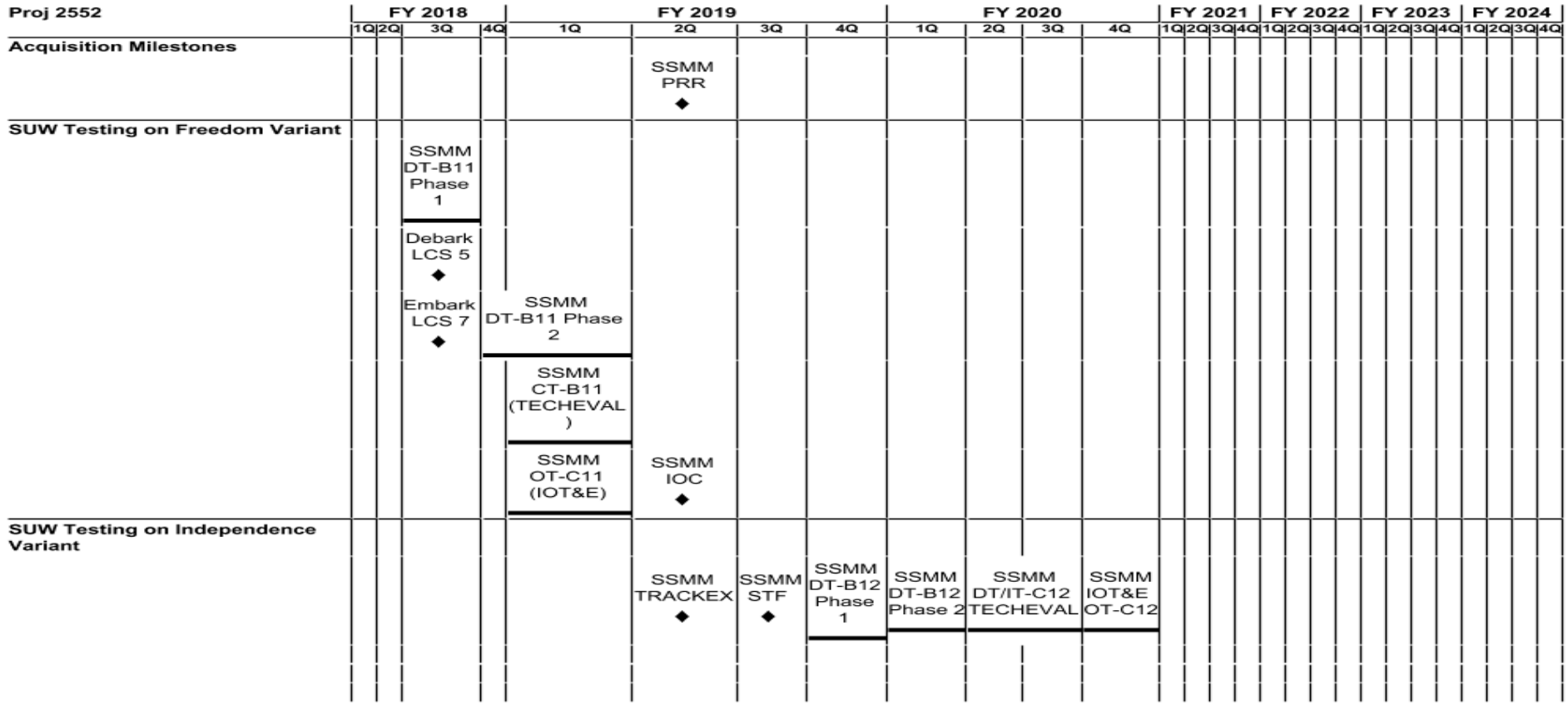
	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	0.000		11.368		17.558		-		17.558	0.000	28.926	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603596N / *(U)LCS Mission Modules*	Project (Number/Name) 2552 / *Surface Warfare (SUW) Mission Package*	

	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603596N / *(U)LCS Mission Modules*	**Project (Number/Name)** 2552 / *Surface Warfare (SUW) Mission Package*



2020PB - 0603596N - 2552

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603596N / *(U)LCS Mission Modules*	**Project (Number/Name)** 2552 / *Surface Warfare (SUW) Mission Package*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 2552				
Acquisition Milestones: Production Readiness Review (PRR) for SSMM	2	2019	2	2019
SUW Testing on Freedom Variant: SSMM DT-B11 Phase 1	3	2018	3	2018
SUW Testing on Freedom Variant: Debark on LCS 5	3	2018	3	2018
SUW Testing on Freedom Variant: Embark LCS 7	3	2018	3	2018
SUW Testing on Freedom Variant: SSMM DT-B11 Phase 2	4	2018	1	2019
SUW Testing on Freedom Variant: SSMM CT-B11 (TECHEVAL)	1	2019	1	2019
SUW Testing on Freedom Variant: SSMM OT-B11 (IOT&E)	1	2019	1	2019
SUW Testing on Freedom Variant: SSMM IOC	2	2019	2	2019
SUW Testing on Independence Variant: SSMM TRACKEX	2	2019	2	2019
SUW Testing on Independence Variant: SSMM Structual Test Fire (STF)	3	2019	3	2019
SUW Testing on Independence Variant: SSMM DT-B12 Phase I	4	2019	4	2019
SUW Testing on Independence Variant: SSMM DT-B12 Phase II	1	2020	1	2020
SUW Testing on Independence Variant: SSMM TECHEVAL DT-C12	2	2020	3	2020
SUW Testing on Independence Variant: SSMM IOT&E OT-C12	4	2020	4	2020

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy											Date: March 2019	
Appropriation/Budget Activity 1319 / 4					R-1 Program Element (Number/Name) PE 0603596N / *(U)LCS Mission Modules*				Project (Number/Name) 3129 / *LCS Mission Package Development*			
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
3129: *LCS Mission Package Development*	525.214	100.470	8.825	9.868	-	9.868	8.993	8.928	9.056	9.235	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Project MDAP/MAIS Code: 443

A. Mission Description and Budget Item Justification

Beginning in FY 2019, Mission Package (MP) funding is realigned into four (4) projects:

2550 Mine Countermeasures (MCM) MP
2551 Anti-Submarine Warfare (ASW) MP
2552 Surface Warfare (SUW) MP
3129 LCS MP Development

Prior to FY 2019 all MP funding was in Project 3129.

FY 2018 and Prior:
The SUW MP increases firepower and offensive/defensive capabilities against large numbers of highly maneuverable, fast, small craft threats, giving LCS the ability to protect the sea lanes and move a force quickly through a choke point or other strategic waterway. The SUW MP is comprised of several modules including the Gun Mission Module (GMM), the Aviation Module, the Maritime Security Module (MSM), and the Surface-to-Surface Missile Module (SSMM). The GMM is comprised of two high velocity 30mm cannons and augments the ship's 57mm gun to counter close in to mid-range threats. The Aviation Module uses the embarked MH-60R helicopter with Hellfire missile and the MQ-8B Fire Scout VTUAV for the detection, identification, and classification of surface contacts and to engage long range threats. The MSM provides the crew with the ability to perform Visit, Board, Search, and Seizure (VBSS) missions. The SSMM is a self-contained module consisting of 2 Missile Exhaust Containment Structures (MECS), integrated articulating hatch covers, a fire control system, and 12 two-rail M299 launchers to support load out and firing of 24 longbow hellfire missiles. SSMM provides missile coverage for mid-range threats and small boats.

The ASW MP enables LCS to conduct detect-to-engage operations against modern submarines that pose a threat. Specific ASW capabilities include protecting forces in transit, protecting joint operating areas, and establishing ASW barriers. The ASW MP provides the warfighter capabilities that can be employed for ASW area search as well as high value unit escort missions. Key components of the ASW MP include a Light Weight Tow torpedo countermeasure, a Variable Depth Sonar, and a Multi-Function Towed Array. These individual systems are combined into three modules: Torpedo Defense Module; an ASW Escort Mission Module that provides High value unit escort capability; and an Aviation Module that offers airborne threat localization and engagement capability through a MQ-8B Fire Scout VTUAV and an MH-60R with MK54 torpedoes.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603596N / *(U)LCS Mission Modules*	**Project (Number/Name)** 3129 / *LCS Mission Package Development*

The MCM MP will counter deep, shallow, and tethered mines in the littoral without putting Sailors in the minefield. When the MCM MP is embarked, LCS is capable of conducting detect-to-engage operations (hunting, sweeping, and neutralization) against very shallow and deep-water sea mine threats. The MCM MP provides these capabilities through the use of sensors and weapons deployed from an MH-60S multi-mission helicopter, unmanned off-board vehicles, and support equipment/ containers. The MCM MP consists of the following modules:
- Remote Minehunting (RMH) Module: MCM Unmanned Surface Vehicle (USV) + AN/AQS-20 Minehunting Sonar
- Coastal Mine Reconnaissance (CMR) Module: Coastal Battlefield Reconnaissance & Analysis (COBRA) + MQ-8B Fire Scout Vertical Take-off and Landing Tactical Unmanned Aerial Vehicle (VTUAV)
- Near Surface Detection (NSD) Module: Airborne Laser Mine Detection System (ALMDS) + MH-60S Helicopter
- Airborne Mine Neutralization (AMN) Module: Airborne Mine Neutralization System (AMNS) + MH-60S Helicopter
- Unmanned Minesweeping (UMS) Module: Unmanned Influence Sweep System (UISS) (USV + Unmanned Surface Sweep System)
- Buried Minehunting (BMH) Module: Knifefish Unmanned Underwater Vehicle (UUV)
- Near-Surface Mine Neutralization: Barracuda Mine Neutralization

FY 2019 and outyear funding includes:

The LCS MM Common Equipment consists of enabling products required by all MPs to provide common hardware interfaces, computer operating environment, communications systems, aviation interface systems, and portable development & integration test-sets. Common hardware interfaces include definition, installation, and control of mechanical, electrical, and cooling requirements common to all mission packages. The Mission Package Computing Environment (MPCE) provides common services and Operating Environment to support all Mission Package Application Software and Open Architecture Products. The Multi-Vehicle Communications System (MVCS) enables the control and data exchange of simultaneous unmanned mission vehicles and the Ship. Aviation interface systems include integration and management of data communications, data processing, and physical hardware interfaces such as common equipment and containers used by all mission packages. Development and integration test-sets provide a mobile operating environment installed in the Mission Package Portable Control Stations (MPPCS) to serve as a surrogate Ship during mission package development and integration test events at test ranges.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Mine Countermeasure (MCM) Mission Package	21.849	0.000	0.000	0.000	0.000
Articles:	-	-	-	-	-
FY 2019 Plans: Funded under Project 2550 for FY 2019.					
FY 2020 Base Plans: Funded under Project Unit 2550 for FY 2020.					
FY 2020 OCO Plans: N/A					
Title: Anti-Submarine Warfare (ASW) Mission Package	34.618	0.000	0.000	0.000	0.000

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603596N / *(U)LCS Mission Modules*	**Project (Number/Name)** 3129 / *LCS Mission Package Development*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Articles:	-	-	-	-	-
FY 2019 Plans: Funded under Project Unit 2551 for FY 2019. ***FY 2020 Base Plans:*** Funded under Project 2551 for FY 2020. ***FY 2020 OCO Plans:*** N/A					
Title: Surface Warfare (SUW) Mission Package	16.499	0.000	0.000	0.000	0.000
Articles:	-	-	-	-	-
FY 2019 Plans: Funded under Project 2552 for FY 2019. ***FY 2020 Base Plans:*** Funded under Project 2552 for FY 2020. ***FY 2020 OCO Plans:*** N/A					
Title: Command, Control, Communication, Computers, Cyber and Intelligence (C5I) and Mission Package Tactical Team Trainers	10.100	8.825	9.868	0.000	9.868
Articles:	-	-	-	-	-
FY 2019 Plans: Mission Package Computing Environment (MPCE) - AN/SYK-32: Initiate development and establish a baseline for MPCE v2.0, which provides a technology refresh of fielded MPCE HW and MPCE Software (MPS /MPOE) in preparation for production in FY 2021. Conduct Preliminary Design Review (PDR) and Critical Design Review (CDR) for MPCE v2.0. Develop a production test article to support element level testing in FY 2019. Multi-Vehicle Communications System (MVCS) - AN/SYC-31: Develop and install solution to provide SIPRNet access to MP watch stations aboard the Freedom variant.					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603596N / *(U)LCS Mission Modules*	**Project (Number/Name)** 3129 / *LCS Mission Package Development*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Finalize the design and complete development of MVCS v1.2.X to implement the Cross Domain Solution (CDS) hardware replacement due to the existing solution reaching end of life and the implementation of the IPS-250 Inline Encryptor. Complete development to update the Ship Configuration Agent (SCA) as part of the MVCS 1.2.X baseline due to integration with the Knifefish, UISS and MCM USV. Complete the development of the Anti-Jam MAGIC SHIELD solution for procurement and integration into the RT-1944A/U. Complete development required to support the MVCS v1.2.X for Integration and Test. Continue efforts to define and develop MVCS v1.3 which will provide an Extended Line of Site (ELOS) and a Beyond Line of Site (BLOS) capability. Fabricate 3 Engineering Development Models (EDMs), adding Emission Control (EMCON), providing spectrum and topside analysis support, begin adaptive noise cancelling firmware development, complete Performance Monitor Fault Location (PMFL) and Built In Test (BIT) design and implementation, conduct an Electromagnetic Interference (EMI) test, perform an initial Anti-Jam antenna and signal assessment, begin test fixture software for production, provide support for MVCS/Seaframe integration and CDS rule-set reprogramming, initiate Freedom variant and USV/UISS Noise assessment, and conduct an Engineering Sea test. Continued development of the Unmanned Aerial Relay (UMAR) Rapid Innovation Fund effort to provide an ELOS capability. Continue to conduct Tech Refresh/Insertion studies needed to sustain incremental MVCS capability upgrades. Develop MVCS differences training and deliver for inclusion in LCS Combat Systems courses. Common Mission Package Trainer (CMPT): Continue to integrate updated software with Freedom and Independence variant Combat Management System Trainers and conduct standalone and integrated team training at LTF for detachments. Continue to compile system data to support Reliability and Maintainability (RAM-C) data to support reliability engineering and analysis. Continue FRACAS effort. ***FY 2020 Base Plans:*** Mission Package Computing Environment (MPCE) - AN/SYK-32 Complete Development of MPCE v2.0. Lock the Mission Package Software (MPS) and Mission Package Operating Environment (MPOE) baselines and conduct Government Factory Acceptance Test (GFAT). Integrate Mission Package Application Software for each of the three mission packages into MPCE v2.0,					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603596N / *(U)LCS Mission Modules*	**Project (Number/Name)** 3129 / *LCS Mission Package Development*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
conduct element level testing at the Mission System Integration Center (MSIC) and the Distributed Integration Facility (DIF), and complete certification for use on LCS. Transition MPCE v2.0 for deployment and sustainment. Multi-Vehicle Communications System (MVCS) - AN/SYC-31: Following the completion of development of MVCS 1.2.x, support formal shipboard integration and testing with the MCM Mission Package. Continue development of MVCS v1.3. Start integration and testing of MVCS 1.3 into the off-board vehicles (UISS, MCM USV and Knifefish), and validate the Anti-Jam capabilities between the off-board vehicles and ship. Complete development and begin fielding of the Tech Refreshed MVCS on MCM division LCS ships. Common Mission Package Trainer (CMPT): Following the completion of the MPCE Technology Refresh, integration the updated hardware into the test platform for CMPT and certify the baseline for installation into the LTFs. Continue to compile system data to support Reliability and Maintainability (RAM-C) data to support reliability engineering and analysis. Continue FRACAS effort. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increase from FY 2019 to FY 2020 is to support MPCE Technology Refresh efforts required to address hardware obsolescence.					
Title: System Engineering and Program Acquisition	17.404	0.000	0.000	0.000	0.000
Articles:	-	-	-	-	-
FY 2019 Plans: Systems Engineering, Program Management, and Training efforts will be funded under mission package specific project units in FY 2019. ***FY 2020 Base Plans:***					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603596N / *(U)LCS Mission Modules*	**Project (Number/Name)** 3129 / *LCS Mission Package Development*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Systems Engineering, Program Management, and Training efforts will be funded under mission package specific project units in FY 2020. ***FY 2020 OCO Plans:*** N/A					
Accomplishments/Planned Programs Subtotals	100.470	8.825	9.868	0.000	9.868

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• OPN 1600: *LCS Common Mission Modules Equipment*	18.760	33.237	51.553	-	51.553	36.657	55.776	29.787	30.382	727.684	1,424.901
• OPN 1601: *LCS MCM Mission Modules*	45.146	98.901	197.129	-	197.129	222.831	222.523	233.151	243.503	1,213.078	2,655.367
• OPN 1602: *LCS ASW Mission Modules.*	0.000	0.000	27.754	-	27.754	63.181	34.104	34.777	35.473	149.221	344.510
• OPN 1603: *LCS SUW Mission Modules*	20.925	13.025	26.566	-	26.566	15.342	15.711	28.711	4.961	32.604	278.669
• WPN 4221: *LCS Module Weapons*	10.610	11.350	0.000	14.585	14.585	14.417	13.825	14.103	14.385	37.555	133.606

Remarks

D. Acquisition Strategy

The LCS Mission Module Acquisition Strategy is employing an incremental procurement approach to allow for the rapid introduction of additional capabilities as system technology matures. This phased plan provides incremental fielding of capability through the introduction of mature programs of record into the respective Mission Packages until the full baseline capability defined in the Capability Development Document (CDD) is reached.

E. Performance Metrics

Program Completed Milestone B January 2014
Complete SUW MP DT, TECHEVAL, and IOT&E on Freedom variant (Refer to Project 2552)
Achieve SUW MP Initial Operational Capability (IOC) on Freedom variant (Refer to Project 2552)
Achieve MCM MP IOC on Independence variant (Refer to Project 2550)
Achieve ASW MP IOC on Freedom variant (Refer to Project 2551)

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603596N / *(U)LCS Mission Modules*	Project (Number/Name) 3129 / *LCS Mission Package Development*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
6.1 System Engineering	WR	NSWC PCD : Panama City, FL	0.000	0.275	Oct 2017	0.000		0.000		-		0.000	0.000	0.275	-
6.1 System Engineering	WR	NSWC DD : Dahlgren, VA	1.031	0.753	Oct 2017	0.000		0.000		-		0.000	0.000	1.784	-
6.1 System Engineering	WR	NAVSEALOGCEN : Norfolk, VA	1.351	0.169	Jan 2018	0.000		0.000		-		0.000	0.000	1.520	-
6.1 System Engineering	C/CPFF	Northrop Grumman : Bethpage, NY	13.435	1.107	Dec 2017	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
6.1 System Engineering	WR	NSWC Carderock : Bethesda, MD	2.530	0.080	Dec 2017	0.000		0.000		-		0.000	0.000	2.610	-
6.1 System Engineering	WR	NSWC PHD : Port Hueneme, CA	1.458	0.110	Dec 2017	0.000		0.000		-		0.000	0.000	1.568	-
6.1 System Engineering	WR	SPAWAR PAC : San Diego, CA	7.431	0.229	Nov 2017	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
6.1 System Engineering	C/CPIF	Booz Allen Hamilton : Washington, DC	0.000	0.355	Jan 2018	0.000		0.000		-		0.000	0.000	0.355	-
6.4 Integration, Assembly, Test and Checkout	Sub Allot	CECOM Bldg 1207 : Various	1.092	0.000		0.000		0.000		-		0.000	0.000	1.092	-
6.4 Integration, Assembly, Test and Checkout	WR	NAWC AD : Patuxent River, MD	1.250	0.680	Jan 2018	0.000		0.000		-		0.000	0.000	1.930	-
6.4 Integration, Assembly, Test and Checkout	WR	NSWC DD : Dahlgren, VA	0.000	0.203	Oct 2017	0.000		0.000		-		0.000	0.000	0.203	-
6.4 Integration, Assembly, Test and Checkout	WR	NSWC PC : Panama City, FL	0.000	0.075	Oct 2017	0.000		0.000		-		0.000	0.000	0.075	-
6.4 Integration, Assembly, Test and Checkout	C/CPFF	Northrop Grumman : Bethpage, NY	1.498	0.000		0.000		0.000		-		0.000	0.000	1.498	-
6.4 Integration, Assembly, Test and Checkout	WR	NSWC Carderock : Bethesda, MD	7.977	0.648	Jan 2018	0.000		0.000		-		0.000	0.000	8.625	-
6.4 Integration, Assembly, Test and Checkout	C/CPFF	PMS 501 : Various	0.000	1.075	Feb 2018	0.000		0.000		-		0.000	0.000	1.075	-
6.4 Integration, Assembly, Test and Checkout	WR	SPAWAR PAC : San Diego, CA	1.330	0.527	Feb 2018	0.000		0.000		-		0.000	Continuing	Continuing	Continuing

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
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Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
6.4 Integration, Assembly, Test and Checkout	WR	NSWC PHD : Port Hueneme, CA	1.203	0.109	Nov 2017	0.000		0.000		-		0.000	0.000	1.312	-
6.4 Integration, Assembly, Test and Checkout	C/CPIF	Booz Allen Hamilton : Washington, DC	0.525	0.425	Jan 2018	0.000		0.000		-		0.000	0.000	0.950	-
6.4 Integration, Assembly, Test and Checkout	WR	NAVAIR : Lakehurst	0.200	0.000		0.000		0.000		-		0.000	0.000	0.200	-
4.0 Command, Control, Communication, Computers, Collaboration and Intelligence (C5I)	C/CPFF	AAC : Uniontown, PA	12.961	2.302	Mar 2018	2.500	Jan 2019	2.928	Jan 2020	-		2.928	0.000	20.691	-
4.0 Command, Control, Communication, Computers, Collaboration and Intelligence (C5I)	WR	NAWC TSD : Orlando, FL	0.750	0.354	Jan 2018	0.550	Dec 2018	0.650	Dec 2019	-		0.650	0.000	2.304	-
4.0 Command, Control, Communication, Computers, Collaboration and Intelligence (C5I)	C/CPFF	Northrop Grumman : Bethpage, NY	2.022	0.578	Feb 2018	0.990	Jan 2019	0.892	Jan 2020	-		0.892	Continuing	Continuing	Continuing
4.0 Command, Control, Communication, Computers, Collaboration and Intelligence (C5I)	WR	NSWC PC : Panama City, FL	8.747	4.123	Dec 2017	2.203	Nov 2018	2.187	Nov 2019	-		2.187	Continuing	Continuing	Continuing
4.0 Command, Control, Communication, Computers, Collaboration and Intelligence (C5I)	WR	NUWC NPT : Newport, RI	1.574	0.500	Nov 2017	0.550	Nov 2018	0.450	Nov 2019	-		0.450	Continuing	Continuing	Continuing
4.0 Command, Control, Communication, Computers, Collaboration and Intelligence (C5I)	C/CPIF	Booz Allen Hamilton : Washington, DC	1.121	0.348	Dec 2017	0.820	Dec 2018	0.836	Dec 2019	-		0.836	0.000	3.125	-
4.0 Command, Control, Communication, Computers, Collaboration and Intelligence (C5I)	WR	SPAWAR PACIFIC : San Diego, CA	2.799	1.150	Jan 2018	0.469	Nov 2018	1.175	Nov 2019	-		1.175	0.000	5.593	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
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Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
4.0 Command, Control, Communication, Computers, Collaboration and Intelligence (C5I)	WR	NSWC DD : Dahlgren, VA	1.942	0.727	Nov 2017	0.743	Nov 2018	0.750	Dec 2019	-		0.750	Continuing	Continuing	Continuing
4.0 Command, Control, Communication, Computers, Collaboration and Intelligence (C5I)	WR	PMW 760 : Various	0.889	0.000		0.000		0.000		-		0.000	0.000	0.889	-
4.0 Command, Control, Communication, Computers, Collaboration and Intelligence (C5I)	C/CPFF	Progeny : Manassas, VA	1.730	0.000		0.000		0.000		-		0.000	0.000	1.730	-
1.0 MCM MP	WR	NSWC PC : Panama City, FL	56.897	14.400	Dec 2017	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
1.0 MCM MP	Sub Allot	PMS 406 : Various	38.861	3.900	Nov 2017	0.000		0.000		-		0.000	0.000	42.761	-
1.0 MCM MP	Sub Allot	PMS 495 : Various	0.000	0.249	Feb 2018	0.000		0.000		-		0.000	0.000	0.249	-
1.0 MCM MP	WR	NSWC PHD : Port Hueneme, CA	0.000	2.300	Dec 2017	0.000		0.000		-		0.000	0.000	2.300	-
1.0 MCM MP	C/CPIF	Booz Allen Hamilton : Washington, DC	0.000	0.400	Dec 2017	0.000		0.000		-		0.000	0.000	0.400	-
1.0 MCM MP	C/CPFF	Northrop Grumman : Bethpage, NY	1.289	0.603	Jan 2018	0.000		0.000		-		0.000	0.000	1.892	-
1.0 MCM MP	WR	Various : Various	1.124	0.000		0.000		0.000		-		0.000	0.000	1.124	-
2.0 ASW MP	Sub Allot	PEO IWS5E : Various	38.490	2.604	Dec 2017	0.000		0.000		-		0.000	0.000	41.094	-
2.0 ASW MP	WR	NUWC NPT : Newport, RI	23.763	5.557	Nov 2017	0.000		0.000		-		0.000	0.000	29.320	-
2.0 ASW MP	WR	SSC PAC : San Diego, CA	4.233	0.734	Dec 2017	0.000		0.000		-		0.000	0.000	4.967	-
2.0 ASW MP	WR	CDSA Dam Neck : Virginia Beach, VA	9.887	1.258	Nov 2017	0.000		0.000		-		0.000	0.000	11.145	-
2.0 ASW MP	C/CPFF	Northrop Grumman : Bethpage, NY	8.564	2.350	Feb 2018	0.000		0.000		-		0.000	0.000	10.914	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603596N / *(U)LCS Mission Modules*	Project (Number/Name) 3129 / *LCS Mission Package Development*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
2.0 ASW MP	WR	PEO IWS 5A : Various	0.601	8.700	Mar 2018	0.000		0.000		-		0.000	0.000	9.301	-
2.0 ASW MP	C/CPFF	SPA : Washington, DC	1.437	0.250	Apr 2018	0.000		0.000		-		0.000	0.000	1.687	-
2.0 ASW MP	WR	NSWC DD : Dahlgren, VA	0.446	0.425	Dec 2017	0.000		0.000		-		0.000	0.000	0.871	-
2.0 ASW MP	WR	NUWC KPT : Keyport, WA	0.595	0.500	Feb 2018	0.000		0.000		-		0.000	0.000	1.095	-
2.0 ASW MP	WR	NSWC PHD : Port Hueneme, CA	0.000	1.550	Nov 2017	0.000		0.000		-		0.000	0.000	1.550	-
2.0 ASW MP	C/FPIF	Booz Allen Hamilton : Washington, DC	0.000	0.500	Dec 2017	0.000		0.000		-		0.000	0.000	0.500	-
2.0 ASW MP	WR	NAWC WD : Point Mugu, CA	5.030	0.400	Mar 2018	0.000		0.000		-		0.000	0.000	5.430	-
2.0 ASW MP	C/CPFF	Various : Various	3.307	0.450	Nov 2017	0.000		0.000		-		0.000	0.000	3.757	-
2.0 ASW MP	Sub Allot	Raytheon : Portmouth, RI	33.868	8.188	Jan 2018	0.000		0.000		-		0.000	0.000	42.056	-
3.0 SUW MP	C/CPFF	JAMS PO : Various	6.480	1.500	Mar 2018	0.000		0.000		-		0.000	0.000	7.980	-
3.0 SUW MP	WR	NAWC WD : Ridgecrest, CA	7.826	0.000		0.000		0.000		-		0.000	0.000	7.826	-
3.0 SUW MP	C/CPFF	Northrop Grumman : Bethpage, NY	58.524	2.000	Feb 2018	0.000		0.000		-		0.000	0.000	60.524	-
3.0 SUW MP	WR	NSWC CD : Crane, IN	0.396	0.000		0.000		0.000		-		0.000	0.000	0.396	-
3.0 SUW MP	WR	NSWC Corona : Corona, CA	0.745	0.950	Jan 2018	0.000		0.000		-		0.000	0.000	1.695	-
3.0 SUW MP	WR	NSWC DD : Dahlgren, VA	52.919	7.397	Jan 2018	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
3.0 SUW MP	WR	NSWC PHD : Port Hueneme, CA	24.637	5.800	Nov 2017	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
3.0 SUW MP	Sub Allot	PEO IWS 3 : Various	9.819	0.000		0.000		0.000		-		0.000	0.000	9.819	-
		Subtotal	466.584	89.867		8.825		9.868		-		9.868	Continuing	Continuing	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603596N / *(U)LCS Mission Modules*	Project (Number/Name) 3129 / *LCS Mission Package Development*	

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
6.5 Training Systems Development	WR	NAWC TSD : Orlando, Fl	0.555	0.354	Oct 2017	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
6.5 Training Systems Development	WR	NSWC PHD : Port Hueneme, CA	0.000	0.390	Oct 2017	0.000		0.000		-		0.000	0.000	0.390	-
6.5 Training Systems Development	C/CPIF	Booz Allen Hamilton : Washington, DC	0.000	0.268	Dec 2017	0.000		0.000		-		0.000	0.000	0.268	-
6.5 Training Systems Development	C/CPAF	Northrop Grumman : Bethpage, NY	0.000	0.575	Jan 2018	0.000		0.000		-		0.000	0.000	0.575	-
6.5 Training Systems Development	Sub Allot	Various : Various	3.221	0.000		0.000		0.000		-		0.000	0.000	3.221	-
6.5 Training Systems Development	WR	JHU/APL : Laurel, MD	1.479	0.000		0.000		0.000		-		0.000	0.000	1.479	-
		Subtotal	5.255	1.587		0.000		0.000		-		0.000	Continuing	Continuing	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
6.3 System Test and Evaluation	WR	NSWC PHD : Port Hueneme, CA	26.248	1.715	Nov 2017	0.000		0.000		-		0.000	0.000	27.963	-
6.3 System Test and Evaluation	WR	COMOPTEVFOR : Norfolk, VA	4.294	0.650	Jan 2018	0.000		0.000		-		0.000	0.000	4.944	-
6.3 System Test and Evaluation	WR	NSWC Corona : Corona, Ca	0.000	0.500	Nov 2017	0.000		0.000		-		0.000	0.000	0.500	-
6.3 System Test and Evaluation	WR	SPAWAR PAC : San Diego, CA	5.258	0.000		0.000		0.000		-		0.000	0.000	5.258	-
6.3 System Test and Evaluation	C/CPIF	Booz Allen Hamilton : Washington, DC	0.000	0.750	Jan 2018	0.000		0.000		-		0.000	0.000	0.750	-
		Subtotal	35.800	3.615		0.000		0.000		-		0.000	0.000	39.415	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603596N / *(U)LCS Mission Modules*	Project (Number/Name) 3129 / *LCS Mission Package Development*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
6.2 Program Management	C/CPFF	CACI : Fairfax, VA	7.698	0.000		0.000		0.000		-		0.000	0.000	7.698	-
6.2 Program Management	C/CPIF	Booz Allen Hamilton : Washington DC	1.937	2.758	Dec 2017	0.000		0.000		-		0.000	0.000	4.695	-
6.2 Program Management	FFRDC	Mitre : McLean, VA	2.679	0.000		0.000		0.000		-		0.000	0.000	2.679	-
6.2 Program Management	FFRDC	JHU/APL : Not Specified	0.000	0.000		0.000		0.000		-		0.000	0.000	0.000	-
6.2 Program Management	C/CPFF	Northrop Grumman : Bethpage, NY	3.511	1.466	Feb 2018	0.000		0.000		-		0.000	0.000	4.977	-
6.2 Program Management	C/CPFF	NSWC Crane : Various	1.750	1.177	Nov 2017	0.000		0.000		-		0.000	0.000	2.927	-
		Subtotal	17.575	5.401		0.000		0.000		-		0.000	0.000	22.976	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	525.214	100.470		8.825		9.868		-		9.868	Continuing	Continuing	N/A

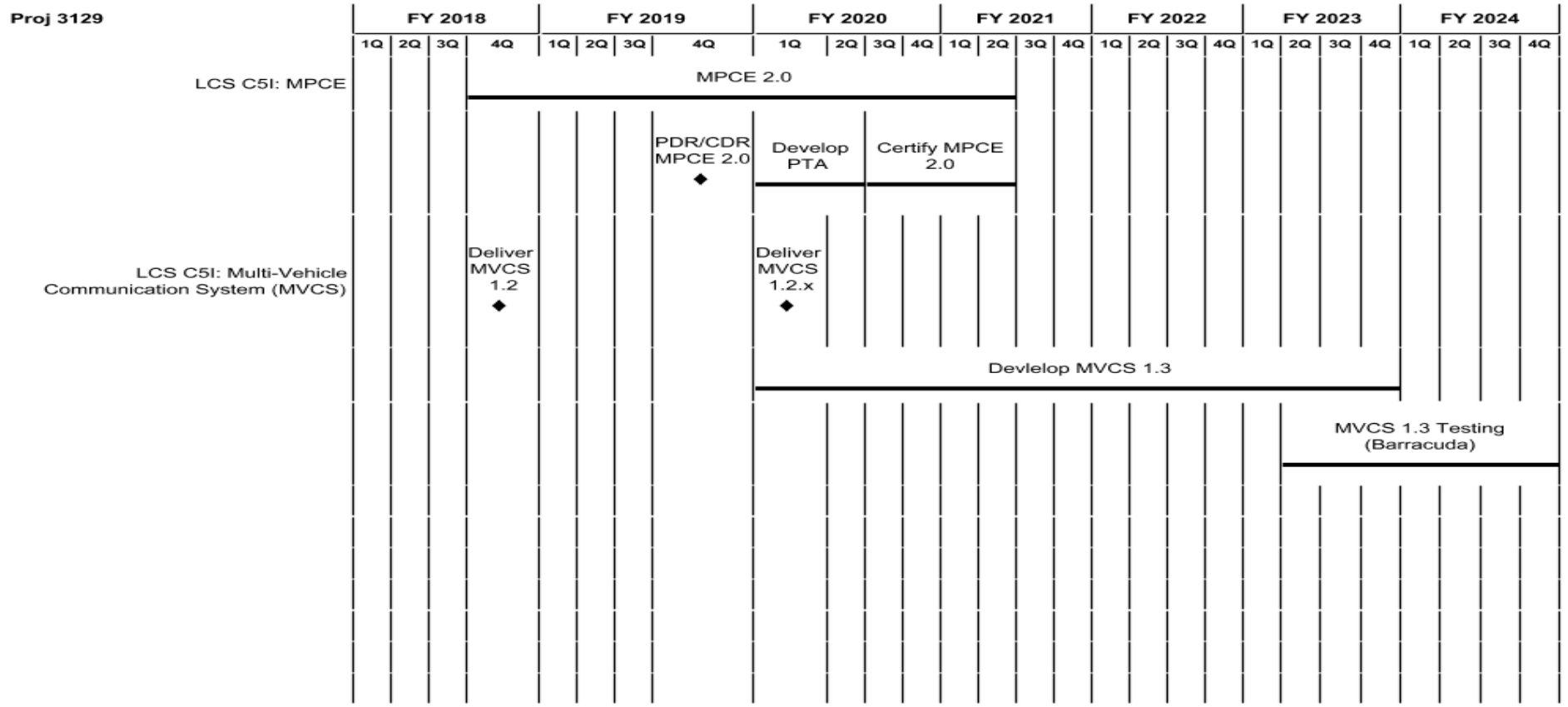
Remarks

Beginning in FY 2019, Mission Package funding is realigned into four (4) projects:

2550 Mine Countermeasures (MCM) Mission Package
2551 Anti-Submarine Warfare (ASW) Mission Package
2552 Surface Warfare (SUW) Mission Package
3129 LCS Mission Package Development

Prior to FY 2019 all Mission Package funding was in Project 3129.

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603596N / *(U)LCS Mission Modules*	**Project (Number/Name)** 3129 / *LCS Mission Package Development*



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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603596N / *(U)LCS Mission Modules*	**Project (Number/Name)** 3129 / *LCS Mission Package Development*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 3129				
LCS C5I: MPCE: Develop and establish baseline for MPCE v2.0	4	2018	2	2021
LCS C5I: MPCE: Conduct PDR and CDR for MPCE v2.0 (AN/SYK-31)	4	2019	4	2019
LCS C5I: MPCE: Develop two Production Test Articles (PTA) to support testing/ certification	1	2020	2	2020
LCS C5I: MPCE: Conduct testing and certification of MPCE v2.0 HW/SW	3	2020	2	2021
LCS C5I: Multi-Vehicle Communication System (MVCS): Deliver MVCS v1.2 and transition to sustainment	4	2018	4	2018
LCS C5I: Multi-Vehicle Communication System (MVCS): Deliver MVCS v1.2.X	1	2020	1	2020
LCS C5I: Multi-Vehicle Communication System (MVCS): Development of MVCS 1.3	1	2020	4	2023
LCS C5I: Multi-Vehicle Communication System (MVCS): MVCS 1.3 Testing with Barracuda	2	2023	4	2024

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0603597N *I (U)Automated Test and Analysis*

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	36.685	24.145	37.931	7.653	-	7.653	7.775	7.947	8.112	8.274	Continuing	Continuing
9999: *Congressional Adds*	0.000	16.406	30.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	46.406
9B88: *Automated Test and Analysis*	36.685	7.739	7.931	7.653	-	7.653	7.775	7.947	8.112	8.274	Continuing	Continuing

A. Mission Description and Budget Item Justification

In FY 2016, OPNAV N94 took on the challenge to implement a Naval enterprise approach to Automated Test and Analysis (ATA). ATA expands the automated test methods currently in use such as Automated Test and Re-Test (ATRT), adds new methods of testing and use of automated test technologies, and standardizes automated test practices, methods and tools. Examples from FY16 include but are not limited to improvements to Link-16 Non-C2 data collection, essential Mission Planning, Service Oriented Architecture Framework, AEGIS Enterprise Solution Enhancements, Strike Force Interoperability testing and Control System Restoration and Validation. In addition, funding supports the development of enterprise level strategies to apply ATA technology to the software-intensive acquisition programs. The FY 2015 ATRT project was funded on Program Element 0603597N: "Automated Test and Re-Test". Starting in FY16 and through the out-years, the project is renamed "Automated Test and Analysis" on Program Element 0603597N.

B. Program Change Summary ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	8.052	7.931	7.926	-	7.926
Current President's Budget	24.145	37.931	7.653	-	7.653
Total Adjustments	16.093	30.000	-0.273	-	-0.273
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	30.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.907	0.000			
• Program Adjustments	0.000	0.000	-0.204	-	-0.204
• Rate/Misc Adjustments	0.000	0.000	-0.069	-	-0.069
• Congressional Add Adjustments	17.000	-	-	-	-

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2018	FY 2019
Project: 9999: *Congressional Adds*		
Congressional Add: *Program Increase*	16.406	0.000

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0603597N *I (U)Automated Test and Analysis*

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2018	FY 2019
Congressional Add: *Program Increase (ATA)*	0.000	30.000
Congressional Add Subtotals for Project: 9999	16.406	30.000
Congressional Add Totals for all Projects	16.406	30.000

Change Summary Explanation

FY19: Program increase of $30 million due to congressional add.

FY20: Contract Services Reform reduction of $69,000. Reduction of $204,000 to fund NAVSEA Headquarters FTE in OMN.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603597N / *(U)Automated Test and Analysis*	Project (Number/Name) 9999 / *Congressional Adds*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
9999: *Congressional Adds*	0.000	16.406	30.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	46.406
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

In response to CNO initiatives, NAVSEA 05H, under the sponsorship of OPNAV N96, in 2008 began developing tools and executing projects for NAVSEA programs in support of "Automated Test and Re-Test". In 2014, CNO/ASN RDA implemented an "Enterprise" approach to automated testing to foster increased automated test tool use and collaboration between Navy SYSCOMs. PE 0603582N Project 9B88, "Automated Test and Re-Test," in OPNAV N96 was modified and moved in PB2016 to "Automated Test and Analysis" (ATA) under PE 0603597N in OPNAV N94. ATA expands the automated test methods currently in use such as Automated Test and Re-Test (ATRT), adds new methods of testing and use of automated test technologies, and standardizes automated test practices, methods and tools. In addition, funding supports the development of enterprise level strategies to apply ATA technology to Navy software-intensive acquisition programs.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019
Congressional Add: Program Increase	16.406	0.000
FY 2018 Accomplishments: With a Program Increase within Project Unit (PU) C311 of $16.4M in FY 2018, ATA was able to provide support to an additional thirteen projects o Collaborative Software Armory(CSA) Phase 1 o HAVEN/SABER o SoS Virtualization o 32 to 64 Bit Code Conversion Automated Testing o Automated Analysis for BL5 Upgrade o Automated Requirements Verification Reporting for Common Control System (CCS) o Test Site Validator o Intermediary Application (iApp) Automated Testing o Automated End-to-End Testing for Aircraft Support Equipment o Tactical Service Oriented Architecture Performance Testing o Test Execution Server o ATRT Operational Readiness and Test System (ORTS) Improvement & Modernization Plan o Enterprise Framework		

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603597N / *(U)Automated Test and Analysis*	**Project (Number/Name)** 9999 / *Congressional Adds*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019
o Scientific Test and Analysis Techniques Center of Excellence (STAT COE) ***FY 2019 Plans:*** N/A		
Congressional Add: Program Increase (ATA) ***FY 2018 Accomplishments:*** N/A ***FY 2019 Plans:*** With a Program Increase within Project Unit (PU) C449 of $30M received in FY 2019, ATA was able to provide support to the following efforts: o Systems of Systems Virtualization (Phase 2 of FY18 ATA effort) o Virtual Twins installed on Aegis platforms (baseline 9/7/5/3) and Surface Ship Defense System/USS Monterey o Virtual Twins installed at the Surface and Air Integration laboratory Patuxent River/Contractor Site o Next Generation Network integration and hardware o Integrated software, test and security environment for Virtual Twins o Developmental software for Distributed Combat System (DCS) o Combat Management System (CMS) Re-architecture	0.000	30.000
Congressional Adds Subtotals	16.406	30.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

The ATA program solicits automated test tool proposals from all qualified sources that show the potential to significantly reduce the time to complete critical testing, increase productivity or system robustness, improve and speed test analysis, and identify commonalities for reuse in testing of Naval acquisition programs. All valid submitted proposals will be evaluated by an Executive Steering Group (ESG) composed of Senior Executive level representatives from NAVSEA, NAVAIR, SPAWAR and US Marine Corps Systems Commands. Proposals selected by the ESG will typically be funded for one year, in which time they must demonstrate their ability to significantly reduce the time to complete critical testing, improve and speed test analysis, or find and correct critical design flaws in testing of Naval acquisition programs. Successful funded proposals and artifacts will be advertised and made available across the Naval enterprise for acquisition program consideration, funding, and use.

E. Performance Metrics

FY 2018 Program Management was directed to assess ATA projects for:
o Technical improvements/quality of the end-product,
o Use of automation to optimize resource allocation to increase productivity/robustness and to execute/analyze/report a test

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603597N / *(U)Automated Test and Analysis*	**Project (Number/Name)** 9999 / *Congressional Adds*

o Use of automation to optimize resource allocation to:
-Increase productivity/robustness
- Plan a test
- Execute a test
- Analyze a test
- Report a test,
o Cost avoidance for the program/project,
o Length of time to see the return on investment.
Progress towards meeting these objectives of ATA efforts is being monitored via the following:
o Monthly Project Manager technical reports, expenditures and risk assessments
- Quarterly Program Reviews
o Bi-Annual ATA Executive Steering Group Meetings

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603597N / *(U)Automated Test and Analysis*	**Project (Number/Name)** 9999 / *Congressional Adds*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Automated Test & Analysis	C/CPFF	Innovative Defense Technologies (IDT) : Ballston, VA	0.000	8.797	Sep 2018	17.174	Apr 2019	0.000		-		0.000	0.000	25.971	-
Automated Test & Analysis	WR	SPAWAR Pacific : San Diego, CA	0.000	4.383	Jul 2018	0.000		0.000		-		0.000	0.000	4.383	-
Automated Test & Analysis	WR	Marine Corp : Not Specified	0.000	0.450	Jul 2018	0.000		0.000		-		0.000	0.000	0.450	-
Automated Test & Analysis	WR	NAVAIR : Lakehurst NJ	0.000	2.095	Jul 2018	0.000		0.000		-		0.000	0.000	2.095	-
Automated Test & Analysis	WR	Various NSWCs : NSWC DD	0.000	0.000	Aug 2018	12.530	Apr 2019	0.000		-		0.000	0.000	12.530	-
Automated Test & Analysis	C/FFP	AFLCMC/AZS : Hanscomb AFB	0.000	0.478	Sep 2018	0.000		0.000		-		0.000	0.000	0.478	-
Automated Test & Analysis	C/FFP	AFIT : Wright- : AFB, OH	0.000	0.203	Sep 2018	0.000		0.000		-		0.000	0.000	0.203	-
		Subtotal	0.000	16.406		29.704		0.000		-		0.000	0.000	46.110	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Automated Test & Analysis	C/CPFF	DELTA Resources, Inc. : Washington, DC	0.000	0.000		0.296	Apr 2019	0.000		-		0.000	0.000	0.296	-
		Subtotal	0.000	0.000		0.296		0.000		-		0.000	0.000	0.296	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	16.406		30.000		0.000		-		0.000	0.000	46.406	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603597N / *(U)Automated Test and Analysis*	**Project (Number/Name)** 9999 / *Congressional Adds*

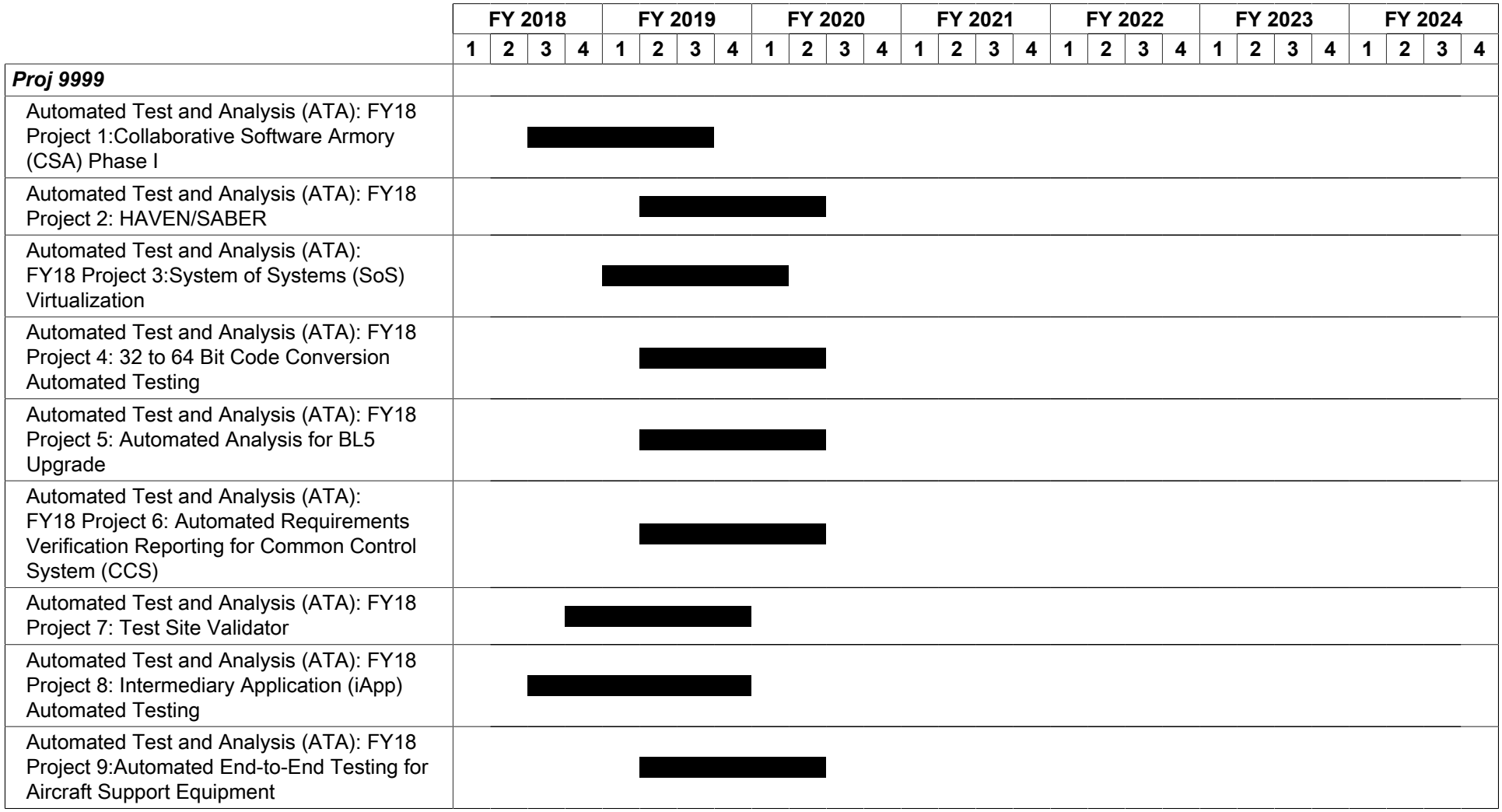


Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603597N / *(U)Automated Test and Analysis*	**Project (Number/Name)** 9999 / *Congressional Adds*

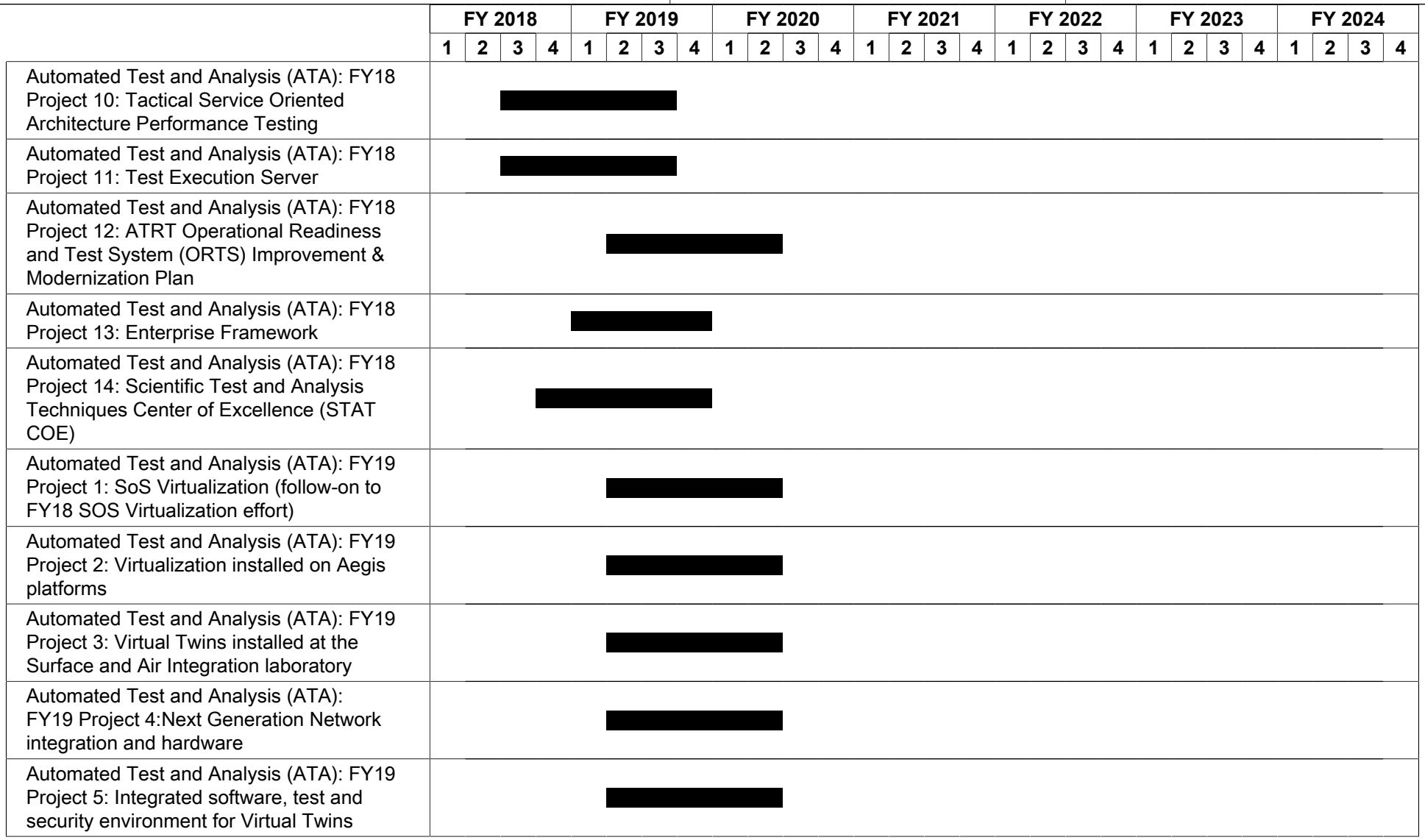


Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603597N / *(U)Automated Test and Analysis*	**Project (Number/Name)** 9999 / *Congressional Adds*

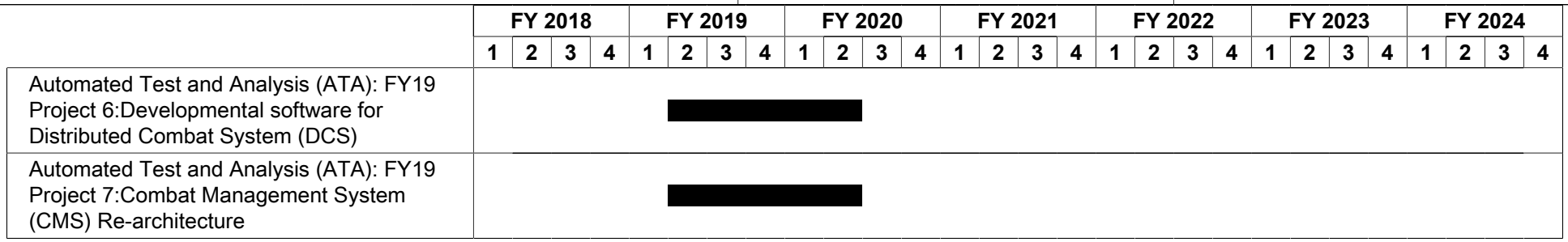


Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603597N / *(U)Automated Test and Analysis*	**Project (Number/Name)** 9999 / *Congressional Adds*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 9999				
Automated Test and Analysis (ATA): FY18 Project 1:Collaborative Software Armory (CSA) Phase I	3	2018	3	2019
Automated Test and Analysis (ATA): FY18 Project 2: HAVEN/SABER	2	2019	2	2020
Automated Test and Analysis (ATA): FY18 Project 3:System of Systems (SoS) Virtualization	1	2019	1	2020
Automated Test and Analysis (ATA): FY18 Project 4: 32 to 64 Bit Code Conversion Automated Testing	2	2019	2	2020
Automated Test and Analysis (ATA): FY18 Project 5: Automated Analysis for BL5 Upgrade	2	2019	2	2020
Automated Test and Analysis (ATA): FY18 Project 6: Automated Requirements Verification Reporting for Common Control System (CCS)	2	2019	2	2020
Automated Test and Analysis (ATA): FY18 Project 7: Test Site Validator	4	2018	4	2019
Automated Test and Analysis (ATA): FY18 Project 8: Intermediary Application (iApp) Automated Testing	3	2018	4	2019
Automated Test and Analysis (ATA): FY18 Project 9:Automated End-to-End Testing for Aircraft Support Equipment	2	2019	2	2020
Automated Test and Analysis (ATA): FY18 Project 10: Tactical Service Oriented Architecture Performance Testing	3	2018	3	2019
Automated Test and Analysis (ATA): FY18 Project 11: Test Execution Server	3	2018	3	2019
Automated Test and Analysis (ATA): FY18 Project 12: ATRT Operational Readiness and Test System (ORTS) Improvement & Modernization Plan	2	2019	2	2020
Automated Test and Analysis (ATA): FY18 Project 13: Enterprise Framework	1	2019	4	2019
Automated Test and Analysis (ATA): FY18 Project 14: Scientific Test and Analysis Techniques Center of Excellence (STAT COE)	4	2018	4	2019

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603597N / *(U)Automated Test and Analysis*	**Project (Number/Name)** 9999 / *Congressional Adds*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Automated Test and Analysis (ATA): FY19 Project 1: SoS Virtualization (follow-on to FY18 SOS Virtualization effort)	2	2019	2	2020
Automated Test and Analysis (ATA): FY19 Project 2: Virtualization installed on Aegis platforms	2	2019	2	2020
Automated Test and Analysis (ATA): FY19 Project 3: Virtual Twins installed at the Surface and Air Integration laboratory	2	2019	2	2020
Automated Test and Analysis (ATA): FY19 Project 4:Next Generation Network integration and hardware	2	2019	2	2020
Automated Test and Analysis (ATA): FY19 Project 5: Integrated software, test and security environment for Virtual Twins	2	2019	2	2020
Automated Test and Analysis (ATA): FY19 Project 6:Developmental software for Distributed Combat System (DCS)	2	2019	2	2020
Automated Test and Analysis (ATA): FY19 Project 7:Combat Management System (CMS) Re-architecture	2	2019	2	2020

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603597N / *(U)Automated Test and Analysis*	Project (Number/Name) 9B88 / *Automated Test and Analysis*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
9B88: *Automated Test and Analysis*	36.685	7.739	7.931	7.653	-	7.653	7.775	7.947	8.112	8.274	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

In FY 2016, OPNAV N94 took on the challenge to implement a Naval enterprise approach to Automated Test and Analysis (ATA). ATA expands the automated test methods currently in use such as Automated Test and Re-Test (ATRT), adds new methods of testing and use of automated test technologies, and standardizes automated test practices, methods and tools. Examples from FY16 include but are not limited to improvements to Link-16 Non-C2 data collection, essential Mission Planning, Service Oriented Architecture Framework, AEGIS Enterprise Solution Enhancements, Strike Force Interoperability testing and Control System Restoration and Validation. In addition, funding supports the development of enterprise level strategies to apply ATA technology to the software-intensive acquisition programs. The FY 2015 ATRT project was funded on Program Element 0603597N under Project Unit 9B88: "Automated Test and Re-Test". Starting in FY16 and through the out-years, the project is renamed "Automated Test and Analysis" on Program Element 0603597N under Project Unit 9B88.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Automated Test and Analysis	7.739	7.931	7.653	0.000	7.653
Articles:	-	-	-	-	-

FY 2019 Plans:

Each year, submitted ATA proposals are reviewed and selected based on their ability to best describe technical merit for nine criteria to include productivity, reusability, enhanced coverage, improved fidelity and reduction in Total Ownership Cost by the Executive Steering Group, which includes Senior Executive level representatives from Naval Sea, Naval Air, Space and Naval Warfare, and US Marine Corps Systems Commands.

With a budget of $7.9M, ATA was able to provide support to six projects in FY 2019:

o SQQ-89 Automated Combat System of Systems(SoS)Integrated Test system(ACSIT)
o Collaborative Software Armory (CSA) Phase II
o Joint-Communications Engineering, Development, and Integration (JEDI) MUOS Automated Call System (JMACS)
o Common Data Link
o Combat Operations Center (COC) Testing Automation
o ATA for Surface Electronic Warfare (EW)

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603597N / *(U)Automated Test and Analysis*	**Project (Number/Name)** 9B88 / *Automated Test and Analysis*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
The ATA Enterprise Program Office will continue with another Naval enterprise-wide data call soliciting automated test tool proposals that will spring-board from some of these efforts and can significantly reduce the time to complete critical testing, increase productivity or system robustness, improve and speed test analysis, and identify commonalities for reuse in Navy acquisition programs for further study in FY 2019. These automated testing projects will reduce errors, increase capabilities and enhance reporting timelines while decreasing Total Ownership Costs for testing critical Navy program initiatives.					
FY 2020 Base Plans: Continue to improve on the automated testing and analysis investments to date while also pursuing system virtualization projects similar to Aegis Virtual Twin. Reevaluate selected ATA FY 2019 proposals for improving technologies in FY 2020 and potential collaboration in development. FY 2020 plans will also build upon the results and lessons learned from the FY 2018 and FY 2019 selection process for improved ATA program planning, selection, execution and analysis with the ATA ESG. The Navy intends to continue improvements in the quality of end products, reducing the time to plan, evaluate, analyze and/or report testing requirements, identify cost avoidance and determine the reduction in total ownership costs for each ATA project. The Navy will also determine enterprise solutions that significantly reduce test and evaluation man-hours, positively impact fleet training, and improve test plans and procedures. The Navy will continue: o Assessing undersea warfare capabilities or fleet modernization and future Navy testing competencies o Evaluating best practices and research capabilities for platform network resiliency and system function validation o Determining common elements through ATA analysis and reporting across multiple SYSCOMs and identifying synergies in development, implementation and training o Augmenting both surface and air Mission Planning for requirements traceability. Specific topics include but are not limited to: o Automating Test Framework for Operations Centers or Service Oriented Architectures o Continuing advanced Combat System development/enhancements (SSDS and AEGIS) o Testing of shipboard navigation or mechanical systems and tactical data links analysis (Link-16) o Integrating test and analyses among various Strike Force Interoperability platforms					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603597N / *(U)Automated Test and Analysis*	**Project (Number/Name)** 9B88 / *Automated Test and Analysis*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
o Implementing test planning/manager improvements The Navy will conduct another Naval enterprise-wide data call soliciting automated test tool proposals that can significantly reduce the time to complete critical testing, improve and speed test analysis, and identify and correct critical design flaws in testing of Naval acquisition programs for further study in FY 2021. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Decrease due to rate adjustments.					
Accomplishments/Planned Programs Subtotals	7.739	7.931	7.653	0.000	7.653

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

The ATA program solicits automated test tool proposals from all qualified sources that show the potential to significantly reduce the time to complete critical testing, increase productivity or system robustness, improve and speed test analysis, and identify commonalities for reuse in testing of Naval acquisition programs. All valid submitted proposals will be evaluated by an Executive Steering Group (ESG) composed of Senior Executive level representatives from NAVSEA, NAVAIR, SPAWAR and US Marine Corps Systems Commands. Proposals selected by the ESG will be funded for one year, in which time they must demonstrate their ability to significantly reduce the time to complete critical testing, improve and speed test analysis, or find and correct critical design flaws in testing of Naval acquisition programs. Successful funded proposals and artifacts will be advertised and made available across the Naval enterprise for acquisition program consideration, funding, and use.

E. Performance Metrics

FY 2018 Program Management was directed to assess ATA projects for:
o Technical improvements/quality of the end-product,
o Use of automation to optimize resource allocation to increase productivity/robustness and to execute/analyze/report a test
o Use of automation to optimize resource allocation to:
-Increase productivity/robustness
- Plan a test
- Execute a test
- Analyze a test

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603597N / *(U)Automated Test and Analysis*	**Project (Number/Name)** 9B88 / *Automated Test and Analysis*

- Report a test,
o Cost avoidance for the program/project,
o Length of time to see the return on investment.
Progress towards meeting these objectives of ATA efforts is being monitored via the following:
o Monthly Project Manager technical reports, expenditures and risk assessments
- Quarterly Program Reviews
o Bi-Annual ATA Executive Steering Group Meetings

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603597N / *(U)Automated Test and Analysis*	**Project (Number/Name)** 9B88 / *Automated Test and Analysis*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Automated Test & Analysis	C/CPFF	Innovative Defense Technologies (IDT) : Ballston, VA	27.103	4.886	Dec 2017	3.778	Jan 2019	4.760	Dec 2019	-		4.760	0.000	40.527	-
Automated Test & Analysis	WR	SPAWAR Pacific : San Diego, CA	4.321	1.432	Nov 2017	3.941	Jan 2019	1.417	Nov 2019	-		1.417	0.000	11.111	-
Automated Test & Analysis	WR	Marine Corp : Not Specified	0.833	0.000		0.000		0.000		-		0.000	0.000	0.833	-
Automated Test & Analysis	WR	NAVAIR : Lakehurst NJ	1.835	0.834	Nov 2017	0.000		0.824	Nov 2019	-		0.824	0.000	3.493	-
Automated Test & Analysis	WR	Various NSWCs : NSWC DD	0.750	0.095	Jun 2018	0.079	Dec 2018	0.094	Nov 2019	-		0.094	0.000	1.018	-
Automated Test & Analysis	C/CPFF	AFIT : Wright-Patterson AFB, OH	0.500	0.000		0.000		0.000		-		0.000	0.000	0.500	-
		Subtotal	35.342	7.247		7.798		7.095		-		7.095	0.000	57.482	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Automated Test & Analysis	C/CPFF	DELTA Resources, Inc. : Washington, DC	1.343	0.492	Jan 2018	0.133	Jan 2019	0.558	Jan 2020	-		0.558	Continuing	Continuing	Continuing
		Subtotal	1.343	0.492		0.133		0.558		-		0.558	Continuing	Continuing	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	36.685	7.739		7.931		7.653		-		7.653	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603597N / *(U)Automated Test and Analysis*	**Project (Number/Name)** 9B88 / *Automated Test and Analysis*

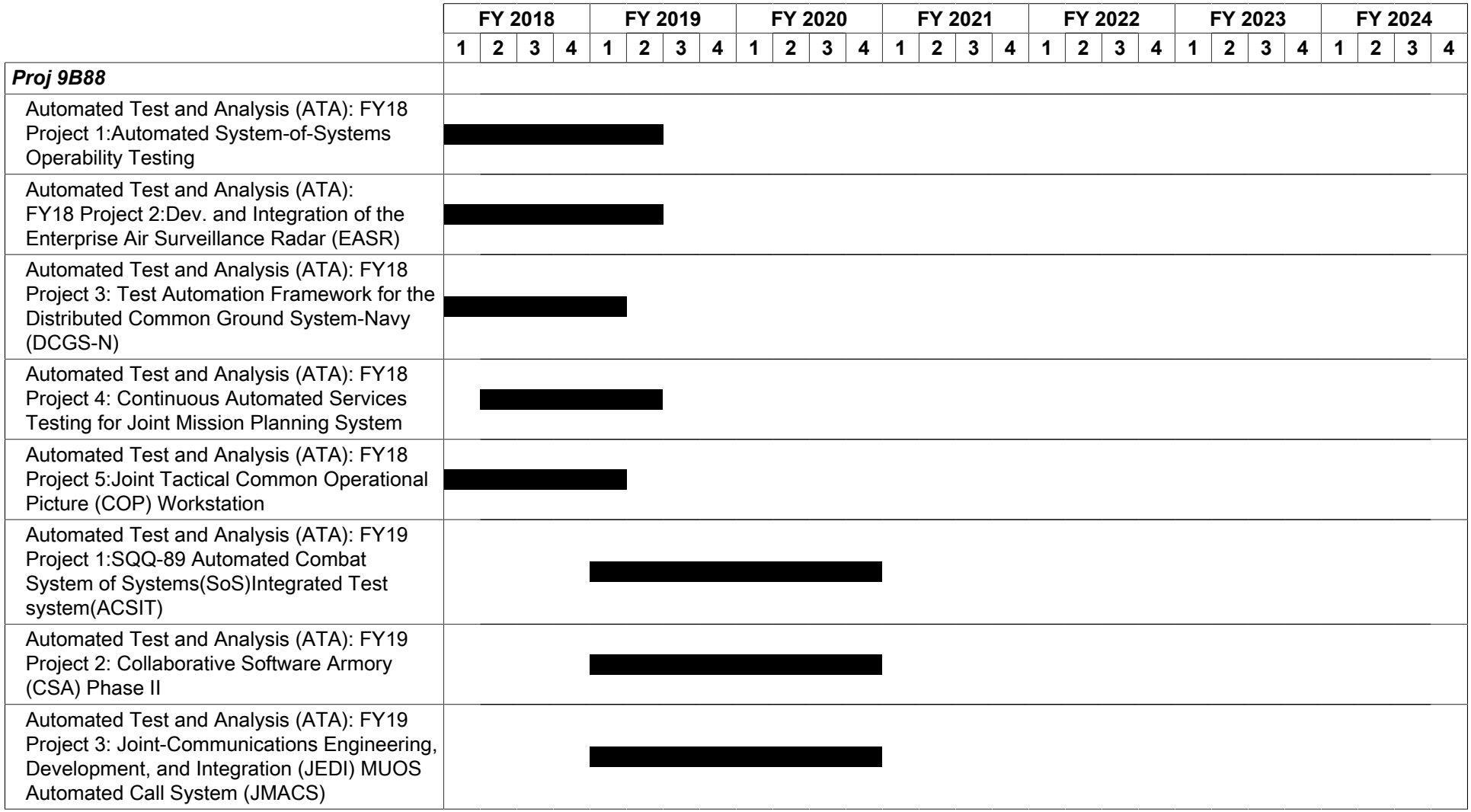


Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603597N / *(U)Automated Test and Analysis*	**Project (Number/Name)** 9B88 / *Automated Test and Analysis*

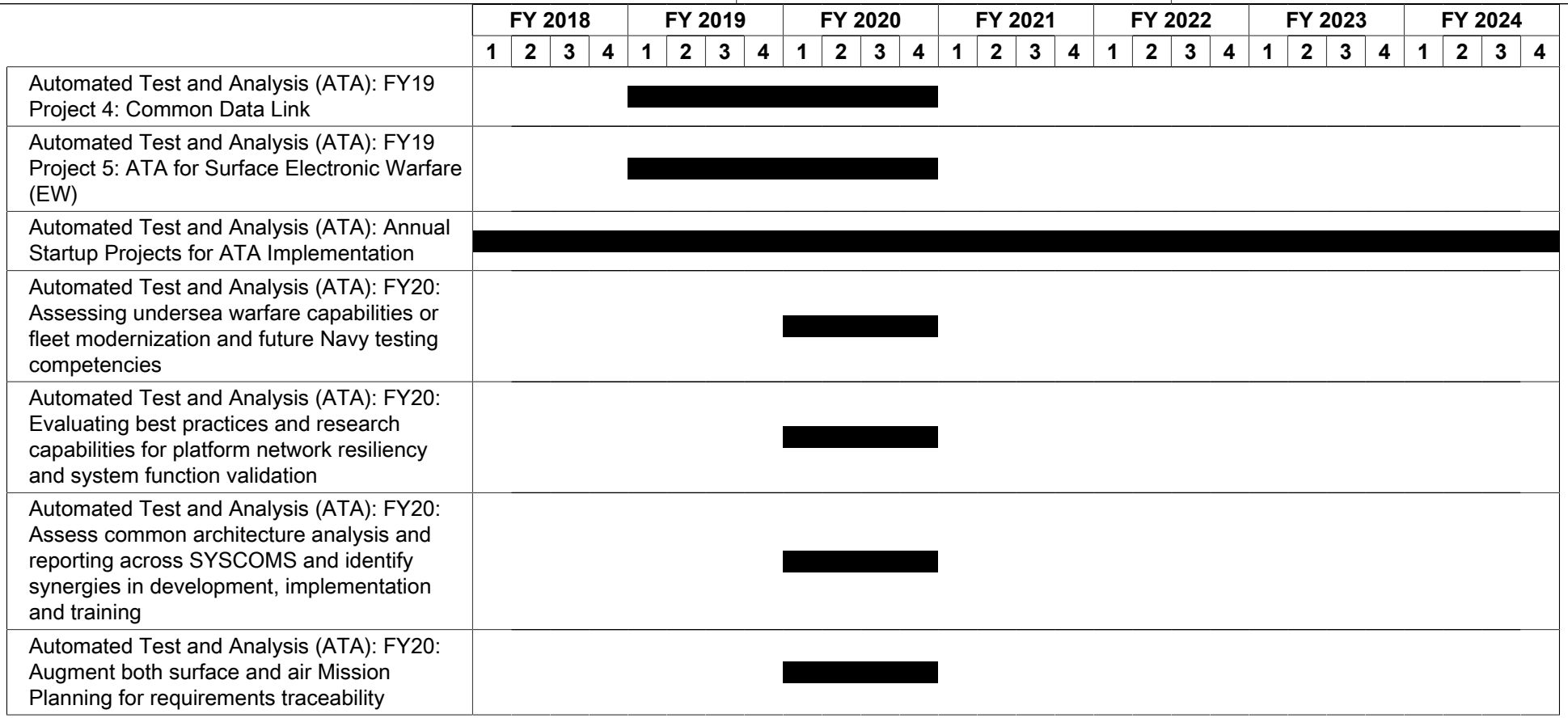


Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603597N / *(U)Automated Test and Analysis*	**Project (Number/Name)** 9B88 / *Automated Test and Analysis*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 9B88				
Automated Test and Analysis (ATA): FY18 Project 1:Automated System-of-Systems Operability Testing	1	2018	2	2019
Automated Test and Analysis (ATA): FY18 Project 2:Dev. and Integration of the Enterprise Air Surveillance Radar (EASR)	1	2018	2	2019
Automated Test and Analysis (ATA): FY18 Project 3: Test Automation Framework for the Distributed Common Ground System-Navy (DCGS-N)	1	2018	1	2019
Automated Test and Analysis (ATA): FY18 Project 4: Continuous Automated Services Testing for Joint Mission Planning System	2	2018	2	2019
Automated Test and Analysis (ATA): FY18 Project 5:Joint Tactical Common Operational Picture (COP) Workstation	1	2018	1	2019
Automated Test and Analysis (ATA): FY19 Project 1:SQQ-89 Automated Combat System of Systems(SoS)Integrated Test system(ACSIT)	1	2019	4	2020
Automated Test and Analysis (ATA): FY19 Project 2: Collaborative Software Armory (CSA) Phase II	1	2019	4	2020
Automated Test and Analysis (ATA): FY19 Project 3: Joint-Communications Engineering, Development, and Integration (JEDI) MUOS Automated Call System (JMACS)	1	2019	4	2020
Automated Test and Analysis (ATA): FY19 Project 4: Common Data Link	1	2019	4	2020
Automated Test and Analysis (ATA): FY19 Project 5: ATA for Surface Electronic Warfare (EW)	1	2019	4	2020
Automated Test and Analysis (ATA): Annual Startup Projects for ATA Implementation	1	2018	4	2024
Automated Test and Analysis (ATA): FY20: Assessing undersea warfare capabilities or fleet modernization and future Navy testing competencies	1	2020	4	2020

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603597N / *(U)Automated Test and Analysis*	**Project (Number/Name)** 9B88 / *Automated Test and Analysis*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Automated Test and Analysis (ATA): FY20: Evaluating best practices and research capabilities for platform network resiliency and system function validation	1	2020	4	2020
Automated Test and Analysis (ATA): FY20: Assess common architecture analysis and reporting across SYSCOMS and identify synergies in development, implementation and training	1	2020	4	2020
Automated Test and Analysis (ATA): FY20: Augment both surface and air Mission Planning for requirements traceability	1	2020	4	2020

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy											Date: March 2019	
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0603599N *I (U)Frigate Development*							
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
Total Program Element	84.594	137.655	132.775	59.007	-	59.007	85.341	75.386	70.707	72.108	Continuing	Continuing
3086: *Frigate*	84.594	137.655	132.775	59.007	-	59.007	85.341	75.386	70.707	72.108	Continuing	Continuing

Program MDAP/MAIS Code:
Project MDAP/MAIS Code(s): 374

A. Mission Description and Budget Item Justification

The FY 2020 funding request was reduced by $15.000 million to account for the availability of prior year execution balances.

In FY 2014, the Navy established the requirements for a lethal and survivable small surface combatant ship (later redesignated as Frigate (FF)), above that of Littoral Combat Ship (LCS) to meet future missions. Based upon the Navy's 2016 Force Structure Assessment resulting in validation of the need for 52 small surface combatants and the need to address increasingly complex threats in the global maritime environment, the Navy reassessed the capabilities required to ensure the Frigate paces future threats. With Guided Missile Frigate (FFG(X)), the Navy desires to maximize the small surface combatant capabilities in the Anti-Surface Warfare (SUW), Anti-Submarine Warfare (ASW), Electromagnetic Maneuver Warfare (EMW), and Air Warfare (AW) mission areas, while keeping the ship affordable and as a part of a "high-low" mix of surface ships. The updated assessment was completed to support establishment of top-level FFG(X) requirements in Summer 2017 and resulted in a Navy-approved Capability Development Document (CDD). The CDD entered JROC Staffing in August 2018 and is scheduled for JROC-Validation in 2nd QTR 2019.

The FFG(X) program will continue to refine the cost estimates to support a FY 2020 Detail Design and Construction (DD&C) contract award. Based on the updated FFG(X) requirements, FY 2017 focused on efforts for the system specification (SPEC) development and on conceptual design contract development. FY 2018 focused on refining the system SPEC and the program awarded conceptual design contracts to multiple vendors. Funds were also used to continue maturing the FFG(X) Government Furnished Equipment (GFE) baseline; continue Frigate Weapon System (FWS)(formally CMS) design development, coding, and test; acquisition documentation development; C4I systems development; and continued system engineering efforts to ensure mature Government Furnished Information (GFI) deliveries. Conceptual Design contracts complete in 4th QTR FY2019. FY 2020 marks the shift to SCN with the completion of the conceptual design phase. Efforts in systems engineering, cost estimating, and ship design management began in RDTE Project 3086, but are reflected in SCN Line Item 2128 after award of the DD&C contract (4th QTR 2020). Remaining FY 2020 funds will be focused on the continuation of DD&C source selection, Frigate Weapon System (FWS) design development, coding, and test; acquisition documentation approval for MS B; Combat System and C4I Element Integration; and test and evaluation activities. Combat System efforts decrease in FY 2023, as testing activities are ramping up resulting in a relatively stable profile in the outyears.

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy					Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*			R-1 Program Element (Number/Name) PE 0603599N *I (U)Frigate Development*		
B. Program Change Summary ($ in Millions)	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**
Previous President's Budget	143.450	134.772	75.353	-	75.353
Current President's Budget	137.655	132.775	59.007	-	59.007
Total Adjustments	-5.795	-1.997	-16.346	-	-16.346
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-1.997			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-3.476	0.000			
• Program Adjustments	0.000	0.000	-15.481	-	-15.481
• Rate/Misc Adjustments	0.000	0.000	-0.865	-	-0.865
• Congressional Directed Reductions Adjustments	-2.319	-	-	-	-

Change Summary Explanation

FY 2018:
-$2.319M Congressional reduction for program management excess growth
-$3.476M SBIR

FY 2019:
-$1.997M - Congressional reduction for testing and engineering delays

FY 2020:
-$15.000M - reduction due to availability of prior year balances
-$0.481 - Contractor Services Reform reduction
-$0.856M - Navy Working Capital Fund and various rate adjustments

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603599N / *(U)Frigate Development*	Project (Number/Name) 3086 / *Frigate*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
3086: *Frigate*	84.594	137.655	132.775	59.007	-	59.007	85.341	75.386	70.707	72.108	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Project MDAP/MAIS Code: 374

A. Mission Description and Budget Item Justification

Frigate (FFG(X)) efforts are composed of the design and development for a more lethal and survivable multi-mission warship focused on anti-surface warfare and anti-submarine warfare capabilities (SUW/ASW), local air defense and enhanced survivability features. FFG(X) design modifications for added capability over LCS include an over-the-horizon (OTH) surface-to-surface missile system, upgraded air defense weapons and sensors, advanced electronic warfare system and improved decoys, local air defense, and enhanced survivability features. This effort will encompass design, development, and technical issue resolution to support design maturity for DD&C FY 2020 contract award. Certification and testing efforts are also required to support the FFG(X) delivery, operations, and introduction to the fleet.

The FFG(X) design and development phases include platform design, development and risk reduction; combat system element integration; total ship system engineering and integration; combat systems and warfare systems certification; and planning and conduct of system testing. These efforts include procurement of combat and warfare system elements and/or simulators to support production representative testing in support of design, development, and certification efforts and ordnance in support of testing. Additional capabilities over the LCS will include an Over-the-Horizon (OTH) surface-to-surface missile system, upgraded air defense weapons and sensors, advanced electronic warfare system and improved decoys, local air defense, and enhanced survivability features.

This funding will also include efforts and activities required for formal Developmental and Operational testing of the FFG(X). Test and Evaluation (T&E) will concentrate on verifying integration and interoperability of employed technologies and systems in the FFG(X) design to achieve the mission capabilities and performance requirements as defined in the FFG(X) Capability Development Document (CDD). T&E functions will include the evaluation of Critical Technical Parameters (CTP), Measures of Effectiveness (MOE), Measures of Suitability (MOS), and Key Performance Parameters (KPP).

Since the FY19 President's Budget submission, additional testing activities have been identified to support Milestone B products, system specification approval and cybersecurity increasing the Test & Evaluation requirements for the program. Funding planned is for the execution of DT and C4I integration & test, cyber test and certification, warfare system integration & test and certification, aviation (manned and unmanned) integration & test and certification in FY 2019.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Ship Systems / C4I / Warfare Systems Engineering	131.653	124.458	50.179	0.000	50.179
Articles:	-	-	-	-	-
Description: The Frigate (FFG(X)) is a multi-mission ship that focuses on Anti-Surface Warfare (SUW), Anti-Submarine Warfare (ASW) capabilities and local air defense. Specific capabilities include Over-the-Horizon					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603599N / *(U)Frigate Development*	**Project (Number/Name)** 3086 / *Frigate*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
(OTH), upgraded Air Defense weapons and sensors, advanced electronic warfare system and improved decoys, variable depth sonar, towed array, torpedo defense, and enhanced survivability features. ***FY 2019 Plans:*** Ship Systems Engineering Continue system engineering efforts related to naval architecture, machinery engineering and topside design analysis. Emphasis will be placed on the structural and stability disciplines, and incorporation of lethality and survivability enhancements to include the flow-down impacts to the supporting machinery and electrical systems. Completion of the Final System SPEC to support DD&C Request for Proposal (RFP) release. Completion of contractor-led conceptual designs to support FY 2020 competition. Continue development of the documentation to support Milestone B in FY 2020. Continue efforts to support and verify updated cost estimates that will feed the Independent Cost Estimate (ICE)/ Component Cost Position (CCP). Complete Gate 4 and 5 reviews to support the final release of DD&C RFP in 4th QTR. C4I / Warfare Systems Engineering Continue system engineering efforts related to C4I and warfare systems specifications. Continue OTH systems engineering and testing efforts for integration of OTH missile. Continue FWS development efforts to ensure full ship integration aligns with total ship design efforts and integrate additional FFG(X) required capabilities. Execute CS Software In Process Reviews (IPRs). Integrate other CS and C4I elements into total ship design. Implement additional cyber security/information assurance (IA) measures on the warfare system and C4I suite to pace the current and future threats. Continue development of the Milestone B documentation. Continue efforts to support and verify cost estimates that will feed the Independent Cost Estimate (ICE)/ Component Cost Position (CCP). ***FY 2020 Base Plans:*** Ship Systems Engineering Continue system engineering efforts related to naval architecture, machinery engineering and topside design analysis. Emphasis will be placed on the structural and stability disciplines, and incorporation of lethality and survivability enhancements to include the flow-down impacts to the supporting machinery and electrical systems. Continue development of the documentation to support Milestone B in FY 2020. Complete MS B for 2nd QTR approval. Participate in source selection for DD&C Award, including technical and cost evaluation. C4I / Warfare Systems Engineering					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603599N / *(U)Frigate Development*	**Project (Number/Name)** 3086 / *Frigate*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Continue system engineering efforts related to C4I and warfare systems specifications. Continue OTH systems engineering and testing efforts for integration of OTH missile. Continue FWS development efforts to ensure full ship integration aligns with total ship design efforts and integrate additional FFG(X) required capabilities. Continue integration of other CS and C4I elements into total ship design. Implement additional cyber security/ information assurance (IA) measures on the warfare system and C4I suite to pace the current and future threats. Continue development of the Milestone B documentation for approval in 2nd QTR. Participate in Source Selection for DD&C Award, including technical and cost evaluation. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Decrease in funds from FY 2019 to FY 2020 is due to the ending of the conceptual design phase and award of the Detail Design and Construction (DD&C) contract under SCN (Line Item 2128) in FY 2020.					
Title: Test & Evaluation	6.002	8.317	8.828	0.000	8.828
Articles:	-	-	-	-	-
Description: Conduct FFG(X) test planning in support of Developmental Testing and Operational Testing (DT/ OT), including Live Fire Test and Evaluation (LFT&E), and procurement of T&E Ordnance. Plan for and execute DT and C4I integration & test, cyber test and certification, warfare system integration & test and certification, aviation (manned and unmanned) integration & test and certification. Late FY17 efforts were shifted to the FFG(X) test planning leveraging the FF test planning efforts. ***FY 2019 Plans:*** Continue FFG(X) Test and Evaluation Master Plan (TEMP) updates and continue WIPTs required to achieve TEMP approval. Support future updates required for land-based SIM/STIM test requirements for the integration and test of the FFG(X) platform. Begin execution of land-based SIM/STIM modeling and test efforts. Acquire LFT&E Waiver Approval to support MS B. Complete collaborative development of LFT&E Management Plan by working with DOT&E. Acquire LFT&E Waiver Approval to support MS B. Plan and Execute Cyber Table Top (CTT)-2. Continue to refine shipyard stage testing events in specification and contracting documentation. Identify and align resources for cybersecurity testing. Continue strategy coordination and oversight approvals for the overaching cybersecurity testing and certification approach. ***FY 2020 Base Plans:*** Complete collaborative development of FFG(X) TEMP and obtain approvals from stakeholder organizations. Continue planning for Cybersecurity Table Top (CTT)-2. Participate in Source Selection for DD&C Award.					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603599N / *(U)Frigate Development*	**Project (Number/Name)** 3086 / *Frigate*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Develop DT and OT scenarios and detailed test planning. Continue execution of LFT&E; SIM/STIM modeling; Verification, Validation and Accreditation (VV&A) and test efforts. Continue alignment for cybersecurity testing. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** No significant change from FY 2019 to FY 2020. Funding planned is for the execution of DT and C4I integration & test, cyber test and certification, warfare system integration & test and certification, aviation (manned and unmanned) integration & test and certification.					
Accomplishments/Planned Programs Subtotals	137.655	132.775	59.007	0.000	59.007

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• SCN/2128: *FFG-Frigate*	0.000	0.000	1,281.177	-	1,281.177	2,057.027	1,750.434	1,792.095	1,827.937	11,761.465	20,470.135

Remarks

Beginning in FY20, SCN Line Item 2128 captures FFG(X) procurement.

D. Acquisition Strategy

The FFG(X) acquisition strategy was signed in 1st QTR FY 2019 to support a full and open competitive contract award in FY 2020.

E. Performance Metrics

T&E functions will include the evaluation of Critical Technical Parameters (CTP), Measures of Effectiveness (MOE), Measures of Suitability (MOS), and Key Performance Parameters (KPP).

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603599N / *(U)Frigate Development*	Project (Number/Name) 3086 / *Frigate*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Conceptual Design Contracts	C/FFP	Various : Various	6.000	68.000	Feb 2018	38.247	Feb 2019	0.000		-		0.000	0.000	112.247	-
System SPEC Development	WR	Government Activities : Various	5.580	1.500	Jan 2018	1.375	Jan 2019	0.000		-		0.000	0.000	8.455	-
System SPEC Development	C/CPAF	Various Contractors : Various	2.500	2.500	Jan 2018	1.225	Jan 2019	0.000		-		0.000	0.000	6.225	-
Over the Horizon (OTH) Missile Integration	WR	NAWC, China Lake : China Lake, CA	0.652	0.558	Feb 2018	0.645	Feb 2019	0.020	Feb 2020	-		0.020	Continuing	Continuing	Continuing
Over the Horizon (OTH) Missile Integration	WR	Various : Various	1.413	1.236	Feb 2018	0.656	Feb 2019	0.020	Feb 2020	-		0.020	Continuing	Continuing	Continuing
FFG Architecture Framework/ Cyber	C/CPAF	Engility : San Diego, CA	0.412	2.202	Jan 2018	3.615	Jan 2019	3.184	Jan 2020	-		3.184	Continuing	Continuing	Continuing
C4I Development	WR	SPAWAR : Charleston, SC	3.516	1.364	Nov 2017	1.831	Nov 2018	1.100	Nov 2019	-		1.100	Continuing	Continuing	Continuing
C4I Development	WR	SPAWAR : San Diego, CA	1.907	1.390	Nov 2017	1.686	Nov 2018	1.516	Nov 2019	-		1.516	Continuing	Continuing	Continuing
Frigate Weapons System Development (FWS)	C/CPIF	Lockheed Martin : Various	15.752	13.980	Jan 2018	13.442	Jan 2019	13.822	Jan 2020	-		13.822	Continuing	Continuing	Continuing
Frigate Weapons System Development (FWS)	Various	Various Contractors : Various	0.500	1.823	Nov 2017	1.889	Nov 2018	1.400	Nov 2019	-		1.400	0.000	5.612	-
Frigate Weapons System Development (FWS)	WR	Government Activities : Various	2.123	1.165	Nov 2017	2.114	Nov 2018	3.530	Nov 2019	-		3.530	Continuing	Continuing	Continuing
Warfare Systems Development	WR	NUWC, Newport : Newport, RI	1.500	1.410	Nov 2017	1.740	Nov 2018	0.554	Nov 2019	-		0.554	Continuing	Continuing	Continuing
Warfare Systems Development	WR	NSWC, DD : Dahlgren, VA	4.989	1.550	Nov 2017	1.307	Nov 2018	0.900	Nov 2019	-		0.900	Continuing	Continuing	Continuing
Warfare Systems Development	WR	NSWC, CD : Carderock, MD	0.445	0.571	Nov 2017	0.555	Nov 2018	0.554	Nov 2019	-		0.554	Continuing	Continuing	Continuing
Warfare Systems Development	C/CPIF	Lockheed Martin : Various	1.852	0.660	Dec 2017	5.197	Dec 2018	0.500	Dec 2019	-		0.500	Continuing	Continuing	Continuing
Warfare Systems Development	Various	Various : Various	4.092	4.316	Nov 2017	6.145	Nov 2018	2.200	Nov 2019	-		2.200	Continuing	Continuing	Continuing

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603599N / *(U)Frigate Development*	Project (Number/Name) 3086 / *Frigate*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Warfare Systems Development	WR	Government Activities : Various	1.438	2.667	Nov 2017	2.245	Nov 2018	1.811	Nov 2019	-		1.811	0.000	8.161	-
Aviation Integration Development	WR	NAWC, AD : Patuxent River, MD	1.396	1.302	Nov 2017	2.273	Dec 2018	1.150	Dec 2019	-		1.150	Continuing	Continuing	Continuing
Aviation Integration Development	WR	NSWC, DD : Dahlgren, VA	0.116	0.441	Dec 2017	0.686	Nov 2018	0.587	Nov 2019	-		0.587	Continuing	Continuing	Continuing
		Subtotal	56.183	108.635		86.873		32.848		-		32.848	Continuing	Continuing	N/A

Remarks

Beginning in FY 2020, most efforts are realigned to SCN Line Item 2128 after ship contract award.

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Government Engineering Support	WR	NSWC, CD : Carderock, MD	5.044	2.505	Nov 2017	10.024	Nov 2018	3.262	Nov 2019	-		3.262	Continuing	Continuing	Continuing
Government Engineering Support	WR	NSWC, PD : Philadelphia, PA	2.676	1.718	Nov 2017	1.849	Nov 2018	1.880	Nov 2019	-		1.880	Continuing	Continuing	Continuing
Government Engineering Support	WR	NSWC, DD : Dahlgren, VA	2.842	3.428	Nov 2017	3.704	Nov 2018	1.500	Nov 2019	-		1.500	Continuing	Continuing	Continuing
Government Engineering Support	WR	NSWC, PHD : Port Hueneme, CA	0.677	0.355	Nov 2017	0.348	Nov 2018	0.270	Nov 2019	-		0.270	Continuing	Continuing	Continuing
Government Engineering Support	WR	Government Activities : Various	0.316	2.285	Nov 2017	1.356	Nov 2018	1.220	Nov 2019	-		1.220	Continuing	Continuing	Continuing
Contractor Engineering Support	C/CPAF	Booz Allen Hamilton : McLean, VA	1.056	0.550	Feb 2018	0.764	Feb 2019	0.000		-		0.000	Continuing	Continuing	Continuing
Contractor Engineering Support	C/CPAF	Gryphon : Arlington, VA	0.000	1.175	Nov 2017	1.688	Nov 2018	1.161	Nov 2019	-		1.161	Continuing	Continuing	Continuing
Contractor Engineering Support	C/CPIF	Alion : Arlington, VA	2.042	1.434	Feb 2018	5.515	Feb 2019	2.670	Feb 2020	-		2.670	Continuing	Continuing	Continuing

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603599N / *(U)Frigate Development*	Project (Number/Name) 3086 / *Frigate*	

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Contractor Engineering Support	Various	Various : Various	1.960	1.252	Jan 2018	1.867	Jan 2019	0.400	Jan 2020	-		0.400	Continuing	Continuing	Continuing
		Subtotal	16.613	14.702		27.115		12.363		-		12.363	Continuing	Continuing	N/A

Remarks

Beginning in FY 2020, a portion of the Support costs are realigned to SCN Line Item 2128.

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Model Development	WR	NSWC, CD : Carderock, MD	2.413	3.880	Nov 2017	3.805	Dec 2018	3.880	Dec 2019	-		3.880	0.000	13.978	-
Test and Evaluation Master Plan (TEMP) Development	C/CPIF	Alion : Arlington, VA	0.550	0.809	Dec 2017	0.552	Dec 2018	0.020	Dec 2019	-		0.020	Continuing	Continuing	Continuing
Test and Evaluation Master Plan (TEMP) Development	WR	Government Activities : Various	0.000	0.841	Dec 2017	0.754	Dec 2018	0.210	Dec 2019	-		0.210	Continuing	Continuing	Continuing
Test and Evaluation Mast Plan (TEMP) Support	C/CPAF	Engility : San Diego	0.000	0.300	Dec 2017	0.954	Dec 2018	0.210	Dec 2019	-		0.210	Continuing	Continuing	Continuing
Land Based Integration & Test	WR	Government Activities : Various	0.000	0.172	Dec 2017	2.252	Nov 2018	4.508	Nov 2019	-		4.508	Continuing	Continuing	Continuing
		Subtotal	2.963	6.002		8.317		8.828		-		8.828	Continuing	Continuing	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management Support	C/CPIF	Alion : Arlington, VA	2.159	1.421	Dec 2017	2.742	Dec 2018	0.000		-		0.000	Continuing	Continuing	Continuing
Program Management Support	WR	Various : Various	6.676	6.895	Dec 2017	7.728	Dec 2018	4.968	Dec 2019	-		4.968	Continuing	Continuing	Continuing

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603599N / *(U)Frigate Development*	Project (Number/Name) 3086 / *Frigate*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Subtotal			8.835	8.316		10.470		4.968		-		4.968	Continuing	Continuing	N/A

Remarks

Program Management Support includes Program Office support, Cost Estimation support, Acquisition Documentation Support, and Program Office travel. Beginning in FY 2020, a portion of the PM Support costs are realigned to SCN Line Item 2128.

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	84.594	137.655		132.775		59.007		-		59.007	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603599N / *(U)Frigate Development*	**Project (Number/Name)** 3086 / *Frigate*

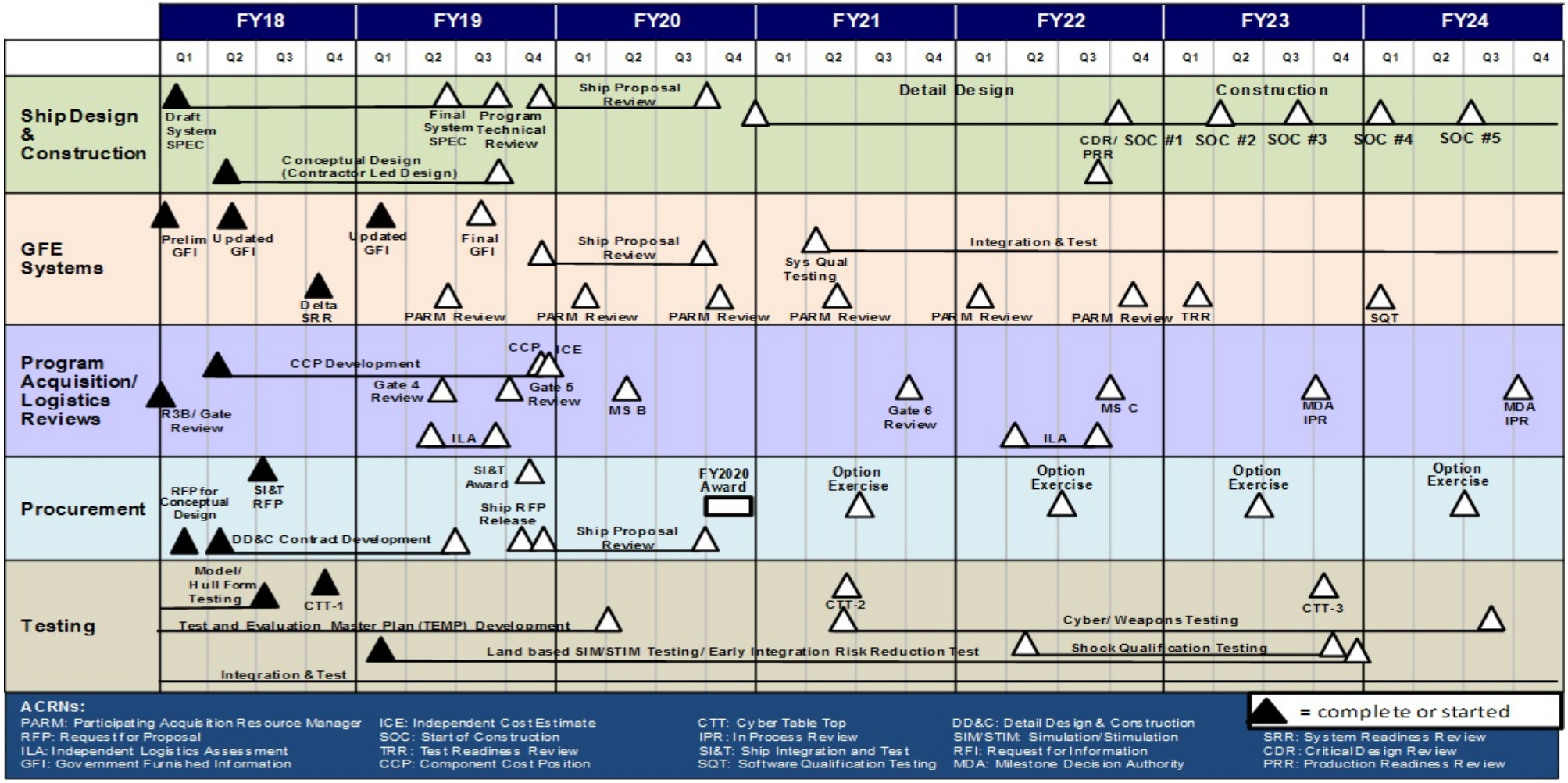


Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603599N / *(U)Frigate Development*	**Project (Number/Name)** 3086 / *Frigate*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 3086				
Ship Design: Draft System SPEC Approval	1	2018	1	2018
Ship Design: System SPEC Development	1	2018	2	2019
Ship Design: Conceptual Design (Contractor Led Design)	2	2018	3	2019
Ship Design: Final System SPEC Approval	2	2019	2	2019
Ship Design: Program Technical Review	3	2019	3	2019
Ship Design: Production (Ship) Proposal Review	4	2019	3	2020
GFE Systems: Preliminary Government Furnished Information (GFI)	1	2018	1	2018
GFE Systems: Updated GFI #1	2	2018	2	2018
GFE Systems: Combat System (CS) Software Delta System Requirements Review (SRR)	4	2018	4	2018
GFE Systems: Updated GFI #2	1	2019	1	2019
GFE Systems: CS In Process Review (IPR) #1	2	2019	2	2019
GFE Systems: Final GFI	3	2019	3	2019
GFE Systems: Production (Ship) Proposal Review	4	2019	3	2020
GFE Systems: CS In Process Review (IPR) #2	1	2020	1	2020
GFE Systems: CS In Process Review (IPR) #3	4	2020	4	2020
GFE Systems: System Qualification Testing	2	2021	2	2021
GFE Systems: CS Integration and Testing	2	2021	4	2024
GFE Systems: CS In Process Review (IPR) #4	2	2021	2	2021
GFE Systems: CS In Process Review (IPR) #5	1	2022	1	2022
GFE Systems: CS In Process Review (IPR) #6	4	2022	4	2022
GFE Systems: CS Software Technical Readiness Review (TRR)	1	2023	1	2023

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603599N / *(U)Frigate Development*	**Project (Number/Name)** 3086 / *Frigate*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
GFE Systems: Software Qualification Testing (SQT)	1	2024	1	2024
Program Acquisition/Logistics Reviews: R3B/Gate Review	1	2018	1	2018
Program Acquisition/Logistics Reviews: Component Cost Position (CCP) Development	2	2018	4	2019
Program Acquisition/Logistics Reviews: Final CCP	4	2019	4	2019
Program Acquisition/Logistics Reviews: Independent Cost Analysis Assessment (ILA) Development	2	2019	3	2019
Program Acquisition/Logistics Reviews: Gate 4 Review	2	2019	2	2019
Program Acquisition/Logistics Reviews: Gate 5 Review	4	2019	4	2019
Program Acquisition/Logistics Reviews: Independent Cost Estimates (ICE)	4	2019	4	2019
Program Acquisition/Logistics Reviews: Milestone B	2	2020	2	2020
Program Acquisition/Logistics Reviews: Milestone Decision Authority (MDA) IPR #1	4	2020	4	2020
Program Acquisition/Logistics Reviews: Gate 6 Review	4	2021	4	2021
Program Acquisition/Logistics Reviews: Independent Logistics Assessment (ILA) Development	2	2022	3	2022
Program Acquisition/Logistics Reviews: Milestone C	4	2022	4	2022
Program Acquisition/Logistics Reviews: Milestone Decision Authority (MDA) IPR #2	4	2023	4	2023
Program Acquisition/Logistics Reviews: Milestone Decision Authority (MDA) IPR #3	4	2024	4	2024
Procurement: Request for Proposal (RFP) Conceptual Design	1	2018	1	2018
Procurement: Detail Design & Construction (DD&C) Contract Development	2	2018	2	2019
Procurement: Ship Integration and Testing (SI&T) RFP	3	2018	3	2018
Procurement: Production (Ship) RFP Release	4	2019	4	2019
Procurement: Production (Ship) Proposal Review	4	2019	3	2020
Procurement: Ship Integration and Test (SI&T) Award	1	2020	1	2020
Procurement: Production (Ship) Award	4	2020	4	2020
Procurement: R3B/Gate Review	2	2023	2	2023
Testing: Model/Hull Form Testing	1	2018	3	2018
Testing: Test and Evaluation Master Plan (TEMP) Development	1	2018	2	2020

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603599N / *(U)Frigate Development*	**Project (Number/Name)** 3086 / *Frigate*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Testing: Cyber Table Top (CTT)-1	4	2018	4	2018
Testing: Cyber Table Top (CTT)-2	2	2020	2	2020
Testing: Land Based Testing	1	2019	4	2023
Testing: Shock Qualification Testing	2	2022	4	2023
Testing: Cyber Table Top (CTT)-3	4	2023	4	2023
Testing: Cyber/Weapons Testing	3	2022	3	2024
Testing: Integration and Test Efforts	1	2018	4	2024

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy											Date: March 2019	
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0603609N *I Conventional Munitions*							
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
Total Program Element	238.753	13.699	9.307	9.988	-	9.988	10.761	8.768	8.941	9.119	Continuing	Continuing
0363: *Insensitive Munitions Adv. Development*	238.753	8.874	8.414	8.434	-	8.434	8.628	8.768	8.941	9.119	Continuing	Continuing
3436: *AN/BST-1 Buoy Component Re-Design*	0.000	0.000	0.893	1.554	-	1.554	2.133	0.000	0.000	0.000	0.000	4.580
9999: *Congressional Adds*	0.000	4.825	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	4.825

A. Mission Description and Budget Item Justification

Proj 0363- Most Navy munitions react violently when exposed to unplanned stimuli such as fire, shock and bullet or fragment impact, thus presenting a great hazard to ships, aircraft, and personnel. The Insensitive Munitions Advanced Development (IMAD) program will provide, validate, and transition technology to all new weapon developments and priority weapon systems and enable production of munitions insensitive to these stimuli with no reduction in combat performance. Insensitive Munitions (IM) is the Navy's focused effort on propellants, propulsion units, explosives, warheads, fuses, and pyrotechnics to reduce the severity of cook-off and bullet/ fragment impact reactions, minimizing the probability for sympathetic detonation, both in normal storage and in use, increasing ship and platform survivability and satisfying performance and readiness requirements.

Proj 3436- The AN/BST-1 Submarine Emergency Communication Transmitter informs Navy leadership when a ballistic missile submarine is in extremis. When activated, a buoy is released from the submarine, floats to the surface and transmits an emergency signal. The energetic components in the system release the buoy from the submarine, separate protective covers and actuate an antenna for communication. The AN/BST-1 Buoy energetic component re-design will replace two antenna related explosive components that utilize explosive formulations that are no longer produced due to environmental impact. The re-design will support future procurements for OHIO and COLUMBIA class deployments. The energetic component re-design includes design, prototyping, design verification testing, environmental qualification, hazard classification, insensitive munitions and developmental testing. The two re-designed energetic components will be qualified for USN use at the conclusion of the program.

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0603609N *I Conventional Munitions*

B. Program Change Summary ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	8.909	9.307	9.988	-	9.988
Current President's Budget	13.699	9.307	9.988	-	9.988
Total Adjustments	4.790	0.000	0.000	-	0.000
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.209	0.000			
• Rate/Misc Adjustments	-0.001	0.000	0.000	-	0.000
• Congressional Add Adjustments	5.000	-	-	-	-

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2018	FY 2019
Project: 9999: *Congressional Adds*		
Congressional Add: *Energetics Technology Research*	4.825	0.000
Congressional Add Subtotals for Project: 9999	4.825	0.000
Congressional Add Totals for all Projects	4.825	0.000

Change Summary Explanation

The FY 2019 funding request was reduced by $0.051 million to reflect the Department of Navy's effort to support the Office of Management and Budget directed reforms for Efficiency and Effectiveness that include a lean, accountable, more efficient government.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603609N / *Conventional Munitions*	Project (Number/Name) 0363 / *Insensitive Munitions Adv. Development*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
0363: *Insensitive Munitions Adv. Development*	238.753	8.874	8.414	8.434	-	8.434	8.628	8.768	8.941	9.119	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Energetic materials producibility is demonstrated to assure national capability to produce and load munitions systems. The program leverages are being closely coordinated with other military departments, North Atlantic Treaty Organization (NATO) and allied countries to eliminate redundant efforts and maximize efficiency. A joint service IM requirement has been developed and through the IM strategic planning process, all Program Executive Offices (PEO) are implementing IM in their priority munitions. IM are identified as a Department of Defense (DoD) critical technology requirement and considered as part of a weapon design. The IMAD program matures the technology developed by a variety of Science and Technology (S&T) sources for program management integration into weapons systems to meet the IM technical deficiencies documented in the PEO IM Strategic Plans. IMAD provides the link between S&T programs and the program managers (PM) by optimizing IM technologies to meet Navy requirements. IMAD offers risk mitigation for the PMs in terms of IM technical knowledge, expertise and manpower with the state of the art expertise across IM products. Each technology area is divided into subtasks addressing specific munition and munition class IM deficiencies.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Insensitive Munitions Adv. Development	8.874	8.414	8.434	0.000	8.434
Articles:	-	-	-	-	-
Description: Validate and assess weapon systems plan of action and milestones for IM compliance. Review Insensitive Munitions Strategic Plan (IMSP) for Navy compile and analyze weapon system, energetic material and generic technology IM test data. Perform Threat Hazard Assessments (THAs). Perform analysis of energetic material properties logistic process. Review IM certification and waivers. Support Insensitive Munitions Council (IMC), Insensitive Munitions Coordination Group (IMCG), and IMC Working Group. Support and develop Insensitive Munitions Technology Tool (IMT2). Support North Atlantic Treaty Organization Standardization Agreement (NATO STANAG) and Advanced Operations (AOP) development. Support IMAD program briefs. Support all Navy Joint Services Insensitive Munitions Technical Panel (JSIMTP) meetings. Support Explosive Safety Working Group (ESWG) meetings. Provide task management support for financial management, review of programmatic deliverables and overall task coordination.					
FY 2019 Plans: Evaluate and demonstrate improved solid propellant for Insensitive Munitions (IM) compliant rocket motor systems and container cook off migration. Evaluate and demonstrate new rocket motor case technology that					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603609N / *Conventional Munitions*	**Project (Number/Name)** 0363 / *Insensitive Munitions Adv. Development*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
can significantly reduce reaction violence of missile and rocket propulsion systems exposed to unplanned stimuli. Develop, demonstrate, and qualify new rocket propellant formulations that meet and/or improve system performance for air launched weapons and meet and/or improve IM goals. Develop, demonstrate, and qualify a Reduced Sensitivity Solventless Gun Propellant. Evaluate new ordnance and container concepts. Qualify next generation area attack weapon fragment impact evaluation. Evaluate Slow Heating Oven Designs. Demonstrate IM Improvement through Integral Rocket Solid Fuel Ramjet Technology. Evaluation, demonstration, and qualification of new explosives that reduce collateral damage when bombs are exposed to thermal and impact threats. Develop and demonstrate new and improved stowage and container materials that achieve compliance with IM criteria while significantly reducing the logistics footprint by lowering system weight. Develop and demonstrate new sensors that will detect and indicate thermal events real time. The sensor can provide warning signal and be capable to initiate venting systems. Develop and demonstrate ballistic barrier concepts to improve or eliminate IM impact threats in logistical transportation and storage conditions. Develop and demonstrate new and improved explosive initiation systems that improve IM and reliably initiate IM explosives. Evaluate qualification potential of explosives using new resonant acoustic mixing (RAM) of explosive ingredients. Develop and demonstrate new and improved explosive initiation systems that improve IM and reliably initiate IM explosives. Evaluate qualification potential of explosives using new resonant acoustic mixing (RAM) of explosive ingredients.					
FY 2020 Base Plans: Evaluate and demonstrate improved solid propellant for Insensitive Munitions (IM) compliant rocket motor systems and container cook off mitigation. Evaluate and demonstrate new rocket motor case technology that can significantly reduce reaction violence of missile and rocket propulsion systems exposed to unplanned stimuli. Develop, demonstrate, and qualify new rocket propellant formulations that meet and/or improve system performance for air launched weapons and meet and/or improve IM goals. Evaluate and demonstrate solid rocket propellant using Highly Loaded Grain technology. Investigate distribute fiber optic sensing for in-situ propellant health monitoring. Develop, demonstrate, and qualify a Reduced Sensitivity Solventless Gun Propellant. Develop, demonstrate, and qualify an enhanced extended range propelling charge for 5" Gun. Evaluate new ordnance and container concepts. Qualify next generation area attack weapon fragment impact evaluation. Evaluation of IM improvement of high density reactive material. Evaluate and demonstrate shape memory alloy rock splitting technology for case venting. Demonstrate effects of slow heating munitions test heating rate changes. Demonstrate IM Improvement through Integral Rocket Solid Fuel Ramjet Technology. Evaluation, demonstration, and qualification of new explosives that reduce collateral damage when bombs are					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603609N / *Conventional Munitions*	**Project (Number/Name)** 0363 / *Insensitive Munitions Adv. Development*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
exposed to thermal and impact threats. Develop and demonstrate new and improved stowage and container materials that achieve compliance with IM criteria while significantly reducing the logistics footprint by lowering system weight. Develop and demonstrate ballistic barrier concepts to improve or eliminate IM impact threats in logistical transportation and storage conditions. Develop and demonstrate new and improved explosive initiation systems that improve IM and reliably initiate IM explosives. Evaluate qualification potential of explosives using new resonant acoustic mixing (RAM) of explosive ingredients. Develop and demonstrate new and improved explosive initiation systems that improve IM and reliably initiate IM explosives. Evaluate qualification potential of explosives using new resonant acoustic mixing (RAM) of explosive ingredients. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Funding change is insignificant.					
Accomplishments/Planned Programs Subtotals	8.874	8.414	8.434	0.000	8.434

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

IMAD is assigned as a non-ACAT program and therefore does not have program milestones like the ACAT I to IV programs. IMAD develops and evaluates IM technologies for use in Navy weapon systems and is not part of a particular weapon acquisition program

E. Performance Metrics

Quarterly program reviews

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603609N / *Conventional Munitions*	**Project (Number/Name)** 0363 / *Insensitive Munitions Adv. Development*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
PROPULSION DEV. AND EVAL.	WR	NAWC DIV/CHINA LAKE : CA	102.752	3.400	Nov 2017	3.373	Nov 2018	3.373	Nov 2019	-		3.373	Continuing	Continuing	Continuing
EXPLOSIVES DEV. AND EVAL.	WR	NSWC/INDIAN HEAD DIV. : MD	86.382	2.149	Nov 2017	2.002	Nov 2018	2.022	Nov 2019	-		2.022	Continuing	Continuing	Continuing
ORDNANCE DEV. AND EVAL.	WR	NSWC/DAHLGREN : VA	27.449	1.160	Nov 2017	1.025	Nov 2018	1.025	Nov 2019	-		1.025	Continuing	Continuing	Continuing
GUN PROPULSION AND EVAL.	WR	NSWC/INDIAN HEAD DIV. : MD	10.707	1.255	Nov 2017	1.015	Nov 2018	1.015	Nov 2019	-		1.015	Continuing	Continuing	Continuing
		Subtotal	227.290	7.964		7.415		7.435		-		7.435	Continuing	Continuing	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
PROGRAM MANAGEMENT SUPT	WR	NOSSA : IN HEAD MD	6.296	0.190	Nov 2017	0.209	Nov 2018	0.209	Nov 2019	-		0.209	Continuing	Continuing	Continuing
PROGRAM MANAGEMENT SUPPORT	MIPR	DTIC : FT BELVOIR VA	5.167	0.720	Nov 2017	0.790	Nov 2018	0.790	Nov 2019	-		0.790	Continuing	Continuing	Continuing
		Subtotal	11.463	0.910		0.999		0.999		-		0.999	Continuing	Continuing	N/A

	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	238.753	8.874		8.414		8.434		-		8.434	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603609N / *Conventional Munitions*	**Project (Number/Name)** 0363 / *Insensitive Munitions Adv. Development*

	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Proj 0363																												
Insensitive Munitions Adv. Development: TBD	[redacted]																											

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603609N / *Conventional Munitions*	**Project (Number/Name)** 0363 / *Insensitive Munitions Adv. Development*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 0363				
Insensitive Munitions Adv. Development: TBD	1	2018	1	2022

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603609N / *Conventional Munitions*	Project (Number/Name) 3436 / *AN/BST-1 Buoy Component Re-Design*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
3436: *AN/BST-1 Buoy Component Re-Design*	0.000	0.000	0.893	1.554	-	1.554	2.133	0.000	0.000	0.000	0.000	4.580
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The AN/BST-1 Submarine Emergency Communication Transmitter informs Navy leadership when a ballistic missile submarine is in extremis. When activated, a buoy is released from the submarine, floats to the surface and transmits an emergency signal. The energetic components in the system release the buoy from the submarine, separate protective covers and actuate an antenna for communication. The AN/BST-1 Buoy energetic component re-design will replace two antenna related explosive components that utilize explosive formulations that are no longer produced due to environmental impact. The re-design will support future procurements for OHIO and COLUMBIA class deployments. The energetic component re-design includes design, prototyping, design verification testing, environmental qualification, hazard classification, insensitive munitions and developmental testing. The two re-designed energetic components will be qualified for Navy use at the conclusion of the program.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Systems Engineering and Testing	0.000	0.893	1.554	0.000	1.554
Articles:	-	-	-	-	-
FY 2019 Plans: -Develop contract statement of work. -Conduct design analysis and specification review. -Develop design feasibility test plan. -Build prototypes for design feasibility testing.					
FY 2020 Base Plans: -Complete design feasibility testing. -Conduct preliminary design review. -Procure long lead materials. -Build design verification test units. -Conduct design verification testing.					
FY 2020 OCO Plans: N/A					
FY 2019 to FY 2020 Increase/Decrease Statement:					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603609N / *Conventional Munitions*	**Project (Number/Name)** 3436 / *AN/BST-1 Buoy Component Re-Design*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
FY20 increase due to increased hardware quantity and testing planned for design verification test units in FY 2020.					
Accomplishments/Planned Programs Subtotals	0.000	0.893	1.554	0.000	1.554

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

The AN/BST-1 Buoy energetic component re-design will be directed by government activities teaming with industry for design and production support. The re-designed components will be qualified for Navy use in FY2022.

E. Performance Metrics

Quarterly Program Reviews and semi-annual Design Reviews.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603609N / *Conventional Munitions*	Project (Number/Name) 3436 / *AN/BST-1 Buoy Component Re-Design*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Produce Drawings, Prototypes and Test	MIPR	DOTC : Picatinny, NJ	0.000	0.000		0.586	Mar 2019	1.144	Mar 2020	-		1.144	3.200	4.930	4.400
		Subtotal	0.000	0.000		0.586		1.144		-		1.144	3.200	4.930	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Government Engineering Services	WR	NSWC, IHEODTD : Indian Head, MD	0.000	0.000		0.252	Nov 2018	0.360	Oct 2019	-		0.360	0.500	1.112	-
Government Engineering Services	WR	NSWC, Crane : Crane, IN	0.000	0.000		0.055	Nov 2018	0.050	Oct 2019	-		0.050	0.100	0.205	-
		Subtotal	0.000	0.000		0.307		0.410		-		0.410	0.600	1.317	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	0.000		0.893		1.554		-		1.554	3.800	6.247	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603609N / *Conventional Munitions*	**Project (Number/Name)** 3436 / *AN/BST-1 Buoy Component Re-Design*

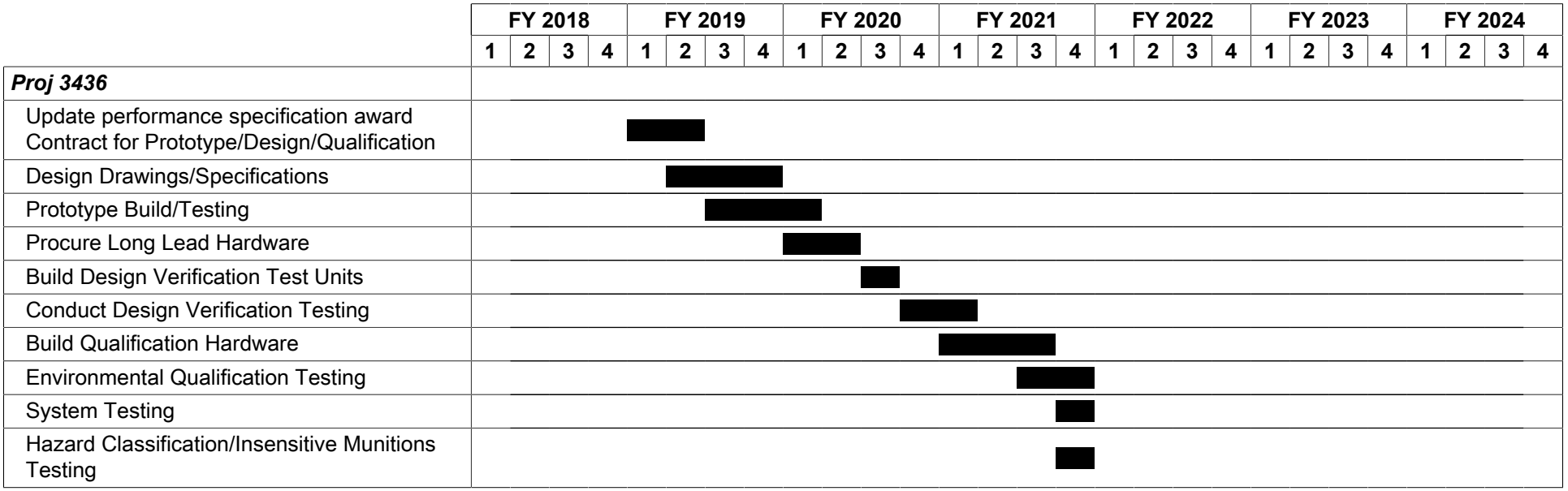


Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603609N / *Conventional Munitions*	**Project (Number/Name)** 3436 / *AN/BST-1 Buoy Component Re-Design*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 3436				
Update performance specification award Contract for Prototype/Design/Qualification	1	2019	2	2019
Design Drawings/Specifications	2	2019	4	2019
Prototype Build/Testing	3	2019	1	2020
Procure Long Lead Hardware	1	2020	2	2020
Build Design Verification Test Units	3	2020	3	2020
Conduct Design Verification Testing	4	2020	1	2021
Build Qualification Hardware	1	2021	3	2021
Environmental Qualification Testing	3	2021	4	2021
System Testing	4	2021	4	2021
Hazard Classification/Insensitive Munitions Testing	4	2021	4	2021

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603609N / *Conventional Munitions*	Project (Number/Name) 9999 / *Congressional Adds*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
9999: *Congressional Adds*	0.000	4.825	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	4.825
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Congressional add funding will be used to fund additional research for the Insensitive Munitions Advanced Development (IMAD) program for propulsion and ordnance projects in Maryland (MD), Virginia (VA) and California (CA).

Most Navy munitions react violently when exposed to unplanned stimuli such as fire, shock and bullet or fragment impact, thus presenting a great hazard to ships, aircraft, and personnel. The Insensitive Munitions Advanced Development (IMAD) program will provide, validate, and transition technology to all new weapon developments and priority weapon systems and enable production of munitions insensitive to these stimuli with no reduction in combat performance. Insensitive Munitions (IM) is the Navy's focused effort on propellants, propulsion units, explosives, warheads, fuses, and pyrotechnics to reduce the severity of cook-off and bullet/ fragment impact reactions, minimizing the probability for sympathetic detonation, both in normal storage and in use, increasing ship and platform survivability and satisfying performance and readiness requirements.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019
Congressional Add: Energetics Technology Research	4.825	0.000
FY 2018 Accomplishments: The Congressional add funding will be used to fund additional research for the Insensitive Munitions Advanced Development (IMAD) program for propulsion and ordnance projects in MD, VA and CA.		
FY 2019 Plans: N/A		
Congressional Adds Subtotals	4.825	0.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance is level of effort for development.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603609N / *Conventional Munitions*	Project (Number/Name) 9999 / *Congressional Adds*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
PROPULSION DEV. AND EVAL.	WR	NAWC DIV/CHINA LAKE : CA	0.000	0.906	Sep 2018	0.000		0.000		-		0.000	0.000	0.906	-
ORDNANCE DEV. AND EVAL.	WR	NAWC DIV/CHINA LAKE : CA	0.000	0.814	Sep 2018	0.000		0.000		-		0.000	0.000	0.814	-
EXPLOSIVES DEV. AND EVAL.	WR	NAWC DIV/CHINA LAKE : CA	0.000	0.200	Sep 2018	0.000		0.000		-		0.000	0.000	0.200	-
ORDNANCE DEV. AND EVAL.	WR	NSWC/DAHLGREN : VA	0.000	0.600	Sep 2018	0.000		0.000		-		0.000	0.000	0.600	-
EXPLOSIVES DEV. AND EVAL.	WR	NSWC/INDIAN HEAD DIV. : MD	0.000	1.424	Sep 2018	0.000		0.000		-		0.000	0.000	1.424	-
GUN PROPULSION AND EVAL.	WR	NSWC/INDIAN HEAD DIV. : MD	0.000	0.330	Sep 2018	0.000		0.000		-		0.000	0.000	0.330	-
ORDNANCE DEV. AND EVAL.	WR	NSWC/INDIAN HEAD DIV. : MD	0.000	0.551	Sep 2018	0.000		0.000		-		0.000	0.000	0.551	-
		Subtotal	0.000	4.825		0.000		0.000		-		0.000	0.000	4.825	N/A

	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	4.825		0.000		0.000		-		0.000	0.000	4.825	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603609N / *Conventional Munitions*	**Project (Number/Name)** 9999 / *Congressional Adds*

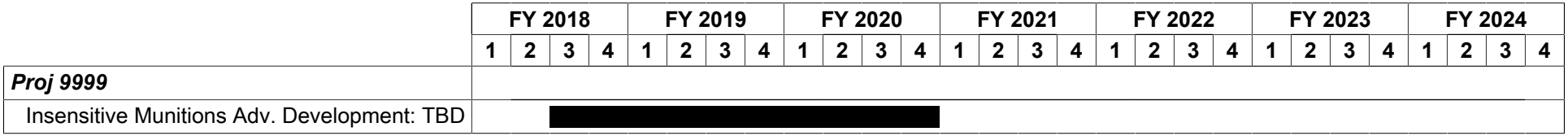


Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603609N / *Conventional Munitions*	**Project (Number/Name)** 9999 / *Congressional Adds*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 9999				
Insensitive Munitions Adv. Development: TBD	3	2018	4	2020

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy											Date: March 2019	
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0603635M *I Marine Corps Grnd Cmbt/Supt Sys*							
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
Total Program Element	25.445	0.771	0.000	86.464	-	86.464	127.998	64.564	99.849	102.951	Continuing	Continuing
1558: *Armored Reconnaissance Vehicle*	0.000	0.000	0.000	15.087	-	15.087	20.241	36.351	76.571	78.107	Continuing	Continuing
1964: *Anti-Armor Weapon System*	2.622	0.494	0.000	0.980	-	0.980	1.004	1.026	1.047	1.068	Continuing	Continuing
2614: *SMAW Follow-On*	22.823	0.277	0.000	0.500	-	0.500	0.500	0.500	0.500	2.000	Continuing	Continuing
7400: *Combat Capability Development Transition*	0.000	0.000	0.000	69.897	-	69.897	106.253	26.687	21.731	21.776	Continuing	Continuing

A. Mission Description and Budget Item Justification

This PE supports the demonstration and validation of Marine Corps Ground/Supporting Arms Systems for utilization in Marine Air-Ground Expeditionary Force amphibious operations. This program is funded under Demonstration & Validation because it develops and integrates hardware for experimental tests related to specific ground weapon systems.

B. Program Change Summary ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	1.428	1.828	1.855	-	1.855
Current President's Budget	0.771	0.000	86.464	-	86.464
Total Adjustments	-0.657	-1.828	84.609	-	84.609
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-1.828			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-0.146	0.000			
• SBIR/STTR Transfer	-0.002	0.000			
• Rate/Misc Adjustments	-0.001	0.000	84.609	-	84.609
• Congressional Directed Reductions Adjustments	-0.508	-	-	-	-

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0603635M *I Marine Corps Grnd Cmbt/Supt Sys*

Change Summary Explanation

The increase of $86.5M from FY19 to FY20 is attributed to the initiation/realignment of funds to Projects 1558 and 7400 to capture programs transitioning from S&T. These include the Armored Reconnaissance Vehicle, the Navy/Marine Expeditionary Ship Interdiction System (NMESIS), the 81 Millimeter (81mm) Advanced Capability Extended Range Mortar (ACERM), and the Sea Mob: Swarming Long Range Unmanned Surface Vehicles (USVs).

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603635M / *Marine Corps Grnd Cmbt/ Supt Sys*	Project (Number/Name) 1558 / *Armored Reconnaissance Vehicle*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
1558: *Armored Reconnaissance Vehicle*	0.000	0.000	0.000	15.087	-	15.087	20.241	36.351	76.571	78.107	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Note

Starting in FY20, the ARV program moved from BA07/PE 0206623M/Project 1557 to BA04/PE 0603635M/Project 1558 in order to align the program to a BA more appropriate for its current acquisition phase.

A. Mission Description and Budget Item Justification

The Armored Reconnaissance Vehicle (ARV) is a replacement for the legacy light armored vehicle in the Light Armored Reconnaissance (LAR) battalions within the Marine Divisions. ARV equipped LAR Battalions perform combined arms, all weather, sustained reconnaissance and security missions in support the Ground Combat Element. The ARV is the core
capability that underpins the next generation armored reconnaissance capability concept. The ARV will be a modern combat vehicle system, capable of fighting for information, that balances competing capability demands to sense, shoot, move, communicate and remain transportable as part of the naval expeditionary force.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Next Gen Armored Reconnaissance Vehicle (LAV replacement)	0.000	0.000	15.087	0.000	15.087
Articles:	-	-	2	-	2
FY 2019 Plans: N/A					
FY 2020 Base Plans: -Initiate cost sharing with the Office of Naval Research (ONR) for two science and technology (S&T) demonstrator platforms. These demonstrators will inform what technologies can be incorporated onto ARV and will be tested and evaluated with all knowledge and technology transferred to the program office upon completion. -Award two other transaction authority (OTA) agreements to industry to build prototype vehicles for competitive prototype testing. These prototypes will undergo performance and reliability, availability, and maintainability (RAM) testing. -Complete analysis of alternatives (AoA).					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603635M / *Marine Corps Grnd Cmbt/ Supt Sys*	**Project (Number/Name)** 1558 / *Armored Reconnaissance Vehicle*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
-Initiate request for proposal (RFP) development. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increase of $15.087M is due to the initiation of cost sharing with the ONR Science & Technology (S&T) technology demonstrators and OTA competitive prototype award.					
Accomplishments/Planned Programs Subtotals	0.000	0.000	15.087	0.000	15.087

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• RDTEN/0603640M/2223: *Marine Corps Advanced Tech. Demo.*	7.087	19.650	13.050	-	13.050	1.500	0.000	0.000	0.000	0.000	41.287
• RDTEN/0206623M/1557: *Enter Other Funding Description.*	0.000	1.500	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	1.500

Remarks

The Office of Naval Research (ONR) supports the next generation Armored Reconnaissance Vehicle (ARV) project utilizing the Future Naval Capability (FNC) process in order to develop and demonstrate viable and mature technologies befitting the program's envisioned operational employment. The funding listed under section C, PE 0603640M, Proj 2223 is allocated to support ARV.

D. Acquisition Strategy

The Armored Reconnaissance Vehicle (ARV) program will be focused on providing a base combat vehicle capable of meeting evolving threats via open systems architecture and sufficient size, weight, & power (SWAP) to accommodate future growth. Subsequent programs of record will expand the ARV capability to other mission roles and integrate capabilities
that emerge from other programs to further develop and enhance LAR operations.

E. Performance Metrics

Milestone Reviews

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603635M / *Marine Corps Grnd Cmbt/ Supt Sys*	**Project (Number/Name)** 1558 / *Armored Reconnaissance Vehicle*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
System Development & Demo.	C/FFP	ONR : Arlington, VA	0.000	0.000		0.000		4.700	Jan 2020	-		4.700	Continuing	Continuing	Continuing
Prototype Manufacturing	C/FFP	TBD : TBD	0.000	0.000		0.000		6.000	May 2020	-		6.000	Continuing	Continuing	Continuing
		Subtotal	0.000	0.000		0.000		10.700		-		10.700	Continuing	Continuing	N/A

Remarks

The Office of Naval Research (ONR) supports the next generation Armored Reconnaissance Vehicle (ARV) project utilizing the Future Naval Capability (FNC) process in order to develop and demonstrate viable and mature technologies befitting the program's envisioned operational employment. $4.7M is allocated to cost share in the development of technology demonstrators.

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Mgmt - LAV	MIPR	TACOM : Warren, MI	0.000	0.000		0.000		3.387	Dec 2019	-		3.387	Continuing	Continuing	Continuing
Analysis of Alternatives	MIPR	TACOM : Warren, MI	0.000	0.000		0.000		0.400	Nov 2019	-		0.400	0.000	0.400	-
		Subtotal	0.000	0.000		0.000		3.787		-		3.787	Continuing	Continuing	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
AOA Support Contract	C/FFP	HII-MDIS : Huntsville, AL	0.000	0.000		0.000		0.600	Nov 2019	-		0.600	0.000	0.600	-
		Subtotal	0.000	0.000		0.000		0.600		-		0.600	0.000	0.600	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	0.000		0.000		15.087		-		15.087	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603635M / *Marine Corps Grnd Cmbt/ Supt Sys*	**Project (Number/Name)** 1558 / *Armored Reconnaissance Vehicle*

ARV Program Plan FY19-24 10 Jan 2019.xlsx

Armored Reconnaissance Vehicle

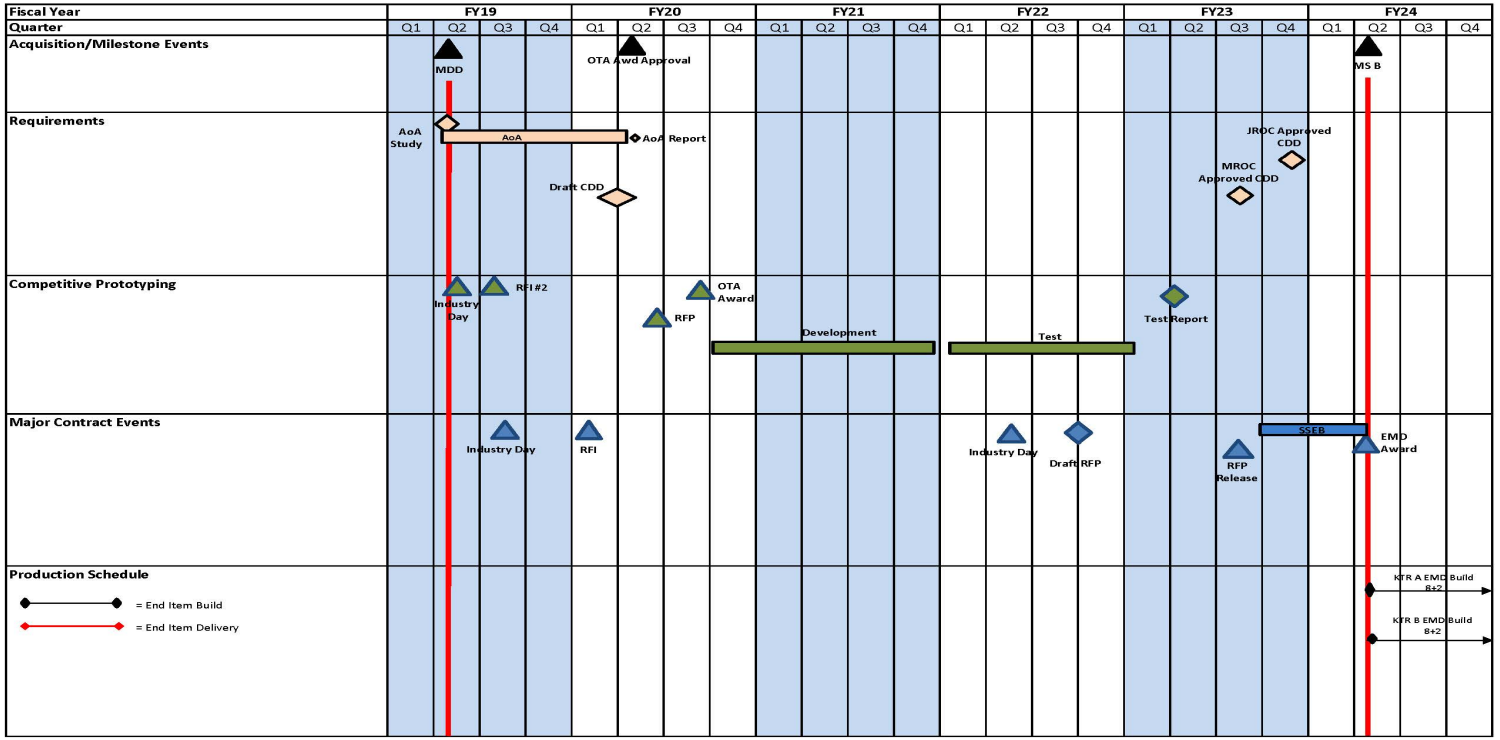


Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603635M / *Marine Corps Grnd Cmbt/ Supt Sys*	**Project (Number/Name)** 1558 / *Armored Reconnaissance Vehicle*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Project C1558 ARV				
Material Development Decision	2	2019	2	2019
ARV Analysis of Alternatives	2	2019	2	2020
OTA Competitve Prototype Award	3	2020	3	2020
Competitive Prototype Demo and Testing	4	2020	1	2023
RFP Release for EMD	3	2023	3	2023
Source Selection	3	2023	2	2024
MS B and EMD Contract Award	2	2024	2	2024

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy											Date: March 2019	
Appropriation/Budget Activity 1319 / 4					R-1 Program Element (Number/Name) PE 0603635M / *Marine Corps Grnd Cmbt/ Supt Sys*				Project (Number/Name) 1964 / *Anti-Armor Weapon System*			
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
1964: *Anti-Armor Weapon System*	2.622	0.494	0.000	0.980	-	0.980	1.004	1.026	1.047	1.068	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The M41A7 Saber system is the primary heavy, anti-armor launch system for the TOW Missile within the Ground Combat Element of the Marine Corps. The Anti-Armor Weapons System-Heavy (AAWS-H) program, working in concert with the U.S. Army, will develop and integrate technology improvements into the Improved Target Acquisition System (ITAS) to meet Increment II system requirements as jointly agreed. Improvements centered on integration of sight image enhancements were concluded.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Saber Battery Replacement	0.352	0.000	0.000	0.000	0.000
Articles:	-	-	-	-	-
FY 2019 Plans: Due to the Force Structure 2025 reduction in the Saber System, will discontinue efforts to seek out product improvement of the current Lithium Battery Box.					
FY 2020 Base Plans: N/A					
FY 2020 OCO Plans: N/A					
FY 2019 to FY 2020 Increase/Decrease Statement: N/A					
Title: Management Support	0.142	0.000	0.980	0.000	0.980
Articles:	-	-	-	-	-
FY 2019 Plans: N/A					
FY 2020 Base Plans:					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603635M / *Marine Corps Grnd Cmbt/ Supt Sys*	**Project (Number/Name)** 1964 / *Anti-Armor Weapon System*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
- Continue support for product improvement upgrades for the Saber System and Lithium Battery Box (LBB) to include engineering, logistics, and program office support. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** $980K increase from FY19 to FY20 allows for product improvement upgrades for the SABER System, engineering, logistics, and program office support to maintain the capability of the SABER System.					
Accomplishments/Planned Programs Subtotals	0.494	0.000	0.980	0.000	0.980

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• PMC/3017: *Anti-Armor Weapon Systems-Heavy*	49.569	51.232	60.501	-	60.501	40.358	42.445	33.283	33.951	Continuing	Continuing

Remarks

D. Acquisition Strategy

The Saber system is a joint program with the U.S. Army. Funding supports the development, integration, and qualification of incremental improvements to meet objective requirements and assesses emergent technologies unique to the USMC operational needs.

E. Performance Metrics

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603635M / *Marine Corps Grnd Cmbt/ Supt Sys*	Project (Number/Name) 1964 / *Anti-Armor Weapon System*	

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Anti Armor	WR	NSWC Indian Head : Indian Head, MD	2.622	0.000		0.000		0.000		-		0.000	0.000	2.622	-
Saber Battery Replacement	WR	NSWC Crane : Crane, IN	0.000	0.352	Feb 2018	0.000		0.000		-		0.000	0.000	0.352	-
		Subtotal	2.622	0.352		0.000		0.000		-		0.000	0.000	2.974	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Need Item Text	C/BA	Not Specified : Not Specified	0.000	0.000		0.000		0.000		-		0.000	0.000	0.000	-
Management Support	C/FFP	MCSC Quantico : MCSC, Quantico, VA	0.000	0.142	Mar 2018	0.000		0.980	Mar 2020	-		0.980	Continuing	Continuing	Continuing
		Subtotal	0.000	0.142		0.000		0.980		-		0.980	Continuing	Continuing	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	2.622	0.494		0.000		0.980		-		0.980	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603635M / *Marine Corps Grnd Cmbt/ Supt Sys*	**Project (Number/Name)** 1964 / *Anti-Armor Weapon System*

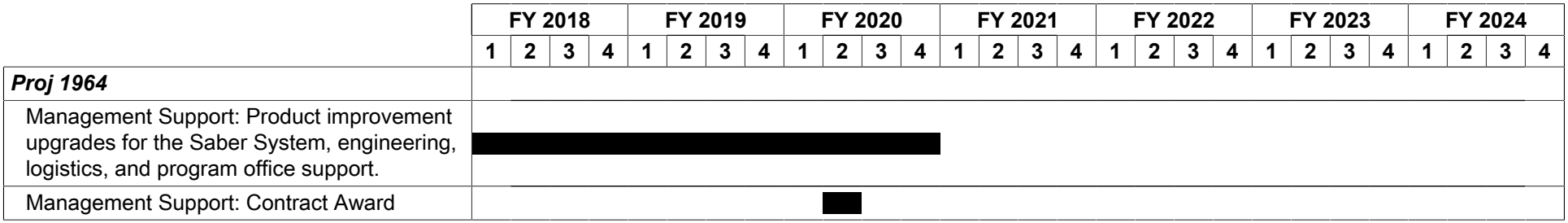


Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603635M / *Marine Corps Grnd Cmbt/ Supt Sys*	**Project (Number/Name)** 1964 / *Anti-Armor Weapon System*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 1964				
Management Support: Product improvement upgrades for the Saber System, engineering, logistics, and program office support.	1	2018	4	2020
Management Support: Contract Award	2	2020	2	2020

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603635M / *Marine Corps Grnd Cmbt/ Supt Sys*	Project (Number/Name) 2614 / *SMAW Follow-On*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
2614: *SMAW Follow-On*	22.823	0.277	0.000	0.500	-	0.500	0.500	0.500	0.500	2.000	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Follow on to Shoulder-Launched Multipurpose Assault Weapon (SMAW) (FOTS):
The solution to the Follow on to SMAW (FOTS) capability requirement is a Family of Marine-portable Rocket Systems. This Family of Systems is composed of separate lightweight, short range, fire-and-forget weapons. Marine Expeditionary Forces will employ the Family of Systems across the spectrum of conflict, under all environmental conditions, to neutralize or destroy a variety of ground targets including personnel, thin-skinned vehicles, and positions. The Family of Systems include various systems, such as SMAW Mod 2 and M3A1 Multi-purpose Anti-Armor Weapon System (MAAWS), with future capability for expansion to additional systems. SMAW Mod 2 consists of a new launcher with an integrated laser range finder and thermal sight. MAAWS consists of a new launcher and integrated fire control system. Future systems and capabilities include similar Marine-portable fire-and-forget shoulder-launched rocket systems with anti-armor, anti-personnel, anti-material, and assault capabilities.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Engineer and technical support.	0.277	0.000	0.500	0.000	0.500
Articles:	-	-	-	-	-

FY 2019 Plans:
N/A

FY 2020 Base Plans:
-Complete MAAWS qualification, performance testing and Marine-specific tests include E3 and Navy/Marine Corps transportation requirements unique to the Marine Corps. Other Marine-unique tests will include support equipment such as weapon and ammunition carriage.
-Continue alternate sight assemblies for MAAWS fire control system improvement

FY 2020 OCO Plans:
N/A

FY 2019 to FY 2020 Increase/Decrease Statement:
Increase of $500K from FY19 to FY20 will fund development of support equipment such as weapon and ammunition carriage in support of achieving Initial Operating Capability (IOC). Increase will also support

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603635M / *Marine Corps Grnd Cmbt/ Supt Sys*	**Project (Number/Name)** 2614 / *SMAW Follow-On*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
development of fire control system improvements to include night vision, thermal, magnification capabilities. Increase in FY20 is in coordination with delivery/fielding schedule.					
Accomplishments/Planned Programs Subtotals	0.277	0.000	0.500	0.000	0.500

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• PMC/3016: *Multi-role Anti-Armor Anti-personnel Weapon System (MAAWS)*	19.053	13.760	21.981	-	21.981	22.002	22.020	22.031	22.308	Continuing	Continuing

Remarks

D. Acquisition Strategy

M3A1 Multi-purpose Anti-Armor Weapon System (MAAWS) is being procured via the Army's contract. USMC changes and additional testing are conducted via Army and Navy Labs. In addition, Marine-specific tests include E3 and Navy/Marine Corps transportation requirements unique the Marine Corps.

E. Performance Metrics

Milestone reviews and technical reviews.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603635M / *Marine Corps Grnd Cmbt/ Supt Sys*	Project (Number/Name) 2614 / *SMAW Follow-On*	

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Prior Year Cumulative Funding	Various	Various : Various	16.300	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Engineering & Technical Support	WR	NSWC Indian Head : Indian Head, VA	0.986	0.000		0.000		0.500	Jan 2020	-		0.500	Continuing	Continuing	Continuing
Engineering & Technical Support	WR	NSWC Dahlgren : Dahlgren, VA	0.122	0.277	Jan 2018	0.000		0.000		-		0.000	0.000	0.399	-
		Subtotal	17.408	0.277		0.000		0.500		-		0.500	Continuing	Continuing	N/A

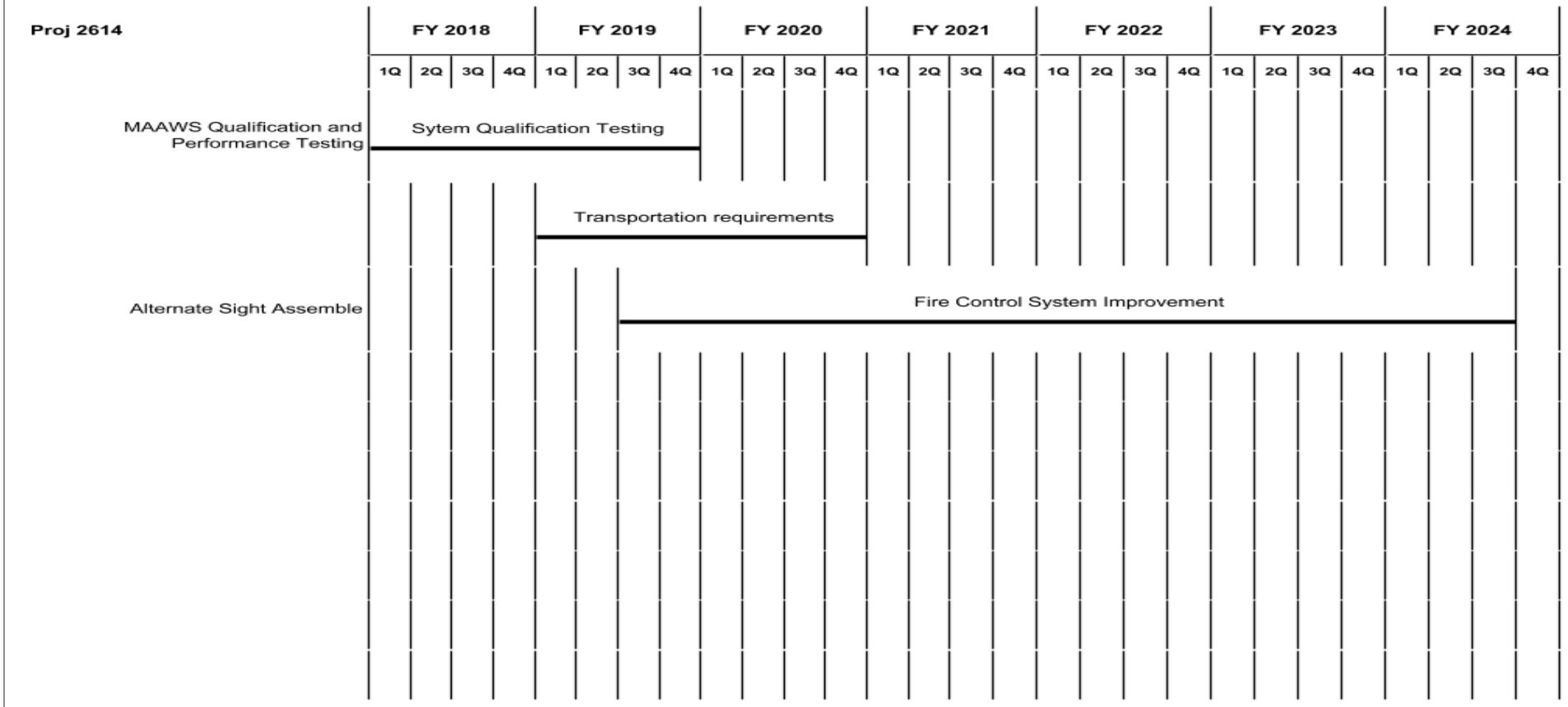
Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Prior year cumulative funding	Various	Various : Various	5.415	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
		Subtotal	5.415	0.000		0.000		0.000		-		0.000	Continuing	Continuing	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	22.823	0.277		0.000		0.500		-		0.500	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603635M / *Marine Corps Grnd Cmbt/ Supt Sys*	**Project (Number/Name)** 2614 / *SMAW Follow-On*



2020OSD - 0603635M - 2614

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603635M / *Marine Corps Grnd Cmbt/ Supt Sys*	**Project (Number/Name)** 2614 / *SMAW Follow-On*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 2614				
MAAWS Qualification and Performance Testing: Sytem Qualification Testing	1	2018	4	2019
MAAWS Qualification and Performance Testing: Transportation requirements	1	2019	4	2020
Alternate Sight Assemble: Optics Improvements	3	2019	3	2024

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603635M / *Marine Corps Grnd Cmbt/ Supt Sys*	Project (Number/Name) 7400 / *Combat Capability Development Transition*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
7400: *Combat Capability Development Transition*	0.000	0.000	0.000	69.897	-	69.897	106.253	26.687	21.731	21.776	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Note

Starting in FY20, the NMESIS and ROGUE efforts moved from BA07/PE 0206623M/Project 2928 to BA04/PE 0603635M/Project 7400 in order to align the program to a BA more appropriate for its current acquisition phase. These efforts are a continuation of the HIMARS Anti-ship Capabilities initiated in FY19 within Project 2928, and are now referred to as NMESIS and ROGUE respectively.

A. Mission Description and Budget Item Justification

The Navy/Marine Expeditionary Ship Interdiction System (NMESIS) is an RDT&E effort to develop long term and short term solutions for an Anti-Ship Missile (ASM) to be integrated within a High Mobility Artillery Rocket System (HIMARS) Battalion and sustain a Joint Force military advantage. This capability is in support of the Marine Corps Expeditionary Advanced Base Operations (EABO) and the National Defense Strategy (NDS) approach to build a more lethal Joint Force. This capability provides the Marine Corps layered missile defense with disruptive capability, influencing significant lead lines of communication world-wide. NMESIS will prototype a USMC system while leveraging other Service-developed missiles to provide a ground based anti-access/area denial, anti-ship capability. ASM capabilities will be further developed through advanced component improvements and launcher integration into a complex, prototype and unmanned ground vehicle system. The prototyping effort will include the development, design, build, and initial testing of a Remotely Operated Ground Unit Expeditionary (ROGUE) Fires vehicle. ROGUE-Fires is an unmanned ground vehicle based system on a Joint Light Tactical Vehicle (JLTV) chassis, capable of mounting a wide range of missile systems for dynamic force employment and supports the National Defense Strategy (NDS) objective to evolve innovative operational concepts. NMESIS will provide strategic deterrence in the global operational environment through layered missile capability and dynamic force employment.

The Sea Mob: Swarming Long Range Unmanned Surface Vehicles (USVs) is a developmental project with the purpose of testing and operational development within the Marine Corps Warfighting Laboratory which will capitalize on extending the range of surface and subsurface reconnaissance in addition to limited strike capability utilizing swarm technology. Sea Mob unmanned surface vehicle will provide a platform for the launch of Organic Precision Fires (OPF) to address sea and land targets, and the launch and recovery of smaller unmanned surface craft for reconnaissance and unmanned underwater vehicles for hydrographic survey/mine detection.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Navy/Marine Expeditionary Ship Interdiction System (NMESIS)	0.000	0.000	58.697	0.000	58.697
Articles:	-	-	-	-	-
FY 2019 Plans:					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603635M / *Marine Corps Grnd Cmbt/ Supt Sys*	**Project (Number/Name)** 7400 / *Combat Capability Development Transition*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
N/A ***FY 2020 Base Plans:*** NMESIS (Long Range Precision Fires, Sea Control) Complete integration of an existing ASM capability onto USMC ground platforms. Activities include: - Other Transaction Authority (OTA) #1 Phase II, integrate ASM concept 1 on a M142 - Other Transaction Authority (OTA) #2 Phase II, integrate ASM concept 2 on a ROGUE vehicle - Build ROGUE-Fires platoon set and test ASM Command Control - Build ROGUE vehicles and conduct off road testing - Conduct user evaluations with vehicle - Test C2 kill chain with various sensors and Naval platforms and AFATDS - Develop TTPs with Marine operators - Conduct initial firing tests of NMESIS ASM capability and purchase missiles in support of integration and large scale test exercise - Purchase inert and live missiles for testing and live fire events - Conduct delta qualification testing on vehicles and missile systems - Conduct inert ballistic missile firing tests - Conduct off road testing with vehicle and launcher systems ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** The budget request for NMESIS increased by $36.850M from FY19 to FY20 in support of the development and integration ASM and Unmanned Ground Vehicle (UGV) capability systems. FY20 initiates a large scale integration exercise of an inert missile that will conclude with a live fire missile test with Navy/Marine Corps in support of Marine Corps Operating Concept and Expeditionary Advanced Base Operations (EABO) concepts.					
Title: Sea Mob Amphibious Reconnaissance Capability	0.000	0.000	11.200	0.000	11.200
Articles:	-	-	-	-	-
FY 2019 Plans: N/A ***FY 2020 Base Plans:***					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603635M / *Marine Corps Grnd Cmbt/ Supt Sys*	**Project (Number/Name)** 7400 / *Combat Capability Development Transition*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
The increase of $11.200M RDT&E from FY19 to FY20 was a result of an emerging material solution to a capability gap as identified by HQMC and is currently a MCWL effort at TRL 6. Sea Mob (also known as Unmanned Surface Vessel (USV)) will be transitioned from S&T in FY20 as a mid-tier acquisition program; continued System/Subsystem development, integration, and Test and Evaluation will be conducted by USMC commencing FY20. FY20 Operational testing will include the following objectives: 1. Procurement of 12 Organic Precision Fire (OPF) Launchers with rounds for 3 previously purchased USVs. 2. Further integration of OPF and USV. 3. Qualification of capabilities for embarkation aboard amphibious shipping. 4. Demonstration of the capability from amphibious shipping. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** The increase of $11.2M from FY2019 to FY2020 supports initial developmental testing and experimentation for Swarming Long Range USVs technology maturity.					
Accomplishments/Planned Programs Subtotals	0.000	0.000	69.897	0.000	69.897

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• RDTEN/0206623M/2928: *Exp Indirect Fire Gen Supt Wpn Sys*	0.000	21.847	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	21.847
• PMC/0206211M/6518: *Amphibious Reconnaissance Capability*	0.000	0.000	0.000	-	0.000	0.000	25.549	41.570	34.270	Continuing	Continuing

Remarks

1) NMESIS program moved from BA07/PE 0206623M/Project 2928 to BA04/PE 0603635M/Project 7400 in order to align the program to a BA more appropriate for its current acquisition phase.
2) FY22 initiates SEA MOB Procurement funding line within LI 6518.

D. Acquisition Strategy

NMESIS RDT&E efforts for USMC HIMARS support Joint Force 2025 guidance, the National Defense Strategy and the Marine Corps Operating Concept to employ HIMARS as a Sea Control capability from distributed locations to include naval platforms or surface connectors to support distributed maneuver. Support the continued

development of long-range precision fire capabilities from austere and expeditionary bases and to improve the range and capacity to provide fires supporting multiple entry points from the sea. Development will consist of the design integration and support from a combination of Army/Navy labs and multiple DOD contractors.

The Sea Mob effort supports acquisition of OPF launchers with rounds for USVs, further integration of OPF and Unmanned Vehicles, qualification of the capabilities for embarkation aboard amphibious shipping, and demonstration of the capability from amphibious shipping. Specific objectives are pre-deployment training and deployment of the 3 Unmanned Surface Vehicles (USVs) with Organic Precision Fire (OPF) and Unmanned Systems and acquisition of 5 USVs for a Marine Expeditionary Force (MEF) to further develop Expeditionary Advance Base CONOPS.

E. Performance Metrics

Milestone Reviews

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603635M / *Marine Corps Grnd Cmbt/ Supt Sys*	**Project (Number/Name)** 7400 / *Combat Capability Development Transition*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
NMESIS ASM OTA	C/BOA	MCSC : Quantico, VA	0.000	0.000		0.000		44.100	Dec 2019	-		44.100	Continuing	Continuing	Continuing
NMESIS ROGUE-Fires Development	MIPR	DOTC : Picatinny, NJ	0.000	0.000		0.000		2.100	Dec 2019	-		2.100	Continuing	Continuing	Continuing
Sea Mob Swarming Long Range USVs	C/FFP	TBD : TBD	0.000	0.000		0.000		10.200	Jan 2020	-		10.200	0.000	10.200	-
		Subtotal	0.000	0.000		0.000		56.400		-		56.400	Continuing	Continuing	N/A

Remarks

NMESIS (Long Range Precision Fires, Sea Control) is defined by the product development in support of Anti-Ship Missile (ASM) Capabilities and the Unmanned Ground Vehicle (UGV), ROGUE-Fires. NMESIS is a conjoined development and integration of both efforts.

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
NMESIS Engineering - ASM	WR	NSWC : China Lake, CA	0.000	0.000		0.000		1.500	Dec 2019	-		1.500	Continuing	Continuing	Continuing
NMESIS Safety	WR	NSWC : Indian Head, MD	0.000	0.000		0.000		0.500	Dec 2019	-		0.500	Continuing	Continuing	Continuing
NMESIS Engineering - ROGUE	WR	NSWC : Dahlgren, VA	0.000	0.000		0.000		1.500	Dec 2019	-		1.500	Continuing	Continuing	Continuing
NMESIS AFATDS Integration	MIPR	PFRMS : AMRDEC, AL	0.000	0.000		0.000		0.500	Dec 2019	-		0.500	Continuing	Continuing	Continuing
		Subtotal	0.000	0.000		0.000		4.000		-		4.000	Continuing	Continuing	N/A

Remarks

NMESIS (Long Range Precision Fires, Sea Control) engineering effort will support weapons sled development and vehicle integration to include system and requirements development and evaluation activities. Evaluation activities include booster vehicle test and system demonstration at Point Mugu.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603635M / *Marine Corps Grnd Cmbt/ Supt Sys*	Project (Number/Name) 7400 / *Combat Capability Development Transition*	

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
NMESIS ASM MIssile Testing	WR	NAS : Point Mugu, CA	0.000	0.000		0.000		7.400	Apr 2020	-		7.400	Continuing	Continuing	Continuing
NMESIS Vehicle/Booster Testing	WR	NSWC : China Lake, CA	0.000	0.000		0.000		0.950	Oct 2019	-		0.950	Continuing	Continuing	Continuing
Sea Mob Long Range USVs Testing	Various	Various : Various	0.000	0.000		0.000		1.000	Jul 2020	-		1.000	0.000	1.000	-
		Subtotal	0.000	0.000		0.000		9.350		-		9.350	Continuing	Continuing	N/A

Remarks

NMESIS (Long Range Precision Fires, Sea Control, Ground Based Anti-Ship Missile) is defined in FY19 and FY20 by testing in support of Anti-Ship Missile (ASM) Capabilities and the Unmanned Ground Vehicle (ROGUE- Fires). NMESIS is testing the integration of both efforts. FY19 will test C2 kill chain through testing with Naval and Marine Corps units. FY20 will test the integration of an inert missile and conclude with a live fire missile test with USN.

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
NMESIS Travel	Various	Various : Various	0.000	0.000		0.000		0.147	Oct 2019	-		0.147	Continuing	Continuing	Continuing
		Subtotal	0.000	0.000		0.000		0.147		-		0.147	Continuing	Continuing	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	0.000		0.000		69.897		-		69.897	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603635M / *Marine Corps Grnd Cmbt/ Supt Sys*	**Project (Number/Name)** 7400 / *Combat Capability Development Transition*

SEA MOB SCHEDULE

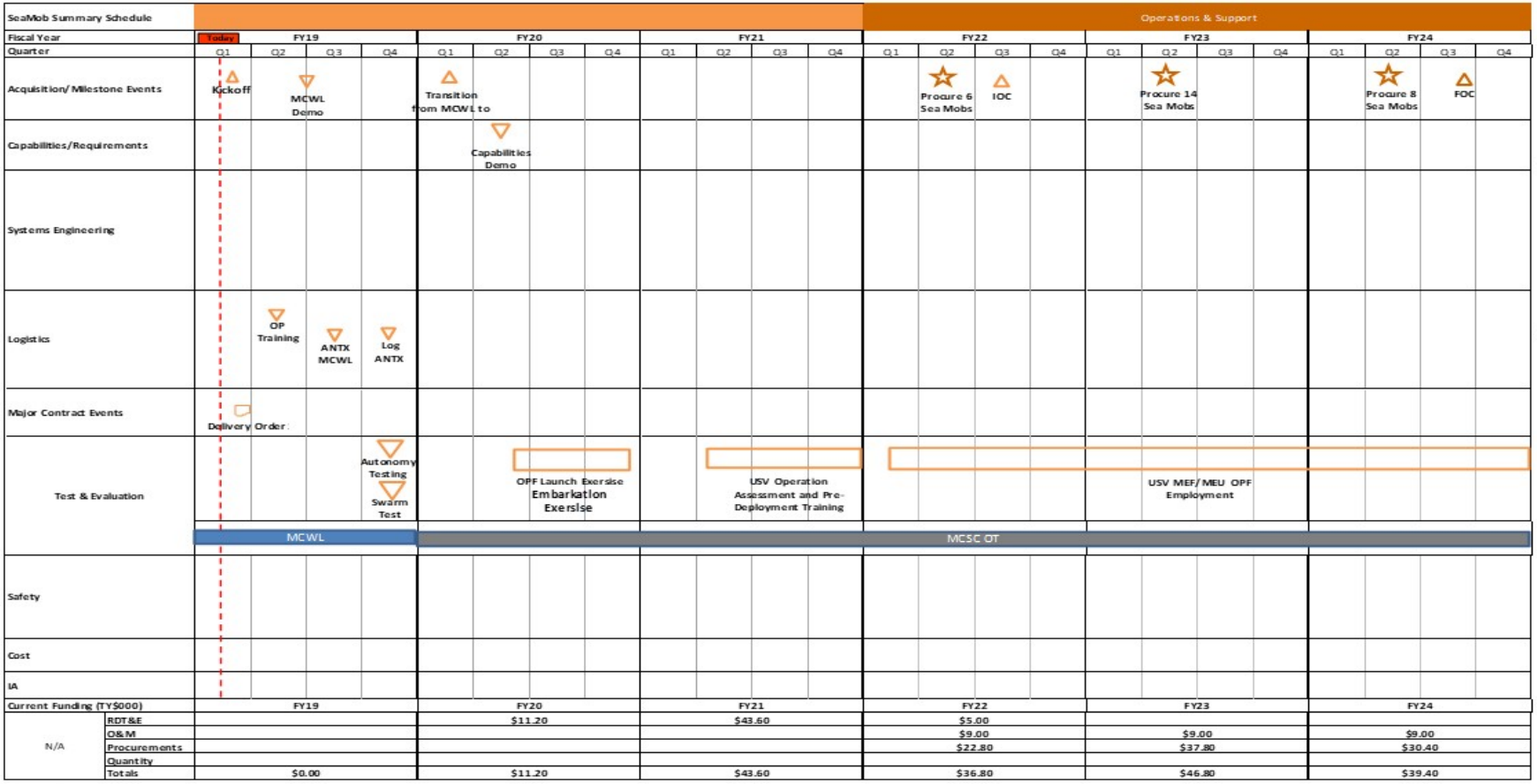
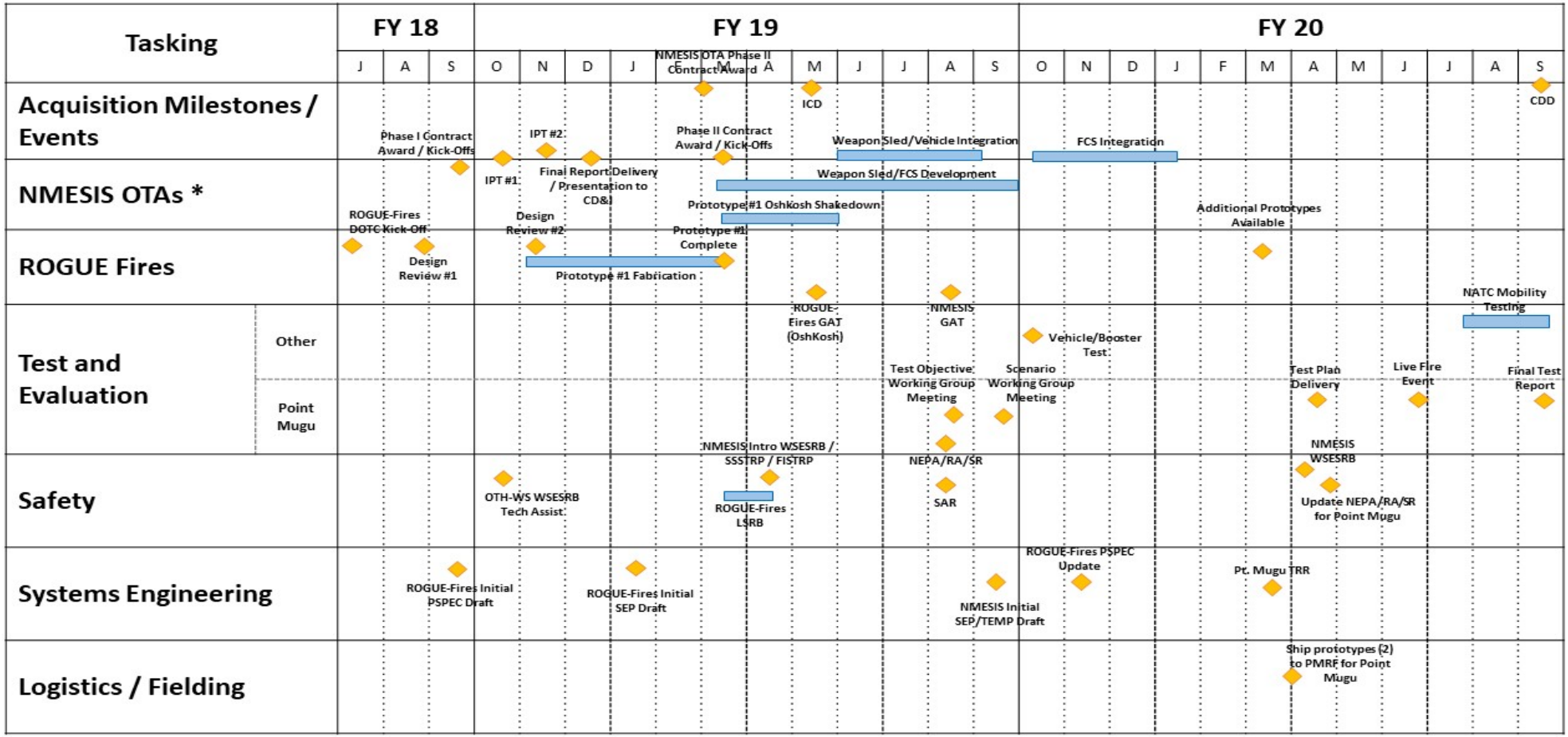


Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603635M / *Marine Corps Grnd Cmbt/ Supt Sys*	**Project (Number/Name)** 7400 / *Combat Capability Development Transition*

NMESIS SCHEDULE



*NMESIS OTA schedule is subject to change and is specific to vendor awarded on Phase II OTA

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603635M / *Marine Corps Grnd Cmbt/ Supt Sys*	**Project (Number/Name)** 7400 / *Combat Capability Development Transition*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 7400				
NMESIS Long Range Precision Fire, Sea Control: NMESIS OTA Milestone Payment - FCS Integration	1	2020	2	2020
NMESIS Long Range Precision Fire, Sea Control: MCASM Missile Test & Eval Exercise	4	2020	4	2020
NMESIS Long Range Precision Fire, Sea Control: NMESIS Vehicle/Booster Testing	1	2020	1	2020
SEA MOB: Swarming Long Range USVs: MCWL Test and Evaluation	1	2019	4	2019
SEA MOB: Swarming Long Range USVs: Organic Precision Fires Launch Exercise	2	2020	4	2020
SEA MOB: Swarming Long Range USVs: Operational Testing	2	2021	4	2021
SEA MOB: Swarming Long Range USVs: Procurement Qty 6	2	2022	2	2022
SEA MOB: Swarming Long Range USVs: IOC	3	2022	3	2022
SEA MOB: Swarming Long Range USVs: Procurement Qty 14	2	2023	2	2023

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy											Date: March 2019	
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0603654N *I JT Service Explosive Ordn Dev*							
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
Total Program Element	631.450	77.409	61.757	33.478	14.178	47.656	62.984	56.524	61.191	62.414	Continuing	Continuing
0377: *JT Service Expl Ord Disp System*	379.039	13.046	7.839	9.780	-	9.780	11.247	9.882	11.377	11.604	Continuing	Continuing
1317: *EOD Diving System*	113.915	5.093	4.357	2.533	-	2.533	5.652	4.644	4.708	4.800	Continuing	Continuing
3177: *Joint Counter Radio-Controlled IED Elec Warfare*	13.194	43.652	27.625	5.044	14.178	19.222	29.858	26.316	26.889	27.430	Continuing	Continuing
4023: *VSW MCM/Force Protection UUV*	125.302	15.618	16.936	16.121	-	16.121	16.227	15.682	18.217	18.580	Continuing	Continuing
9999: *Congressional Adds*	0.000	0.000	5.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	5.000

A. Mission Description and Budget Item Justification

This is a Joint Service Program.

This program provides for the development of Explosive Ordnance Disposal tools and equipment aimed at meeting National Defense Strategy's guidance to build a more lethal force. The responsibility is assigned to the Navy as single service manager, by Department of Defense Directive 5160.62 of 15 May, 2017, for management of the Joint Service Explosive Ordnance Disposal Research and Development Program.

Proliferation of sophisticated types of foreign and domestic ordnance and Improvised Explosive Devices necessitate a continuing development program to provide Explosive Ordnance Disposal personnel of all military services with the tools and equipment designed for modularity, scalability, and flexibility, while maintaining readiness to respond to contingencies and ensure long-term warfighting readiness.

This program also provides life support related equipment necessary to support the performance of Navy Explosive Ordnance Disposal tasks underwater. This equipment must have inherently low acoustic and magnetic signatures in order to allow the Explosive Ordnance Disposal technician to safely approach, render-safe and dispose of sea mines and other underwater ordnance.

This program also provides for the research and development of Electronic Warfare (EW) systems, equipment, procedures, and tactical aids for all military services against the threat posed by Radio-Controlled Improvised Explosive Devices (RCIEDs) and to prevent initiation of RCIEDs across the spectrum of Joint military operations. Utilize Joint requirements to provide a system of systems approach for a suite of equipment for mounted, dismounted, and fixed site operations; provide a Joint Counter RCIED EW (CREW) development of equipment, procedures, and tactical aids to make rapid improvements to performance, supportability and affordability, while maintaining pace with evolving global threat.

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0603654N *I JT Service Explosive Ordn Dev*

B. Program Change Summary ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	53.367	43.148	51.725	-	51.725
Current President's Budget	77.409	61.757	33.478	14.178	47.656
Total Adjustments	24.042	18.609	-18.247	14.178	-4.069
• Congressional General Reductions	-	-0.291			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	5.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-2.100	0.000			
• Program Adjustments	29.700	27.800	-17.378	14.178	-3.200
• Rate/Misc Adjustments	0.000	-13.900	-0.869	-	-0.869
• Congressional General Reductions Adjustments	-0.058	-	-	-	-
• Congressional Directed Reductions Adjustments	-3.500	-	-	-	-

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2018	FY 2019
Project: 9999: *Congressional Adds*		
Congressional Add: *Breathing Apparatus for EOD Divers*	0.000	5.000
Congressional Add Subtotals for Project: 9999	0.000	5.000
Congressional Add Totals for all Projects	0.000	5.000

Change Summary Explanation

FY2020: Other Program Adjustments Addition, $14.178 million for enduring operations in base.

FY2020: Other Rate/Misc Adjustments(MISC), funding request was reduced by $17.378 million to account for the availability of prior year under execution and $869K for miscellaneous adjustments.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603654N / *JT Service Explosive Ordn Dev*	Project (Number/Name) 0377 / *JT Service Expl Ord Disp System*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
0377: *JT Service Expl Ord Disp System*	379.039	13.046	7.839	9.780	-	9.780	11.247	9.882	11.377	11.604	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Program Element (PE) Project (0377) provides funding for the detailed design, development, risk mitigation, issue resolution, integrations, test, test equipment, simulations and post-deployment improvements of specialized equipment, tools and assessment of accessories that expand range of military operations required to support DoD's only Joint Explosive Ordnance Disposal (EOD) programs.

EOD exclusively executes world-wide missions for detection/location, identification, render-safe, recovery, field and laboratory evaluation, and disposal of hazards and unexploded ordnance (UXO) that is a threat to military operations, installations, personnel, or material. UXO includes foreign and domestic, both conventional and non-conventional, including Improvised Explosive Devices (IEDs); hazards includes fuels weapons and weapons of mass destruction devices using radiological and biological means with or without explosives.

The responsibility is assigned to the Navy as single service manager, by Department of Defense Directive 5160.62 of 3 June 2011, for management of the Joint Service Explosive Ordnance Disposal Research and Development Program. EOD programs are designed to reduce the EOD operator's exposure to explosive hazards or limit the risk to an acceptable level. EOD operations range from hand entry of explosive devices by EOD technicians to robotic actions and sensing capabilities that provide a safe distance of the explosive hazard at a greatly reduced cost to trained and experienced EOD operators.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: JOINT EXPLOSIVE ORDNANCE DISPOSAL DECISION SUPPORT SYSTEM (JEOD DSS)	2.296	1.258	4.900	0.000	4.900
Articles:	-	-	-	-	-
FY 2019 Plans: Continue the EOD Warfighter defined improvements to the JEOD DSS Common Controller Portals and Mobile Field Kit software. Complete migrations from Navy Enterprise Data Center to Cloud Support Services Platforms. Continue development of Mobile applications specific to EOD.					
FY 2020 Base Plans: Develop EOD specific mobile applications and design interfaces to existing EOD approved mobile software applications. Finalize migration from Navy Enterprise Data Center to Cloud support services platforms.					
FY 2020 OCO Plans:					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** FY 2019 to FY 2020 increase ($+3.642M) reflects funding of software development efforts required for software mobile applications.					
Title: ANALYSIS OF ALTERNATIVES/ EOD MODERNIZATION	0.000	0.337	1.464	0.000	1.464
Articles:	-	-	-	-	-
FY 2019 Plans: Conduct evaluation of technology readiness for sub-surface Ordnance and Improvised Explosive devices Locators, and for Detect and Locate requirements in support of Joint EOD endorsed Statement of Operational Needs.					
FY 2020 Base Plans: Implement Analysis of Alternatives (AOA) to assess warfighter identified capability gaps, review the operational environments including threats and scenarios, alternative development approaches, operational concept development for technology maturity and insertion readiness. Conduct evaluation of technology readiness for Joint EOD endorsed Statement of Operational Needs.					
FY 2020 OCO Plans: N/A					
FY 2019 to FY 2020 Increase/Decrease Statement: Increase from FY2019 to FY2020 ($+1.127M) for development of Diagnostics, Neutralization and render safe tools and equipment in response to statement of operational needs.					
Title: EOD ROBOTICS	9.430	6.244	3.416	0.000	3.416
Articles:	-	-	-	-	-
FY 2019 Plans: Complete technical insertion plans and engineering improvements plans for AEODRS. Finalize development configuration AEODRS Production Configuration for Low Rate Initial Production and user suitability assessments.					
FY 2020 Base Plans:					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Continued development for EOD specific modules and tech insertion for technology enhancements and Robotics continuous Improvements. Prototyping efforts for AEODRS will continue and will inform planned Critical Design Review. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** FY 2019 to FY 2020 decrease ($-2.828M) due to AEODRS INC 2 RFP release on hold, based on Revalidation of requirements and evaluation of corresponding material solution and acquisition approach.					
Title: TCM AN/PLT-XXX SYSTEMS ***Articles:*** ***FY 2019 Plans:*** Technical adjustment to Project 3177. ***FY 2020 Base Plans:*** N/A ***FY 2020 OCO Plans:*** N/A	1.320 -	0.000 -	0.000 -	0.000 -	0.000 -
Accomplishments/Planned Programs Subtotals	13.046	7.839	9.780	0.000	9.780

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• OPN/5509(a): *EOD Equipment (VN075)*	0.000	2.500	9.237	-	9.237	5.579	5.771	6.039	6.262	0.000	63.626

Remarks

D. Acquisition Strategy

Joint Service acquisition strategies utilize an evolutionary open architecture and modular strategy for rapid acquisition of mature technology for the user. The evolutionary approach delivers baseline capability and subsequent increments, recognizing up front the need for future capability improvements. Each increment is a militarily useful and supportable operational capability that can be developed, produced, deployed, and sustained. The evolutionary open architecture and modular strategy allows for rapid block upgrades, pre-planned product improvements, new accessories that expand range of military operations that provide a significant increase

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
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in operational capability and improvements at the modular level and encourages competition and second sources to lower life cycle costs. Once deployed, the upgrades can be developed, tested and deployed at the modular level and new capabilities can be delivered without having to return the entire tool (e.g. robot) to a depot for system level conversion. System Test bed and modeling and simulation can verify module system level compliance in a laboratory, greatly reducing the cost to conduct expensive range testing. EOD Modernization increases technology advances for more capable diagnostics and render-safe systems and EOD tools. Analysis of Alternatives (AOA) studies are conducted prior to the initiation of new subprojects. The AOA addresses and emphasizes acquisition strategies of the most cost-effective solution over the subprojects' life-cycle. Contracting for RDT&E, if required, is always competitive and when feasible, production options are included.

E. Performance Metrics

Implemented 6 Engineering Changes which addressed 121 Functional Change Requests and 136 Continuous Improvement Change Requests to the Joint Service EOD Decision Support System (DSS). Delivered 1850 DSS Mobile Field Kit (MFK) Software DVDs, 1814 Unclassified Automated EOD Publication System (AEODPS) and 1834 Secret AEODPS DVDs to Joint Service EOD. Developed and delivered DSS Unclassified Portal and subset of software mobile apps to be hosted via DISA MilCloud with 3224 current Joint Service EOD registered users.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
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Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Primary Hardware Development	WR	NSWCIHEODTD : Indian Head, MD	193.409	2.646	Nov 2017	0.000	Nov 2018	3.067	Nov 2019	-		3.067	Continuing	Continuing	Continuing
Primary Hardware Development	C/FFP	Northrop Grumman : Herndon, VA	12.544	2.600	Nov 2017	0.000	Nov 2018	0.000	Nov 2019	-		0.000	Continuing	Continuing	Continuing
Primary Hardware Development	C/FFP	John Hopkins, MD : Laurel, MD	0.000	5.700	Nov 2017	4.847	Nov 2018	0.000	Nov 2019	-		0.000	0.000	10.547	-
ILS	WR	NSWCIHEODTD : Indian Head, MD	49.090	0.400	Nov 2017	0.300	Nov 2018	0.400	Nov 2019	-		0.400	Continuing	Continuing	Continuing
Primary Hardware Development	C/FPIF	TBD : TBD	0.000	0.000		0.000	Nov 2018	2.088	Nov 2019	-		2.088	0.000	2.088	-
Primary Software Development	WR	ARL/Army : Aberdeen Proving Ground	0.000	0.000		1.000	Nov 2018	2.500	Nov 2019	-		2.500	0.000	3.500	-
		Subtotal	255.043	11.346		6.147		8.055		-		8.055	Continuing	Continuing	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management Support	C/CPFF	Peraton : Herndon, VA	8.308	0.375	Nov 2017	0.367	Nov 2018	0.400	Nov 2019	-		0.400	Continuing	Continuing	Continuing
		Subtotal	8.308	0.375		0.367		0.400		-		0.400	Continuing	Continuing	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Developmental Test & Evaluation	WR	NSWCIHEODTD : Indian Head, MD	77.319	0.900	Nov 2017	0.900	Dec 2018	0.900	Nov 2019	-		0.900	Continuing	Continuing	Continuing
Operation Test & Evaluation	WR	NSWCIHEODTD : Indian Head, MD	11.508	0.025	Nov 2017	0.025	Nov 2018	0.025	Nov 2019	-		0.025	Continuing	Continuing	Continuing

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
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Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
		Subtotal	88.827	0.925		0.925		0.925		-		0.925	Continuing	Continuing	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Managementt Support	WR	NSWCIHEODTD : Indian Head, MD	10.409	0.400	Nov 2017	0.400	Nov 2018	0.400	Nov 2019	-		0.400	Continuing	Continuing	Continuing
Miscellaneous	WR	NSWCIHEODTD : Indian Head, MD	16.452	0.000		0.000	Nov 2018	0.000		-		0.000	Continuing	Continuing	Continuing
		Subtotal	26.861	0.400		0.400		0.400		-		0.400	Continuing	Continuing	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	379.039	13.046		7.839		9.780		-		9.780	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603654N / *JT Service Explosive Ordn Dev*	**Project (Number/Name)** 0377 / *JT Service Expl Ord Disp System*

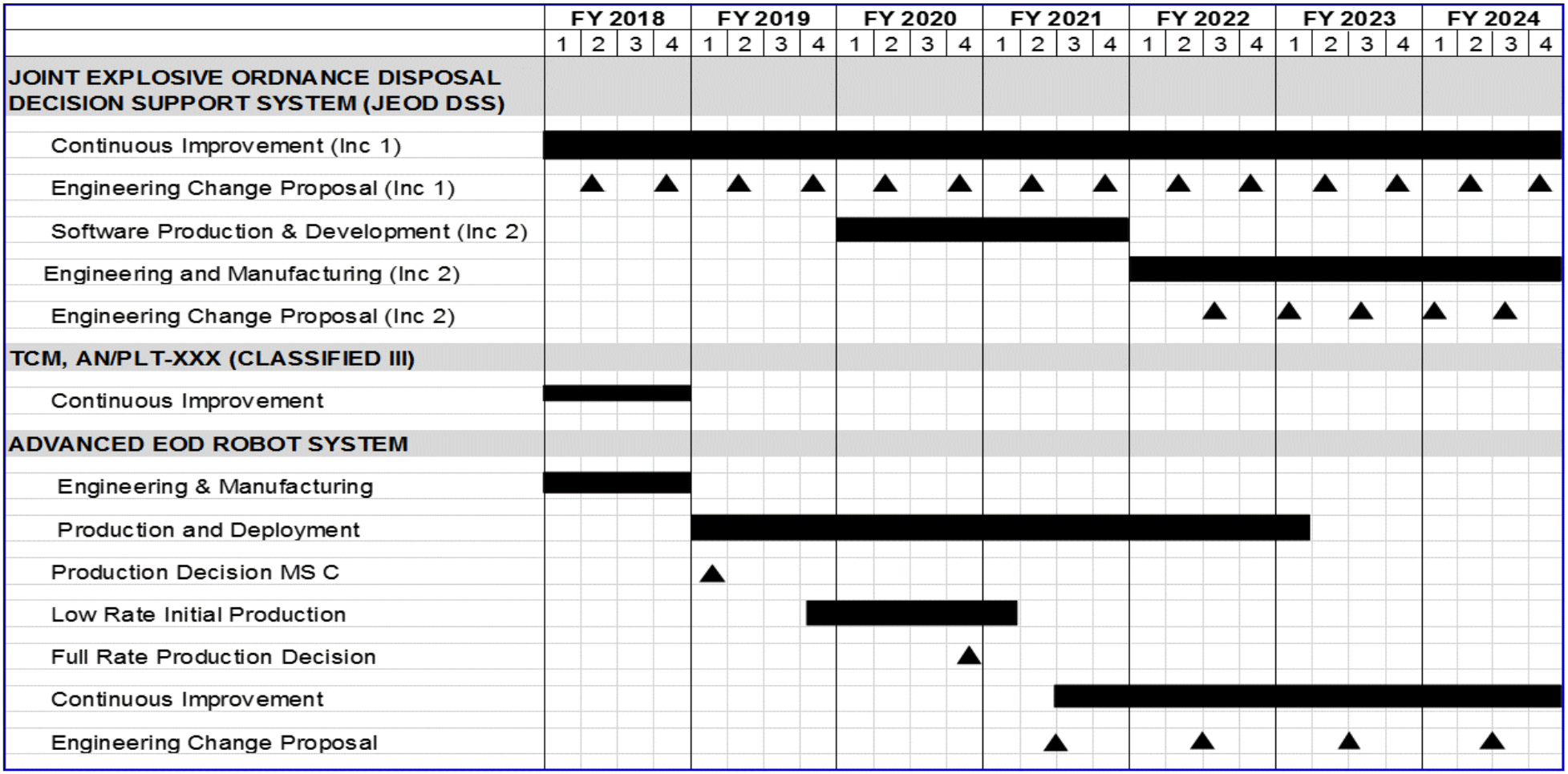


Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603654N / *JT Service Explosive Ordn Dev*	**Project (Number/Name)** 0377 / *JT Service Expl Ord Disp System*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 0377				
JOINT EXPLOSIVE ORDNANCE DISPOSAL DECISION SUPPORT SYSTEM (JEOD DSS): Continuous Improvement (Inc 1)	1	2018	4	2024
JOINT EXPLOSIVE ORDNANCE DISPOSAL DECISION SUPPORT SYSTEM (JEOD DSS): Engineering Change Proposal 1 (Inc 1)	2	2018	2	2018
JOINT EXPLOSIVE ORDNANCE DISPOSAL DECISION SUPPORT SYSTEM (JEOD DSS): Engineering Change Proposal 2 (Inc 1)	4	2018	4	2018
JOINT EXPLOSIVE ORDNANCE DISPOSAL DECISION SUPPORT SYSTEM (JEOD DSS): Engineering Change Proposal 3 (Inc 1)	2	2019	2	2019
JOINT EXPLOSIVE ORDNANCE DISPOSAL DECISION SUPPORT SYSTEM (JEOD DSS): Engineering Change Proposal 4 (Inc 1)	4	2019	4	2019
JOINT EXPLOSIVE ORDNANCE DISPOSAL DECISION SUPPORT SYSTEM (JEOD DSS): Engineering Change Proposal 5 (Inc 1)	2	2020	2	2020
JOINT EXPLOSIVE ORDNANCE DISPOSAL DECISION SUPPORT SYSTEM (JEOD DSS): Engineering Change Proposal 6 (Inc 1)	4	2020	4	2020
JOINT EXPLOSIVE ORDNANCE DISPOSAL DECISION SUPPORT SYSTEM (JEOD DSS): Engineering Change Proposal 7 (Inc 1)	2	2021	2	2021
JOINT EXPLOSIVE ORDNANCE DISPOSAL DECISION SUPPORT SYSTEM (JEOD DSS): Engineering Change Proposal 8 (Inc 1)	4	2021	4	2021
JOINT EXPLOSIVE ORDNANCE DISPOSAL DECISION SUPPORT SYSTEM (JEOD DSS): Engineering Change Proposal 9 (Inc 1)	2	2022	2	2022
JOINT EXPLOSIVE ORDNANCE DISPOSAL DECISION SUPPORT SYSTEM (JEOD DSS): Engineering Change Proposal 10 (Inc 1)	4	2022	4	2022
JOINT EXPLOSIVE ORDNANCE DISPOSAL DECISION SUPPORT SYSTEM (JEOD DSS): Engineering Change Proposal 11 (Inc 1)	2	2023	2	2023

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
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	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
JOINT EXPLOSIVE ORDNANCE DISPOSAL DECISION SUPPORT SYSTEM (JEOD DSS): Engineering Change Proposal 12 (Inc 1)	4	2023	4	2023
JOINT EXPLOSIVE ORDNANCE DISPOSAL DECISION SUPPORT SYSTEM (JEOD DSS): Engineering Change Proposal 13 (Inc 1)	2	2024	2	2024
JOINT EXPLOSIVE ORDNANCE DISPOSAL DECISION SUPPORT SYSTEM (JEOD DSS): Engineering Change Proposal 14 (Inc 1)	4	2024	4	2024
JOINT EXPLOSIVE ORDNANCE DISPOSAL DECISION SUPPORT SYSTEM (JEOD DSS): Software Production & Development (Inc 2)	1	2020	4	2021
JOINT EXPLOSIVE ORDNANCE DISPOSAL DECISION SUPPORT SYSTEM (JEOD DSS): Engineering & Manufacturing (Inc 2)	1	2022	4	2024
JOINT EXPLOSIVE ORDNANCE DISPOSAL DECISION SUPPORT SYSTEM (JEOD DSS): Engineering Change Proposal 1 (Inc 2)	3	2022	3	2022
JOINT EXPLOSIVE ORDNANCE DISPOSAL DECISION SUPPORT SYSTEM (JEOD DSS): Engineering Change Proposal 2 (Inc 2)	1	2023	1	2023
JOINT EXPLOSIVE ORDNANCE DISPOSAL DECISION SUPPORT SYSTEM (JEOD DSS): Engineering Change Proposal 3 (Inc 2)	3	2023	3	2023
JOINT EXPLOSIVE ORDNANCE DISPOSAL DECISION SUPPORT SYSTEM (JEOD DSS): Engineering Change Proposal 4 (Inc 2)	1	2024	1	2024
JOINT EXPLOSIVE ORDNANCE DISPOSAL DECISION SUPPORT SYSTEM (JEOD DSS): Engineering Change Proposal 5 (Inc 2)	3	2024	3	2024
TCM, AN/PLT-XXX (CLASSIFIED III): Continuous Improvement	1	2018	4	2018
ADVANCED EOD ROBOT SYSTEM: Engineering & Manufacturing	1	2018	4	2018
ADVANCED EOD ROBOT SYSTEM: Production and Deployment	1	2019	1	2023
ADVANCED EOD ROBOT SYSTEM: Production Decision MS C	1	2019	1	2019
ADVANCED EOD ROBOT SYSTEM: Low Rate Inital Production	4	2019	1	2021
ADVANCED EOD ROBOT SYSTEM: Full Rate Production Decision	4	2020	4	2020
ADVANCED EOD ROBOT SYSTEM: Continuouse Improvement	3	2021	4	2024
ADVANCED EOD ROBOT SYSTEM: Engineering Change Proposal 1	3	2021	3	2021

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
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	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
ADVANCED EOD ROBOT SYSTEM: Engineering Change Proposal 2	3	2022	3	2022
ADVANCED EOD ROBOT SYSTEM: Engineering Change Proposal 3	3	2023	3	2023
ADVANCED EOD ROBOT SYSTEM: Engineering Change Proposal 4	3	2024	3	2024

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603654N / *JT Service Explosive Ordn Dev*	Project (Number/Name) 1317 / *EOD Diving System*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
1317: *EOD Diving System*	113.915	5.093	4.357	2.533	-	2.533	5.652	4.644	4.708	4.800	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

These resources support the development of equipment for the Navy's only comprehensive expeditionary detect to engage MCM capability. Specifically, it provides for development of Diver Safety/Life Support Equipment, Advanced Diver Integrated Sensors and Advanced Firing Systems to support Navy Explosive Ordnance Disposal (EOD) underwater operations, expeditionary salvage, and Expeditionary MCM Company operations by US Fleet Forces Command. The equipment must have inherently low acoustic and magnetic signatures in order to allow the EOD divers to safely reaquire, approach, render-safe, recover, exploit, and dispose of underwater explosive threats to include sea mines, limpet mines, underwater improvised explosive devices, and unexploded ordnance.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: DIVER SAFETY & LIFE SUPPORT SYSTEMS	2.930	2.000	2.150	0.000	2.150
Articles:	-	-	-	-	-
Description: Diver Safety & Life Support Systems: Develop diver safety tools to include more capable life support systems for EOD, and Mobile Diving & Salvage Units (MDSU) operations. Specific tools include but are not limited to Underwater Breathing Apparatus (UBA), specialized dive masks, heads-up displays, emergency life support systems and the ability to train divers and to evaluate Mine Countermeasures (MCM)/Explosive Ordnance Disposal (EOD) tools, tactics and procedures including control of signatures with regard to influence fired ordnance both in homeland waters and in controlled threat areas.					
FY 2019 Plans: Efforts will focus on continuation of the MMUBA acquisition program (MOTS UBA, MK 16 PIP) and diver safety life support enhancements identified through continued engagement with Fleet EOD diving and expeditionary salvage forces.					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603654N / *JT Service Explosive Ordn Dev*	**Project (Number/Name)** 1317 / *EOD Diving System*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
This program will develop the capabilities defined by the CNO approved MMUBA Capability Definition Document (CDD) of May 2018. Unmanned testing at NEDU will commence leading to determination of suitability of candidate rigs prior to initiation of manned in-water testing. MMUBA will receive an acquisition designation in FY19. ***FY 2020 Base Plans:*** Efforts will continue the unmanned and manned testing needed to ensure that the UBAs selected in FY19 to address the capabilities defined by the approved CDD meet all required performance, safety, and user suitability thresholds. NEDU commercial environmental test chambers will be used to verify that applicable MIL-STD-810 environmental test conditions are met. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** No significant change from FY19 to FY20.					
Title: ADVANCED DIVER INTEGRATED SENSORS	1.920	1.958	0.293	0.000	0.293
Articles:	-	-	-	-	-
Description: Develop Advanced Diver Integrated Sensors equipment to enhance EOD and MDSU ability to detect, access, neutralize and gather intelligence on underwater targets of interest. Requirements include STRIDENT and improvements to the MK 15 Underwater Imaging System (UIS). ***FY 2019 Plans:*** CDD and acquisition strategy will be developed for STRIDENT. Engineering Development Model (EDM) Course of Action (COA) will be approved by the Milestone Decision Authority (MDA). Efforts will focus on completing the enhancements needed to continue MK 15 UIS capability until STRIDENT capability is fielded. Complete characterization of candidate					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
performance and minefield suitability including influence signatures. ***FY 2020 Base Plans:*** ACAT designation and CDD will be approved. Initial candidate user evaluations conducted in FY19 will inform the development of the performance specification and source selection criteria to ensure that the candidate EDMs fully meet the required performance thresholds. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Decrease from FY19 to FY20 due to completion of FY19 characterizations; DT&E will resume in FY21 upon selection of EDM candidates.					
Title: ADVANCED FIRING SYSTEM ***Articles:*** ***Description:*** Develops product improvements to existing systems for below and above water neutralization of underwater threats to support EOD and MDSU operations. ***FY 2019 Plans:*** Continuing development, testing, and evaluation of product improvements to the MK 12 Acoustic Firing System (AFS) receiver subsystems. ***FY 2020 Base Plans:*** Complete the testing of product improvements to the AFS receiver subsystems. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** No significant change from FY19 to FY20	0.243 -	0.399 -	0.090 -	0.000 -	0.090 -
Accomplishments/Planned Programs Subtotals	5.093	4.357	2.533	0.000	2.533

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
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C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• OPN/0977a: *Underwater EOD Program (Cost Code UQ034)*	1.100	1.125	1.350	-	1.350	2.095	1.645	2.119	5.790	0.000	43.699
• OPN/0977b: *UW EOD (UQ036)*	0.475	0.660	0.660	-	0.660	0.660	3.950	4.010	4.033	0.000	18.397

Remarks

D. Acquisition Strategy

Analysis of Alternatives (AOA) studies are always conducted prior to the initiation of new sub-projects. The AOA addresses and emphasizes acquisition strategies of the most cost-effective solution over the sub-projects life-cycle. The acquisition strategies observe the following hierarchy of alternatives: commercial item (including modification), non-developmental item (including modification), and lastly, developmental programs. Contracting for RDT&E, if required, is always competitive and when feasible, production options are included. Maximum use of innovative contracting mechanisms will be assessed and pursued where applicable and in the best interest of the Navy.

E. Performance Metrics

CNO approved requirements documents that define necessary Key Performance Parameters (KPPs) and additional system attributes will be used to verify and validate operational effectiveness and suitability through component and system level test and evaluation to locate, classify, identify, assess, neutralize and conduct post-neutralization battle damage
assessment/verification of mines and unexploded ordnance.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
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Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Primary Hardware Development	WR	Multiple Activities : Not Specified	44.150	0.950	Oct 2017	0.850	Nov 2018	0.455	Nov 2019	-		0.455	Continuing	Continuing	Continuing
Software Development	WR	Multiple Activites : Not Specified	6.533	0.208	Oct 2017	0.170	Nov 2018	0.065	Nov 2019	-		0.065	Continuing	Continuing	Continuing
Systems Engineering	WR	Multiple Activities : Not Specified	8.228	0.000		0.000		0.000		-		0.000	0.000	8.228	-
ILS	WR	Multiple Activities : Not Specified	11.916	0.000		0.000		0.000		-		0.000	0.000	11.916	-
Systems Engineering	WR	NSWC : Panama City	2.845	0.879	Oct 2017	0.702	Nov 2018	0.502	Nov 2019	-		0.502	Continuing	Continuing	Continuing
Systems Engineering	WR	SPAWAR : San Diego	4.010	1.189	Oct 2017	0.970	Nov 2018	0.581	Nov 2019	-		0.581	Continuing	Continuing	Continuing
		Subtotal	77.682	3.226		2.692		1.603		-		1.603	Continuing	Continuing	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management Support2	C/CPFF	PERATON : Herndon VA	7.938	0.510	Nov 2017	0.450	Nov 2018	0.307	Nov 2019	-		0.307	Continuing	Continuing	Continuing
		Subtotal	7.938	0.510		0.450		0.307		-		0.307	Continuing	Continuing	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Development Test & Evaluation	WR	Multiple Activities : Not Specified	8.899	0.663	Oct 2017	0.585	Nov 2018	0.289	Nov 2019	-		0.289	Continuing	Continuing	Continuing
Operational Test & Evaluation	WR	Multiple Activities : Not Specified	1.560	0.000		0.000		0.000		-		0.000	0.000	1.560	-
		Subtotal	10.459	0.663		0.585		0.289		-		0.289	Continuing	Continuing	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603654N / *JT Service Explosive Ordn Dev*	Project (Number/Name) 1317 / *EOD Diving System*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management Support	WR	NSWCIHEODTD : Indian Head, MD	10.858	0.673	Nov 2017	0.611	Nov 2018	0.334	Nov 2019	-		0.334	0.000	12.476	-
Miscellaneous	WR	NSWC, Activities : Not Specified	6.965	0.021	Nov 2017	0.019	Nov 2018	0.000	Nov 2019	-		0.000	0.000	7.005	-
Acquisition Workforce Fund	Various	Various : Various	0.013	0.000		0.000		0.000		-		0.000	0.000	0.013	-
		Subtotal	17.836	0.694		0.630		0.334		-		0.334	0.000	19.494	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	113.915	5.093		4.357		2.533		-		2.533	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603654N / *JT Service Explosive Ordn Dev*	**Project (Number/Name)** 1317 / *EOD Diving System*

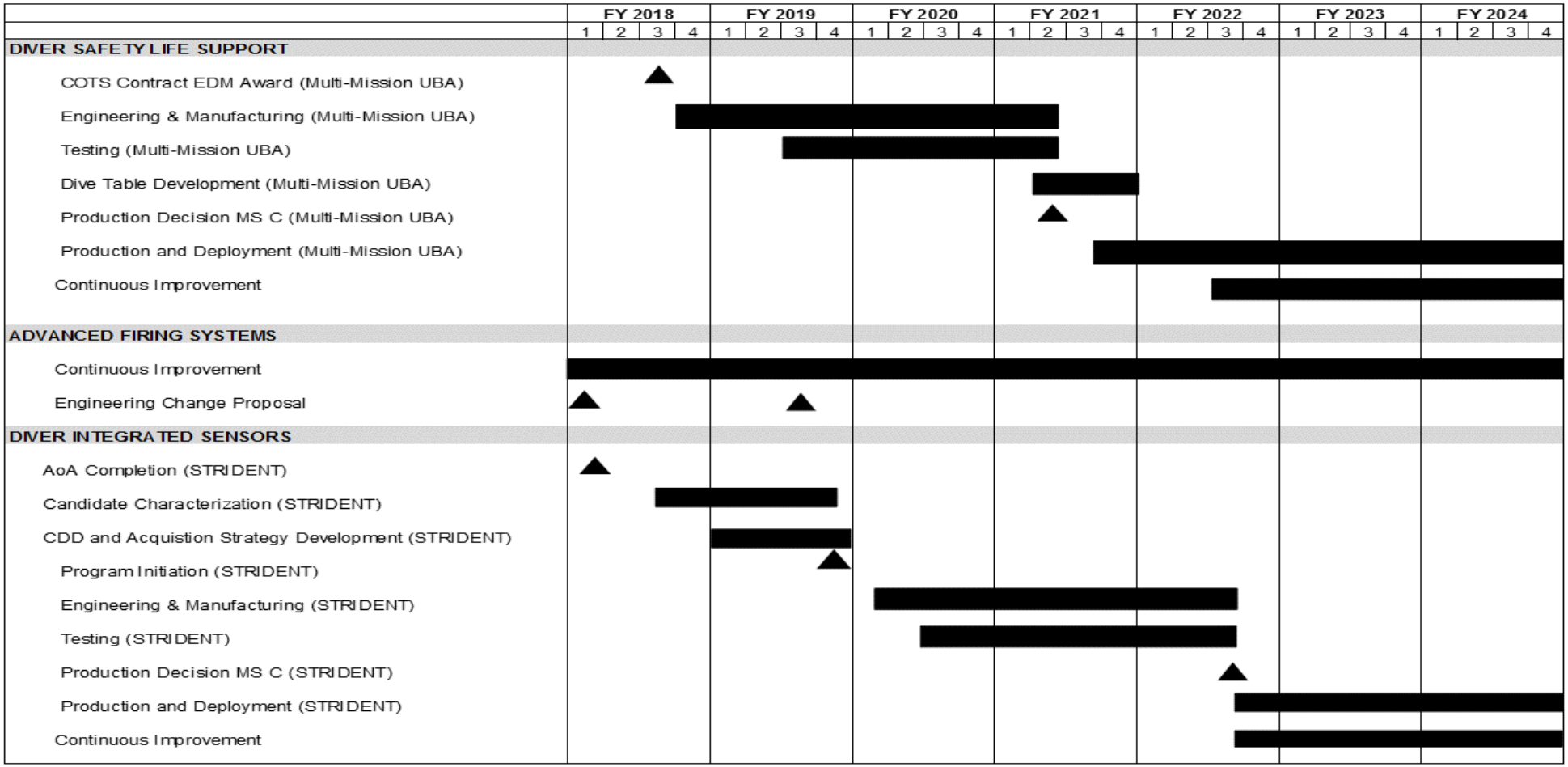


Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603654N / *JT Service Explosive Ordn Dev*	**Project (Number/Name)** 1317 / *EOD Diving System*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 1317				
TITLE: DIVER SAFETY LIFE SUPPORT	1	2018	4	2024
---COTS Contract EDM Award (Multi-Mission UBA)	3	2018	3	2018
---Engineering & Manufacturing (Multi-Mission UBA)	4	2018	2	2021
---Testing (Multi-Mission UBA)	3	2019	2	2021
---Dive Table Development (Multi-Mission UBA)	2	2021	4	2021
---Production Decision MS C (Multi-Mission UBA)	2	2021	2	2021
---Production and Deployment (Multi-Mission UBA)	4	2021	4	2024
---Continuous Improvement_	3	2022	4	2024
TITLE: ADVANCED FIRING SYSTEMS	1	2018	4	2024
---Continuous Improvement.	1	2018	4	2024
---Engineering Change Proposal 1	1	2018	1	2018
---Engineering Change Proposal 2	3	2019	3	2019
TITLE: ADVANCED INTEGRATED DIVER SENSORS	1	2018	4	2024
--AoA Completion (STRIDENT)	1	2018	1	2018
--Candidate Characterization (STRIDENT)	4	2018	4	2019
---CDD and Acquisition Strategy Development (STRIDENT)	1	2019	4	2019
---Program Initiation (STRIDENT)	4	2019	4	2019
---Engineering & Manufacturing (STRIDENT)	2	2020	3	2022
---Testing (STRIDENT)	3	2020	3	2022
---Production Decision MS C (STRIDENT)	3	2021	3	2021
---Production and Deployment (STRIDENT)	4	2022	4	2024

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603654N / *JT Service Explosive Ordn Dev*	**Project (Number/Name)** 1317 / *EOD Diving System*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
---Continuous Improvement	4	2022	4	2024

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603654N / *JT Service Explosive Ordn Dev*	Project (Number/Name) 3177 / *Joint Counter Radio-Controlled IED Elec Warfare*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
3177: *Joint Counter Radio-Controlled IED Elec Warfare*	13.194	43.652	27.625	5.044	14.178	19.222	29.858	26.316	26.889	27.430	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Provides for the research and development of Electronic Warfare (EW) systems, equipment, procedures, and tactical aids for all military services against the threat posed by Radio-Controlled Improvised Explosive Devices (RCIEDs) and to prevent initiation of RCIEDs across the spectrum of Joint military operations. Utilize Joint requirements to provide a system of systems approach for a suite of equipment for mounted, dismounted, and fixed site operations; provide a Joint Counter RCIED EW (JCREW) development of equipment, procedures, and tactical aids to make rapid improvements to performance, supportability and affordability, while maintaining pace with evolving global threat.

Also provides for the rapid development and testing of JCREW Counter-Unmanned Aerial System (C-UAS) for Joint Urgent Operational Need Statement (JUON) CC-0558. This includes the modification of JCREW hardware, software, threat loads, and advanced techniques to provide an Increment I C-UAS capability, integration into JCREW dismounted systems delivered off the LRIP contract, lab verification, and open air testing. Due to rapidly evolving threats team will develop and support additional software drops throughout year.

The JCREW system, Increment 1 Block 1 (I1B1) is the next generation of counter RCIED systems. This family of systems includes fixed site, mounted and dismounted units, which provide countermeasures against the global RCIED threat. Key system design features include significant performance increases over current legacy systems, a modular open architecture system to address current and future advanced threats, robust information assurance and security, and is net-capable for improved Communications and Control (C2). JCREW I1B1 supports global deployment and sustainment for all combatant commands providing increased protection to Warfighter against the evolving worldwide RCIED threats.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Joint Counter Radio-Controlled IED Elec Warfare	43.652	25.679	4.135	13.158	17.293
Articles:	-	-	-	-	-
Description: Supports the development, integration and test of Tech Insertion hardware, software, and advanced techniques into JCREW systems. Tech Insertion candidates include Office of Naval Research (ONR) sponsored technologies ready for transition to JCREW; and techniques, hardware and software performance improvements developed by United States Government (USG) laboratories, Federally Funded Research and Development Centers (FFRDCs), University Affiliated Research Centers (UARCs), and the JCREW prime contractor. Analysis of Alternatives (AoA) will be conducted to evaluate and select Tech Insertion candidates					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603654N / *JT Service Explosive Ordn Dev*	**Project (Number/Name)** 3177 / *Joint Counter Radio-Controlled IED Elec Warfare*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
based on technical maturity, cost, and performance. Hardware and software updates will be integrated, tested, and implemented into JCREW through Engineering Change Proposals (ECPs). Also supports rapid development and testing of JCREW Counter-Unmanned Aerial System (C-UAS) for Joint Urgent Operational Need(JUON) CC-0558. ***FY 2019 Plans:*** Perform and complete Tech Refresh development, implementation and testing for Tech Insertion 2. Complete AoA for Tech Insertion 3. Continue development and testing of threat loads, software, and hardware and processing the associated ECPs in support C-UAS JUON CC-0558. $12.9M OCO funding supports Navy assigned requirement to provide C-UAS capability in response to JUON CC-0558. Sixty C-UAS systems have been fielded to date to provide a rapid response initial capability, with additional systems planned per the JUON. Enhanced performance will be required to maintain capability against the evolving UAS threat. These enhancements will require development and testing of hardware and software/ firmware upgrades, and integration of C-UAS capability on various platforms, to include small combatant craft, ships, and fixed site infrastructure. ***FY 2020 Base Plans:*** Begin and perform development, implementation and testing for Tech Insertion 3. Continue development and testing of threat loads, software, and hardware and processing the associated ECPs. ***FY 2020 OCO Plans:*** Perform Tech Refresh to develop improved C-UAS detect, identify, track, and defeat capabilities. Continue development and testing of threat loads, software, and hardware and processing the associated ECPs. Funding supports Navy assigned requirement to provide C-UAS capability in response to the emerging threat. 60 C-UAS systems have been fielded to date to provide a rapid response initial capability, with additional systems planned per the JUON. Enhanced performance will be required to maintain capability against the evolving UAS threat.					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603654N / *JT Service Explosive Ordn Dev*	**Project (Number/Name)** 3177 / *Joint Counter Radio-Controlled IED Elec Warfare*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
These enhancements will require development and testing of hardware and software/firmware upgrades, and integration of C-UAS capability on various platforms, to include small combatant craft, ships, and fixed site infrastructure. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** FY 2019 to FY 2020 decrease ($-8.386M) accounts for the Completion of Tech insertion 2 in FY19, and to initiate the development of Tech insertion 3 in FY2020.					
Title: EOD CREW ***Articles:*** ***FY 2019 Plans:*** Provide systems engineering support for EOD CREW systems. Develop AN/PLT-5 load sets to remain current with continually changing CONUS and OCONUS threats. Develop and validate AN/PLT-4 replacement requirements. ***FY 2020 Base Plans:*** Provide systems engineering support for EOD CREW systems. Develop AN/PLT-5 load sets to remain current with continually changing CONUS and OCONUS threats. Develop and validate AN/PLT-4 replacement requirements. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** No significant change.	0.000 -	0.946 -	0.909 -	0.000 -	0.909 -
Title: HEMLOCK ***Articles:*** ***FY 2019 Plans:*** $1M FY19 OCO funds to develop hardware and software capabilities to enable enhanced cyber and electronics forensics and exploitation of evolving RCIED threats. Further information available at a higher classification. ***FY 2020 Base Plans:*** N/A ***FY 2020 OCO Plans:***	0.000 -	1.000 -	0.000 -	1.020 -	1.020 -

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603654N / *JT Service Explosive Ordn Dev*	**Project (Number/Name)** 3177 / *Joint Counter Radio-Controlled IED Elec Warfare*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Develop hardware and software capabilities to enable enhanced cyber and electronics forensics and exploitation of evolving RCIED threats. Further information available at a higher classification. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** No significant change.					
Accomplishments/Planned Programs Subtotals	43.652	27.625	5.044	14.178	19.222

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• OPN/5509(b): *Explosive Ordnance Disposal Equip*	51.262	31.736	0.868	-	0.868	0.877	0.894	0.912	0.931	0.000	171.617

Remarks

PE 0604653N/JT Cntr Radio Controlled IED Elec War (JCREW) consolidated into PE 0603654N/JT Service Explosive Ordn Dev FY17 and out.

D. Acquisition Strategy

Develop, integrate, test, and field hardware and software upgrades, and advanced techniques into JCREW systems through the JCREW Tech Insertion / Tech Refresh process. Tech Insertion candidates include Office of Naval Research (ONR) sponsored technologies ready for transition to JCREW; and techniques, hardware and software performance improvements developed by United States Government (USG) laboratories, Federally Funded Research and Development Centers (FFRDCs), University Affiliated Research Centers (UARCs), and the JCREW prime contractor. Analysis of Alternatives (AoA) will be conducted to evaluate and select Tech Insertion candidates based on technical maturity, cost, and performance. Hardware and software updates will be integrated, tested, and implemented into JCREW through Engineering Change Proposals (ECPs). Also supports rapid development and testing of JCREW Counter-Unmanned Aerial System (C-UAS) for Joint Urgent Operational Need (JUON) CC-0558.

E. Performance Metrics

Full Rate Production contract awarded July 2017 to Northrop Grumman includes Engineering Support Services (ESS) for Tech Insertion. Tech Insertion 1 development complete; ECP to retrofit systems approved in FY2018. Additional ESS awarded in June 2018 to support development and integration of Tech insertion 2. Tech Insertion 2 development commenced in FY2018 based on outcome of Analysis of Alternatives. Initiated Market Research for Tech Insertion 3 technology candidates in FY2018.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603654N / *JT Service Explosive Ordn Dev*	Project (Number/Name) 3177 / *Joint Counter Radio-Controlled IED Elec Warfare*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Primary Hardware Development	C/CPFF	Northrup Grumman : San Diego, CA	1.929	8.615	Jun 2018	5.534	Jan 2019	0.000		-		0.000	Continuing	Continuing	Continuing
Systems Engineering	C/CPFF	Northrup Grumman : San Diego, CA	3.464	3.452	Jun 2018	2.553	Jan 2019	0.000		-		0.000	Continuing	Continuing	Continuing
Software Development	C/CPFF	Northrup Grumman : San Diego, CA	0.964	6.495	Jun 2018	2.682	Jan 2019	0.000		-		0.000	Continuing	Continuing	Continuing
System Integration	C/CPFF	Northrup Grumman : San Diego, CA	0.964	1.952	Jun 2018	2.405	Jan 2019	0.000		-		0.000	Continuing	Continuing	Continuing
Primary Hardware Development	Various	TBD : TBD	0.000	0.000		0.000		0.828	Jan 2020	2.526	Jan 2020	3.354	0.000	3.354	-
Systems Engineering	Various	TBD : TBD	0.000	0.000		0.000		0.376	Jan 2020	1.348	Jan 2020	1.724	0.000	1.724	-
Software Development	Various	TBD : TBD	0.000	0.000		0.000		0.510	Jan 2020	1.204	Jan 2020	1.714	0.000	1.714	-
System Integration	Various	TBD : TBD	0.000	0.000		0.000		0.373	Jan 2020	1.152	Jan 2020	1.525	0.000	1.525	-
		Subtotal	7.321	20.514		13.174		2.087		6.230		8.317	Continuing	Continuing	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Loadset Development	FFRDC	JHU/APL, MITRE : Laurel, MD	0.592	4.504	Dec 2017	1.858	Nov 2018	0.394	Nov 2019	1.148	Nov 2019	1.542	Continuing	Continuing	Continuing
Systems Engineering	WR	NSWC : Various	2.242	7.179	Nov 2017	6.886	Nov 2018	1.252	Nov 2019	3.062	Nov 2019	4.314	Continuing	Continuing	Continuing
Program Management Support	WR	IHEODTD : Indian Head, MD	0.331	1.241	Nov 2017	0.645	Nov 2018	0.159	Nov 2019	0.477	Nov 2019	0.636	Continuing	Continuing	Continuing
Loadset Development	WR	IHEODTD : Indian Head, MD	0.000	0.000		0.000		0.000		-		0.000	0.000	0.000	-
		Subtotal	3.165	12.924		9.389		1.805		4.687		6.492	Continuing	Continuing	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603654N / *JT Service Explosive Ordn Dev*	**Project (Number/Name)** 3177 / *Joint Counter Radio-Controlled IED Elec Warfare*

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Test & Evaluation	WR	NSWC : Various	1.208	5.458	Nov 2017	1.927	Nov 2018	0.381	Nov 2019	1.633	Nov 2019	2.014	Continuing	Continuing	Continuing
Test & Evaluation	MIPR	YPG : Yuma, Arizona	0.850	3.175	Nov 2017	2.606	Nov 2018	0.485	Nov 2019	1.241	Nov 2019	1.726	Continuing	Continuing	Continuing
		Subtotal	2.058	8.633		4.533		0.866		2.874		3.740	Continuing	Continuing	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management Support	C/CPFF	Cydecor : Various	0.224	0.790	Dec 2017	0.000		0.121	Nov 2019	0.229	Nov 2019	0.350	Continuing	Continuing	Continuing
Miscellaneous	WR	NSWC : Various	0.426	0.791	Dec 2017	0.529	Nov 2018	0.165	Nov 2019	0.158	Nov 2019	0.323	Continuing	Continuing	Continuing
		Subtotal	0.650	1.581		0.529		0.286		0.387		0.673	Continuing	Continuing	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	13.194	43.652		27.625		5.044		14.178		19.222	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603654N / *JT Service Explosive Ordn Dev*	**Project (Number/Name)** 3177 / *Joint Counter Radio-Controlled IED Elec Warfare*

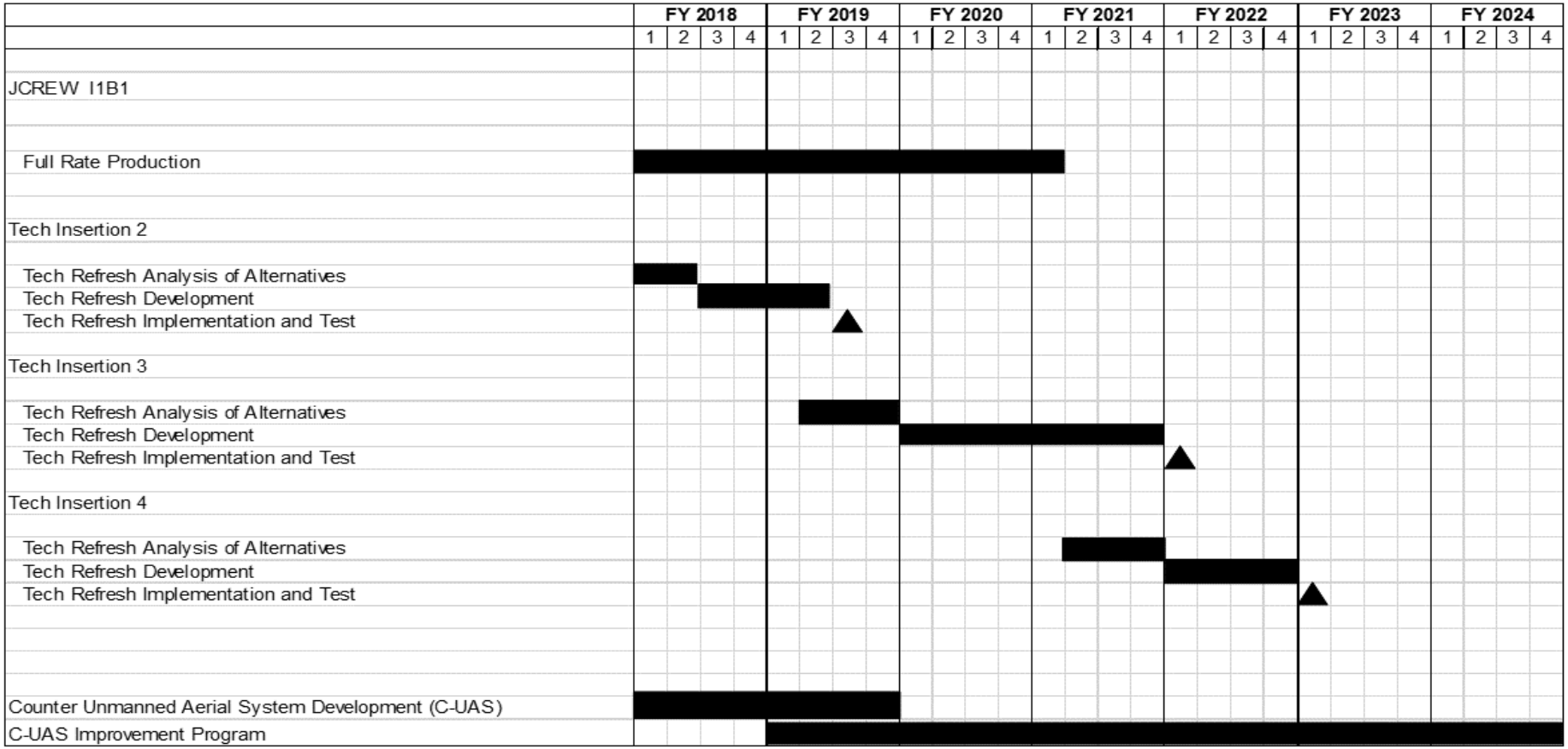


Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603654N / *JT Service Explosive Ordn Dev*	**Project (Number/Name)** 3177 / *Joint Counter Radio-Controlled IED Elec Warfare*

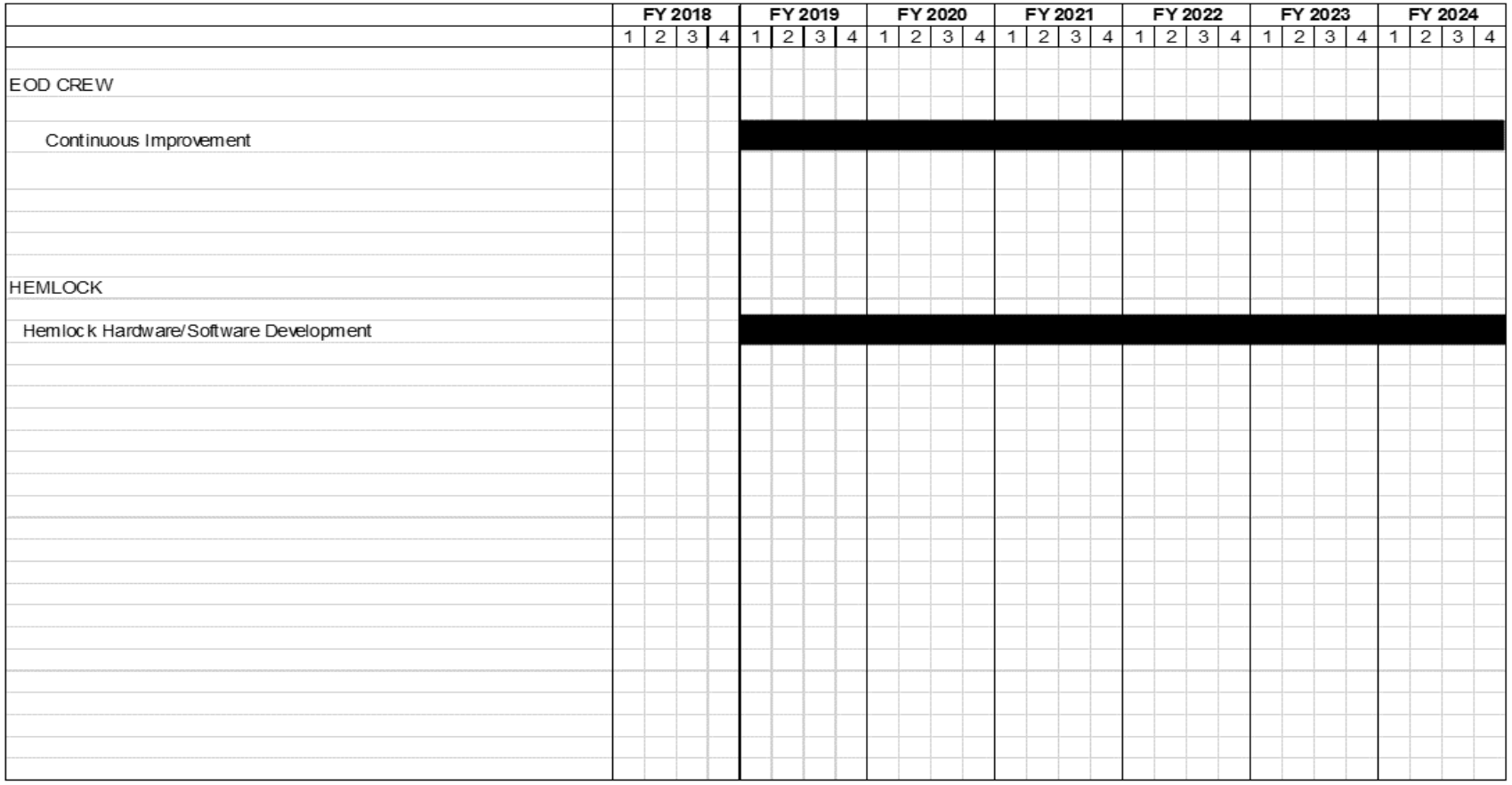


Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603654N / *JT Service Explosive Ordn Dev*	**Project (Number/Name)** 3177 / *Joint Counter Radio-Controlled IED Elec Warfare*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 3177				
JCREW I1B1: Full Rate Production	1	2018	1	2021
JCREW I1B1: TECH INSERTION 2	1	2018	3	2019
JCREW I1B1: Tech Refresh Analysis of Alternatives (2)	1	2018	2	2018
JCREW I1B1: Tech Refresh Development (2)	3	2018	2	2019
JCREW I1B1: Tech Refresh Implementation and Test (2)	3	2019	3	2019
JCREW I1B1: TECH INSERTION 3	2	2019	2	2021
JCREW I1B1: Tech Refresh Analysis of Alternatives (3)	2	2019	4	2019
JCREW I1B1: Tech Refresh Development (3)	1	2020	4	2021
JCREW I1B1: Tech Refresh Implementation and Test (3)	1	2022	1	2022
JCREW I1B1: TECH INSERTION 4	2	2021	1	2023
JCREW I1B1: Tech Refresh Analysis of Alternatives (4)	2	2021	4	2021
JCREW I1B1: Tech Refresh Development (4)	1	2022	4	2022
JCREW I1B1: Tech Refresh Implementation and Test (4)	1	2023	1	2023
JCREW I1B1: Counter Unmanned Aerial System Development	1	2018	4	2019
JCREW I1B1: C-UAS Improvement Program	1	2019	4	2020
EOD CREW: Continuous Improvement	1	2019	4	2024
EOD CREW: HEMLOCK	1	2019	4	2024

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603654N / *JT Service Explosive Ordn Dev*	Project (Number/Name) 4023 / *VSW MCM/Force Protection UUV*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
4023: *VSW MCM/Force Protection UUV*	125.302	15.618	16.936	16.121	-	16.121	16.227	15.682	18.217	18.580	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Funding supports the development of unmanned systems for the Navy's expeditionary unmanned underwater EOD and MCM capability. Specifically, it provides for development of affordable expeditionary, unmanned underwater systems to support Navy Expeditionary forces including Explosive Ordnance Disposal (EOD), Mobile Diving and Salvage, Very Shallow Water (VSW), and Expeditionary Mine Countermeasures (ExMCM) mission operations. The equipment must be highly portable in order to support the Navy EOD technician to safely approach, render safe, recover, exploit, and dispose of underwater explosive threats to include sea mines, limpet mines, and unexploded ordnance. Provides support for the Navy's high priority missions of Maritime Homeland Defense and MCM, including clandestine reconnaissance and mine clearance in support of amphibious operations. Development of Expeditionary UUV systems to support localization render-safe and detailed intelligence gathering of UXO including Underwater Improvised Explosive Devices. This project directly supports Department of the Navy Strategic Roadmap for Unmanned Systems promulgated in March 2018.

This budget provides the resources needed to execute two formal MK18 Family of Systems acquisition programs as well as three major engineering change proposals and the enhancement to the MK18 Family of Systems to provide an underwater threat interdiction capability. These efforts require prototype development and significant RDT&E during FY20. Program execution tempo reflects continued efforts to support MK 18 UUV Increment II and EOD Response ROV capability development.

FY20 will focus on continuation of the development and testing of advanced technologies that will allow warfighters to detect, classify, and localize high priority threats in meeting mine warfare missions. For example, the MK 18 Mod 2 Increment II upgrade will provide improved Automated Target Recognition (ATR) algorithms, more advanced autonomy architecture and continue to enhance electro-optic sensor performance. Increment II development and testing will focus on improving MCM performance and reducing the tactical timeline through development of a Reacquire, Identify and Mark capability for the MK18 Mod 2 system. Concurrently with these efforts, the MK18 Mod 1 is undergoing a configuration change that will provide a higher area coverage rate, inclusion of vehicle autonomy, and Automated Target Recognition. Also, resources will continue to be used to expand deployability of the MK 18 Family of Systems (FoS) aboard a higher number of shipboard platforms and also to deploy the FoS from additional small boats other than the current 11 meter Rigid Hull Inflatable Boat (RHIB). These efforts will significantly improve the capabilities of the projected inventory of 16 MK 18 Mod 1 and 16 MK 18 Mod 2 systems for fleet Expeditionary MCM forces. Currently, the MK 18 Family of Systems are being employed in multiple theater of operations (5th, 6th, and 7th Fleet) and have been employed in multiple CONUS based port survey and maritime homeland defense operations as well.

Additional efforts will continue to execute the open competition process necessary to acquire and verify an EOD Response ROV capability focusing on user effectiveness and operational suitability to provide a ROV based target interdiction capability to address the capability gaps assessed in the previously conducted EUNS AoA. This next generation capability (i.e. modified-off-the-shelf (MOTS) ROV) is developed to decrease risk when reacquiring/investigating a potential threat (i.e. sea mine or Underwater Improvised Explosive Device).

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603654N / *JT Service Explosive Ordn Dev*	**Project (Number/Name)** 4023 / *VSW MCM/Force Protection UUV*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: MK18 UUV Family of Systems	7.328	12.779	8.142	0.000	8.142
Articles:	-	-	-	-	-
Description: This program supports development, testing and Fleet approval for evolving generations of affordable, expeditionary Unmanned Underwater Vehicle (UUVs) systems to address validated requirements in support of Expeditionary SW and VSW UMCM mission areas defined by the Maritime Expeditionary MCM UUV (MEMUUV) Capability Description Document (CDD) approved in September 2017. ***FY 2019 Plans:*** FY19 efforts will focus on continued development and testing of MK 18 Mod 2 Increment II projects. Additionally, efforts to complete preliminary engineering change proposal actions necessary to transition technologies developed and demonstrated in the rapid innovation fund (RIF) and small business innovative research (SBIR) initiatives to initiate transition as incremental capability improvements to baseline MK 18 systems will continue. These capability improvements will form the developmental baseline for the Next Generation UUV system. ***FY 2020 Base Plans:*** FY20 will continue the development, testing, and evaluation of MK 18 Family of Systems. FY20 will focus on continuation of the development and testing of advanced technologies that will transition into the Increment II program of record during the engineering and manufacturing development phase. As each of these component technologies are tested and integrated into the system, the demonstrated capabilities will provide the means for warfighters to detect, classify and localize high priority threats in meeting mine warfare missions. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Decrease of $4.637M from FY19 to FY20 is due to completion of the development and testing of UUV Advanced Sensor modules (SSAM and ATLAS) and initiation of the transition to Production & Deployment.					
Title: EOD Response ROVs and Maritime Expeditionary Standoff Response System of Systems	8.290	4.157	7.979	0.000	7.979
Articles:	-	-	-	-	-
Description: This program supports development, testing and evaluation of technologies and commercial systems that will provide needed capabilities to EOD and Expeditionary forces in responding to the wide range of underwater threats					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603654N / *JT Service Explosive Ordn Dev*	**Project (Number/Name)** 4023 / *VSW MCM/Force Protection UUV*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
and operational environments encountered in assigned mission areas to include: confined areas, hulls, piers and pilings to search, classify, map, re-acquire, identify, and neutralize sea and limpet mines and underwater improvised explosive devices. ***FY 2019 Plans:*** FY19 efforts will focus on continued development and testing of MOTS ROV candidates to fill the existing capability gaps facing EOD forces in performing EOD response missions in assigned operational environments. FY19 efforts will also include initiation of the Maritime Expeditionary Standoff Response System of Systems (MESR SoS) defined by the approved MESR CDD. Each of these initiatives will provide enhanced capabilities for EOD forces in both contested and non-contested operational environments. ***FY 2020 Base Plans:*** FY20 will investigate and develop, test and evaluate enhancements to the selected MOTS ROV and will continue the development and testing of the first generation MESR systems. Component technologies will be integrated into three specific capability sets: Response Vehicle (RV) systems; standoff command and control modules; Task-Specialized Response Payloads. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increase of $3.822M is due to the continued development and testing of enhancements to selected MOTS ROV to fill the existing capability gaps facing EOD forces and the initiation of the development and testing of candidate EOD					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603654N / *JT Service Explosive Ordn Dev*	**Project (Number/Name)** 4023 / *VSW MCM/Force Protection UUV*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Response ROV systems to provide a first generation Maritime Expeditionary EOD Response capability.					
Accomplishments/Planned Programs Subtotals	15.618	16.936	16.121	0.000	16.121

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• OPN/0977(a): *Underwater EOD Program (Cost Code UQ034)*	2.450	1.850	0.000	-	0.000	0.000	1.350	0.900	2.700	0.000	151.048
• OPN/0977(b): *Expeditionary Mine Countermeasures (ExMCM) (Cost Code UQ038)*	11.396	33.041	34.760	-	34.760	27.902	27.907	37.914	19.533	0.000	192.453
• OPN/0977 (c): *MK18 Unmanned Underwater Vehicle (MK UUV) (Cost Code UQ040)*	22.050	24.720	19.946	5.800	25.746	18.630	14.660	14.660	9.721	0.000	130.187

Remarks

D. Acquisition Strategy

Analysis of Alternatives (AOA) studies are conducted prior to the initiation of new sub-projects. The AOA addresses and emphasizes acquisitions strategies of the most cost effective solution over the sub-projects' life -cycle. The acquisition strategies observe the following hierarchy of alternatives: commercial item (including modifications), non-developmental item (including modifications), and lastly, developmental programs. Contracting for RDT&E, if required is competitive and when feasible, production options are included. This ongoing program capitalizes on a User Operational Evaluation System (UOES) effort involving Fleet operators engaged in tactical experimentation with prototype UUVs prior to fielding baseline systems and capability improvement package increments. These UUV operators also participate in detailed requirements analyses and definition. Operational capabilities with UUVs have been realized at designated operational units, with a competitive acquisition strategy. The addition of enhanced capabilities through an evolutionary acquisition approach to the UUV toolbox is programmed for delivery in accordance with approved CNO requirements and ONR Technology Transition Agreements (TTAs) which close capability gaps. Further improvements to the toolbox to add basic mine and underwater explosive threats neutralization capabilities will continue to be pursued, including expansion of EOD Response capabilities employing Remotely Operated Vehicles (ROVs) in areas where current UUVs cannot operate. Streamlined acquisition initiatives are in place to quickly evaluate candidate EOD response capabilities while the longer term Maritime Expeditionary Response System of Systems is developed. A key attribute for these systems is minefield suitability and control of system signatures to counter influence fired ordnance. Influence signatures of subject UUVs and ROVs will be characterized as a vital component of the acquisition initiatives. Maximum use of innovative contracting mechanisms will be assessed and pursued where applicable and in the best interest of the Navy.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603654N / *JT Service Explosive Ordn Dev*	**Project (Number/Name)** 4023 / *VSW MCM/Force Protection UUV*

E. Performance Metrics

CNO approved requirements documents that define necessary Key Performance Parameters (KPPs) and additional system attributes will be used to verify and validate operational effectiveness and suitability through component and system level test and evaluation to locate, classify, identify, assess, neutralize and conduct post-neutralization battle damage assessment/verification of mines and unexploded ordnance.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603654N / *JT Service Explosive Ordn Dev*	Project (Number/Name) 4023 / *VSW MCM/Force Protection UUV*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Primary Hardware Development	WR	Multiple Activities : Not Specified	22.622	4.240	Oct 2017	3.588	Nov 2018	3.397	Nov 2019	-		3.397	0.000	33.847	-
Systems Engineering	WR	NSWC Activities : Not Specified	16.178	1.478	Oct 2017	2.613	Nov 2018	2.363	Nov 2019	-		2.363	0.000	22.632	-
Primary Hardware Development	WR	NSWCIHEODTD : Indian Head, MD	16.238	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Systems Engineering	WR	NSWC, Activities : Not Specified	24.345	1.652	Oct 2017	2.761	Nov 2018	2.524	Nov 2019	-		2.524	Continuing	Continuing	Continuing
		Subtotal	79.383	7.370		8.962		8.284		-		8.284	Continuing	Continuing	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Technical Support	C/CPFF	PERATON : Herndon, VA	6.262	0.572	Nov 2017	0.583	Nov 2018	0.528	Nov 2019	-		0.528	Continuing	Continuing	Continuing
		Subtotal	6.262	0.572		0.583		0.528		-		0.528	Continuing	Continuing	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Developmental Test & Evaluation-WR	WR	NSWC Activities : Not Specified	16.971	3.844	Oct 2017	3.681	Nov 2018	3.604	Nov 2019	-		3.604	0.000	28.100	-
Independent T&E	WR	NSWC Activities : Not Specified	4.311	1.785	Oct 2017	1.763	Nov 2018	1.784	Nov 2019	-		1.784	0.000	9.643	-
Developmental Test & Evaluation	WR	NSWC Activities : Not Specified	10.145	1.284	Oct 2017	1.269	Nov 2018	1.272	Nov 2019	-		1.272	Continuing	Continuing	Continuing
Independent T&E	WR	NSWCIHEODTD : Indian Head, MD	1.424	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
		Subtotal	32.851	6.913		6.713		6.660		-		6.660	Continuing	Continuing	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603654N / *JT Service Explosive Ordn Dev*	**Project (Number/Name)** 4023 / *VSW MCM/Force Protection UUV*

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management Support	WR	NSWCIHEODTD : Indian Head, MD	4.485	0.511	Nov 2017	0.520	Nov 2018	0.528	Nov 2019	-		0.528	Continuing	Continuing	Continuing
Miscellaneous	WR	NSWC Activities : Not Specified	2.303	0.252	Nov 2017	0.158	Nov 2018	0.121	Nov 2019	-		0.121	Continuing	Continuing	Continuing
DAWDF	Various	Not Specified : Not Specified	0.018	0.000		0.000		0.000		-		0.000	0.000	0.018	-
		Subtotal	6.806	0.763		0.678		0.649		-		0.649	Continuing	Continuing	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	125.302	15.618		16.936		16.121		-		16.121	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603654N / *JT Service Explosive Ordn Dev*	**Project (Number/Name)** 4023 / *VSW MCM/Force Protection UUV*

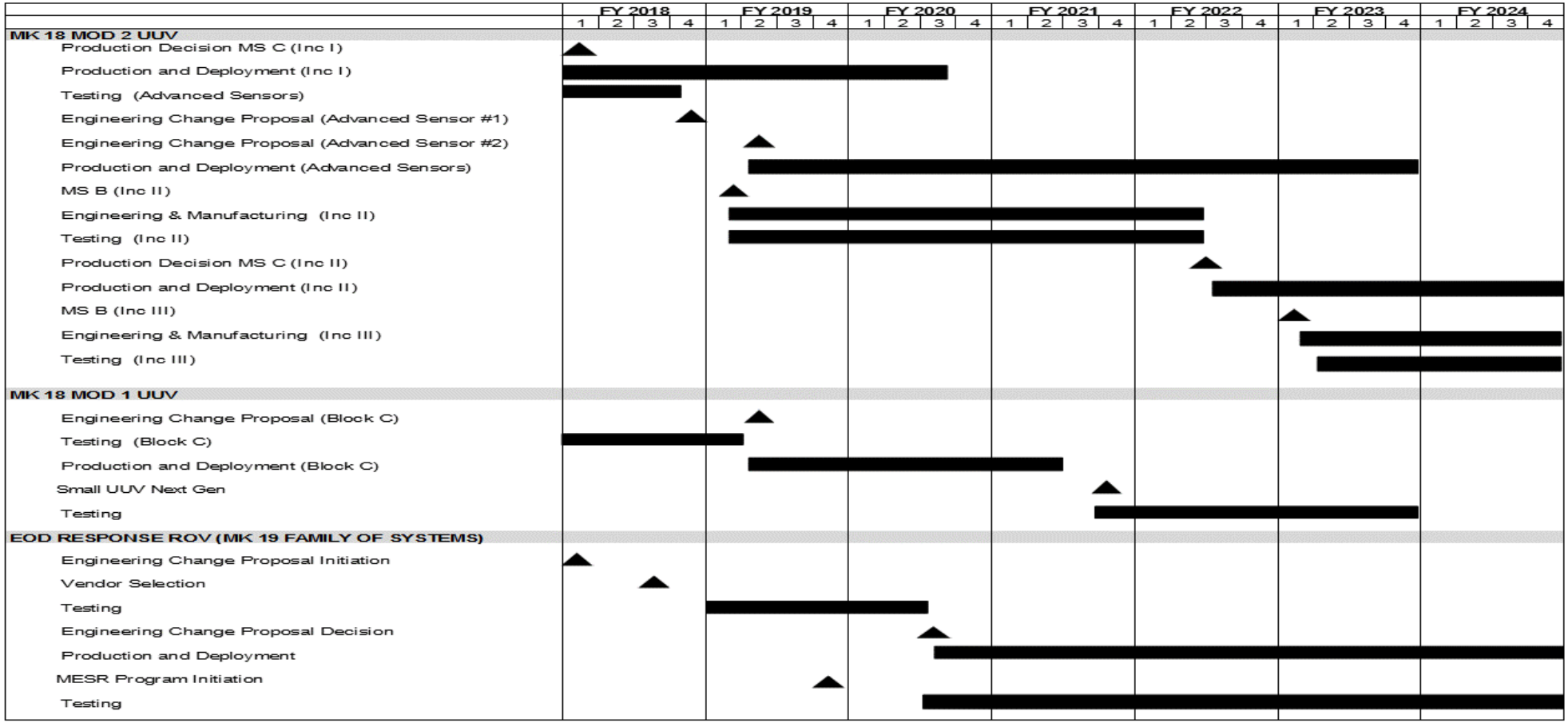


Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603654N / *JT Service Explosive Ordn Dev*	**Project (Number/Name)** 4023 / *VSW MCM/Force Protection UUV*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 4023				
TITLE: MK 18 MOD 2 UUV	1	2018	4	2024
---Production Decision MS C (Inc 1)	1	2018	1	2018
---Production and Deployment (Inc 1)	1	2018	3	2020
---Testing (Advanced Sensors)	1	2018	3	2018
---Engineering Change Proposal (Advanced Sensors #1)	4	2018	4	2018
---Engineering Change Proposal (Advanced Sensors #2)	2	2019	2	2019
---Production and Deployment (Advanced Sensors)	2	2019	4	2023
---MS B (Inc 2)	1	2019	1	2019
---Engineering & Manufacturing (Inc 2)	2	2019	2	2022
---Testing (Inc 2)	2	2019	2	2022
---Production Decision MS C (Inc 2)	2	2022	2	2022
---Production and Deployment (Inc 2)	3	2022	4	2024
---MS B (Inc III)	1	2023	1	2023
---Engineering & Manufacturing (Inc III)	2	2023	4	2024
---Testing (Inc III)	2	2023	4	2024
TITLE: MK 18 MOD 1 UUV	1	2018	4	2024
---Engineering Change Proposal (Block C)	2	2019	2	2019
---Testing (Block C)	1	2018	1	2019
---Production and Deployment (Block C)	2	2019	2	2021
---Small UUV Next Gen	4	2021	4	2021
---Testing (Block D)	4	2021	4	2023

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603654N / *JT Service Explosive Ordn Dev*	**Project (Number/Name)** 4023 / *VSW MCM/Force Protection UUV*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
TITLE: EOD RESPONSE (ROV) (MK 19 FAMILY OF SYSTEMS)	1	2018	4	2024
---Engineering Change Proposal Initiation	1	2018	1	2018
---Vendor Selection	3	2018	3	2018
---Testing.	1	2019	2	2020
---Engineering Change Proposal Decision	3	2020	3	2020
---Production and Deployment	3	2020	4	2024
---MESR Program Initiation	4	2019	4	2019
---Testing	3	2020	4	2024

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603654N / *JT Service Explosive Ordn Dev*	Project (Number/Name) 9999 / *Congressional Adds*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
9999: *Congressional Adds*	0.000	0.000	5.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	5.000
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Develop, acquire, test, and evaluate diver life support systems and diving safety tools and equipment to provide more effective and suitable capabilities to conduct EOD, and Mobile Diving & Salvage Units (MDSU) operations in emergent, high priority underwater missions. Specific tools and equipment include but are not limited to Underwater Breathing Apparatus (UBAs), specialized dive masks, heads-up displays, emergency life support systems and the ability to train divers and to evaluate Mine Countermeasures (MCM)/Explosive Ordnance Disposal (EOD) tools, tactics and procedures including control of signatures with regard to influence fired ordnance both in homeland waters and in controlled threat areas.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019
Congressional Add: Breathing Apparatus for EOD Divers	0.000	5.000
FY 2018 Accomplishments: N/A		
FY 2019 Plans: Efforts will focus on acceleration of the MMUBA acquisition program (MOTS UBA, MK 16 PIP) and diver safety life support enhancements through acquisition of additional prototypes, more rapid acquisition of long lead components for MK 16 UBA PIP and acceleration of bench testing, field demonstrations and environmental evaluation. This funding will significantly enhance the ability to deliver the capabilities defined by the CNO approved MMUBA Capability Definition Document (CDD) of May 2018.		
Congressional Adds Subtotals	0.000	5.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Analysis of Alternatives (AOA) studies are always conducted prior to the initiation of new sub-projects. The AOA addresses and emphasizes acquisition strategies of the most cost-effective solution over the sub-projects life-cycle. The acquisition strategies observe the following hierarchy of alternatives: commercial item (including modification), non- developmental item (including modification), and lastly, developmental programs. Contracting for RDT&E, if required, is always competitive and when feasible, production options are included. Maximum use of innovative contracting mechanisms will be assessed and pursued where applicable and in the best interest of the Navy.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603654N / *JT Service Explosive Ordn Dev*	**Project (Number/Name)** 9999 / *Congressional Adds*

E. Performance Metrics

Performance metrics: Performance metrics vary depending upon specific capability developed aligned with specific missions. Reliability, Availability and Maintainability are primary metrics for life support systems. Metrics also include life support certification requirements mandated by NAVSEA SS521-AA-MAN-010.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603654N / *JT Service Explosive Ordn Dev*	Project (Number/Name) 9999 / *Congressional Adds*	

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Technical Support	C/CPFF	PERATON : Herndon, VA	0.000	0.000		0.828	Nov 2018	0.000		-		0.000	0.000	0.828	-
		Subtotal	0.000	0.000		0.828		0.000		-		0.000	0.000	0.828	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Development Test & Evaluation	WR	NSWC : Panama City	0.000	0.000		3.996	Nov 2018	0.000		-		0.000	0.000	3.996	-
		Subtotal	0.000	0.000		3.996		0.000		-		0.000	0.000	3.996	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management	WR	NSWCIHEODTD : Indian Head, MD	0.000	0.000		0.100	Nov 2018	0.000		-		0.000	0.000	0.100	-
Miscellaneous	WR	NSWCIHEODTD : Indian Head, MD	0.000	0.000		0.076	Nov 2018	0.000		-		0.000	0.000	0.076	-
		Subtotal	0.000	0.000		0.176		0.000		-		0.000	0.000	0.176	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	0.000		5.000		0.000		-		0.000	0.000	5.000	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603654N / *JT Service Explosive Ordn Dev*	**Project (Number/Name)** 9999 / *Congressional Adds*

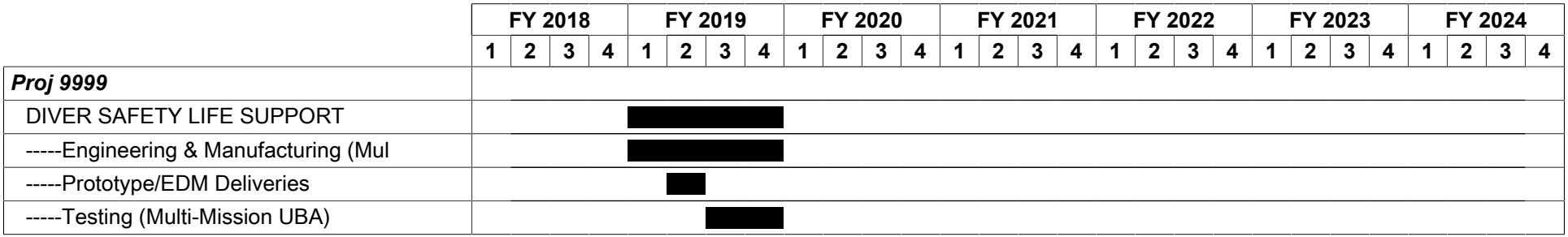


Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603654N / *JT Service Explosive Ordn Dev*	**Project (Number/Name)** 9999 / *Congressional Adds*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 9999				
DIVER SAFETY LIFE SUPPORT	1	2019	4	2019
-----Engineering & Manufacturing (Mul	1	2019	4	2019
-----Prototype/EDM Deliveries	2	2019	2	2019
-----Testing (Multi-Mission UBA)	3	2019	4	2019

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy											Date: March 2019	
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0603713N *I Ocean Engineering Tech Dev*							
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
Total Program Element	64.428	8.853	5.915	5.619	-	5.619	5.731	5.845	5.965	6.085	Continuing	Continuing
0099: *Deep Submergence Bio Med Dev*	35.034	4.620	4.487	4.360	-	4.360	4.444	4.534	4.627	4.720	Continuing	Continuing
0394: *Shallow Depth Diving EQ*	29.394	4.233	1.428	1.259	-	1.259	1.287	1.311	1.338	1.365	Continuing	Continuing

A. Mission Description and Budget Item Justification

Developments in this program will enable the U.S. Navy to overcome deficiencies that constrain manned diving operations in several critical areas such as submarine rescue, recovery, salvage, underwater ship husbandry, underwater construction and naval special operations. This program develops biomedical technology, diver life support equipment, and the systems, tools, and procedures to permit manned underwater operations and enhance diver performance and safety.

B. Program Change Summary ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	8.212	5.915	5.619	-	5.619
Current President's Budget	8.853	5.915	5.619	-	5.619
Total Adjustments	0.641	0.000	0.000	-	0.000
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	0.795	0.000			
• SBIR/STTR Transfer	-0.153	0.000			
• Rate/Misc Adjustments	-0.001	0.000	0.000	-	0.000

Change Summary Explanation

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603713N / *Ocean Engineering Tech Dev*	Project (Number/Name) 0099 / *Deep Submergence Bio Med Dev*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
0099: *Deep Submergence Bio Med Dev*	35.034	4.620	4.487	4.360	-	4.360	4.444	4.534	4.627	4.720	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This project:
1) Develops advanced biomedical and bioengineering technology for medical and life support enhancement to decrease submariner deaths and permanent injury in a disabled submarine (DISSUB) and during submarine escape and rescue;
2) Conducts research for diver health, safety, and effectiveness:
- to increase understanding of human performance and enhanced diver stress management and survivability in high stress environments such as in cold/warm water and at altitude; and - to validate and improve the accuracy of assumptions associated with equipment testing and certification, diving procedures, and diver biomedical physiology.

Deliverables for DISSUB include: medical guidance/procedures increasing submariner survivability for submarine escape and rescue (including new Submarine Rescue Diving and Recompression System (SRDRS)), life support parameters, medical procedures for life support; exposure and mitigation guidance for atmospheric contaminants, high levels of oxygen and/or carbon dioxide; prevention and treatment of decompression sickness and pulmonary oxygen toxicity; and senior survivor expert decision system.

Deliverables for diver health and safety include: decompression guidance in extreme environment diving with various breathing mixtures, temperatures, durations, and altitudes; exposure guidance for oxygen breathing; diver performance guidance based on physiological effects of diving; enhanced underwater swimming efficiency; enhanced diver thermal protection; collection of operational diving depth/time profiles to predict decompression risk, and exposure and mitigation guidance for divers experiencing underwater continuous noise, impulse noise, or underwater blast.

Requirements:
OPNAVINST 3150.27C, Navy Diving Policy and Joint Military Diving Technology and Training Program, 24 Jun 2016
Navy Salvage and Navy Diving Capabilities-Based Assessment (CBA) Report, 19 Dec 2013
NAPDD #587-873, Deep Submergence Biomedical Development, 23 Nov 1999
NAVSEA Instruction 3900.10, Management of the Deep Submergence Biomedical Research and Development Program, 4 Feb 2003
Navy Diving Initial Capabilities Document (ICD)

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Deep Submergence Bio Med Dev - Diver Health and Safety	2.396	2.244	2.180	0.000	2.180

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603713N / *Ocean Engineering Tech Dev*	**Project (Number/Name)** 0099 / *Deep Submergence Bio Med Dev*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Articles:	-	-	-	-	-

Description: Diver Health and Safety Research: Novel methods for decompression safety and treatment of decompression sickness/arterial gas embolism. Advanced decompression models for extreme environments, including thermally challenging, long duration, multi-gas, and/or diving at altitude. Diving physiology advances in exercise, thermal exposure, oxygen/carbon dioxide alterations, other gas mixture alternations, hydration, and sustained operations. Develop pulmonary oxygen toxicity exposure limits. Provide pulmonary and Central Nervous System (CNS) oxygen toxicity mitigation strategies. Develop an advanced diver thermal model. Develop advanced insulation garments for diver thermal protection. Develop guidance for optimizing thermal control during decompression. Develop guidelines for conduct of diving operations at altitude. Develop guidance for infra- and ultra-sound diver exposure. Continue collection of operational and research dive data for inclusion in advanced probabilistic decompression models. Investigate diver in-water maladies. Develop/improve real-time decompression guidance and dive planning. Research procedures for assessing and mitigating risk for diving in contaminated water.

FY 2019 Plans:

* Multi-Year Project Support: Completion of projects initiated in prior fiscal years will be supported where progress is deemed acceptable and project goals remain valid and attainable.

* Modernization of the Navy Dive Planner: Modernizing the Navy Dive Planner to ensure continued availability of this critical dive planning tool as software advances create obsolescence issues for the current version. This work is planned to continue into FY-20.

* Development of 21st Century Helium-O2 Decompression Tables: Sentinel work developing new probabilistic helium-oxygen decompression tables, enabling safer deep diving beyond current limits. This work is planned to continue into FY-20 and FY-21.

* Prevention of Swimming-Induced Pulmonary Edema: Research will begin seeking to prevent Swimming-Induced Pulmonary Edema (SIPE), a problem identified as a priority by the Naval Special Warfare community. This work is planned to continue into FY-20.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603713N / *Ocean Engineering Tech Dev*	**Project (Number/Name)** 0099 / *Deep Submergence Bio Med Dev*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
* Assessment of Ketone Esters for Prevention of CNS O2 Toxicity: Investigation into the utility of ketone esters for prevention of CNS oxygen toxicity will be supported. This will contribute to the goal of enabling divers to submerge for longer times more safely. This work is planned to continue into FY-20 and FY-21. * Assess Heart Rate Variability for Predicting Diver Impairment: An investigation into the association between heart rate variability (HRV) and diver impairment from gas narcosis, oxygen toxicity, or decompression sickness will begin. * Applied Systems Engineering for Warm Water Diving Guidance: Analysis of and improvement to warm water diving guidance will be pursued, to address concerns raised by divers assigned to regions requiring operations in warm water environments. This work is planned to continue into FY-20.					
FY 2020 Base Plans: * Multi-Year Project Support: Completion of projects initiated in prior fiscal years will be supported where progress is deemed acceptable and project goals remain valid and attainable. * Improve Safety of Rebreather Diving: Rebreather diving entails the highest risk diving performed by Navy personnel. This is an ongoing area of focus for the program and projects addressing these concerns will be solicited in future Broad Agency Announcements. This work is planned to continue into FY-21 and FY-22. * Pursue Approval of Medication Use to Prevent O2 Toxicity: Cutting edge approaches using medications and supplements to mitigate oxygen toxicity will be pursued, with seeking and obtaining FDA approval being a major milestone in such efforts. Work will be sponsored to define that process and establish the organizational connections to make this streamlined. This work is planned to continue into FY-21 and FY-22. * Improve Diver Safety Through Innovative Monitoring Techniques: Technological advances are accelerating enabling broad physiologic monitoring of warfighters. We will pursue methods to translate these technologies into the undersea environment. This work is planned to continue into FY-21 and FY-22. * Improve Thermoregulation and Thermal Monitoring: Thermal control for divers remains a top priority and a long-term area of focus for the program due to the mission-limiting nature of this challenge. This work is planned to continue into FY-21 and FY-22.					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603713N / *Ocean Engineering Tech Dev*	**Project (Number/Name)** 0099 / *Deep Submergence Bio Med Dev*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
* Develop Real-Time Decompression Capability for Next Generation Navy Dive Computer: Current advances in computing power are enabling embedding real-time probabilistic decompression models into diver computers. This will be the next significant leap forward in decompression dive planning and is expected to enable risk-based decompression planning. This work is planned to continue into FY-21 and FY-22. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** A decrease of 0.064 in FY20 for the Diver Health, Safety, and Performance portion of the program is due to the reduction of one biomedical research project in this focus area.					
Title: Deep Submergence Bio Med Dev - Submarine Escape & Rescue	2.224	2.243	2.180	0.000	2.180
Articles:	-	-	-	-	-
Description: Submarine Rescue/Escape Research: Provide decompression procedures for pressurized Submarine Rescue Diving and Recompression System (SRDRS) operators. Investigate adjunctive therapies for treating Disabled Submarine (DISSUB) survivors. Provide updated guidance for food, water, clothing, medical supplies, to enhance survival of submarine crews awaiting rescue. Develop/provide flexible computer-generated decompression schedules for wide range of conditions in a DISSUB. Develop DISSUB medical triage procedures and support DISSUB survival trials. Develop mitigation strategies to reduce hyperbaric oxygen exposures in closed vehicles/compartments. Develop treatment guidance for decompression sickness and arterial gas embolism in submarine escape and rescue. Investigate the use of novel pharmacologic agents to reduce decompression risk and/or oxygen toxicity in submarine rescues. Develop/deploy toxic gas analyzer for use in pressurized DISSUB rescue. Investigate interventions for toxicological problems in DISSUB survivors. Develop strategies to minimize decompression sickness and arterial gas embolism with Submarine Escape and Surface Survival Personnel Equipment (SESSPE) training. ***FY 2019 Plans:*** * Multi-Year Project Support: Completion of projects initiated in prior fiscal years will be supported where progress is deemed acceptable and project goals remain valid and attainable. * Man-testing of Specialized Surface Decompression Procedures for DISSUB: Research involving manned testing of specialized oxygen pre-breathe and surface decompression procedures for DISSUB rescue without					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603713N / *Ocean Engineering Tech Dev*	**Project (Number/Name)** 0099 / *Deep Submergence Bio Med Dev*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
TUP will begin to continue our efforts to mitigate this life-threatening scenario. This work is planned to continue into FY-20 and FY-21. * Assessment of Tiotropium Bromide for Prevention of Pulmonary O2 Toxicity: Work will be sponsored to pursue approval to use this FDA approved medication in humans to test its utility for reducing the negative impact of hyperbaric oxygen on lung function. * Medical Response Strategies for DISSUB Escapees: Phase 2 work will be completed, leveraging findings of a prior study focused on submarine rescue, to investigate and develop medical response strategies for submarine escape. * Complete Development and Integration of DISSUB Dive Planner: Recently completed project developing DISSUB Dive Planner will need to have an Independent Validation and Verification (IV&V) performed prior to distribution to the Fleet. This will be conducted in FY19. ***FY 2020 Base Plans:*** * Multi-Year Project Support: Completion of projects initiated in prior fiscal years will be supported where progress is deemed acceptable and project goals remain valid and attainable. * Development of a New Simplified Toxic Gas Detector for DISSUB: New technology has been identified which has the potential to simplify detection and quantification of toxic gas presence in a disabled submarine situation, allowing rapid atmosphere contamination assessment by rescue forces. This work is planned to continue into FY-21 and FY-22. * Improve Guidance in the Submarine Rescue System Decompression Plan: The SRS Decompression Plan is a living document which will be updated based on results from relevant studies completed in prior years. As procedural testing proceeds in effort to certify the rescue system, additional biomedical concerns are expected to arise and will be addressed. This work is planned to continue into FY-21 and FY-22. * Optimize Submarine Cognition and Decision-Making in DISSUB: This will remain an area of focus for the program in an effort to mitigate factors which are expected to diminish effectiveness of personnel, particularly leaders, onboard a DISSUB. This work is planned to continue into FY-21 and FY-22.					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603713N / *Ocean Engineering Tech Dev*	**Project (Number/Name)** 0099 / *Deep Submergence Bio Med Dev*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
* Update DISSUB Rescue Planner: As with the Navy Dive Planner, a need to update and upgrade the DISSUB Rescue Planner is anticipated as Fleet use expands. This work is planned to continue into FY-21 and FY-22. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** A decrease of 0.063M in FY20 for the Submarine Escape and Rescue portion of the program is due to the reduction of one biomedical research project in this focus area.					
Accomplishments/Planned Programs Subtotals	4.620	4.487	4.360	0.000	4.360

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Integrated thrust area teams (e.g., decompression research) are established with university, commercial, and in-house Navy labs to jointly execute biomedical R&D. Peer review of research proposals accomplished by independent Technical Advisory Board. Annual review of progress by Executive Review Board (CNO/NAVSEA/ ONR/BUMED). Program management by 0-6 Undersea Medical Officer. Contracting by competitive process using BAA and leveraging ONR capabilities.

E. Performance Metrics

Quarterly Program Reviews of researcher progress measured against research proposal goals and timelines.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603713N / *Ocean Engineering Tech Dev*	Project (Number/Name) 0099 / *Deep Submergence Bio Med Dev*	

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Development Test & Evaluation	WR	NEDU : Panama City, FL	22.993	1.100	Nov 2017	0.403	Nov 2018	0.000		-		0.000	Continuing	Continuing	Continuing
Development Test & Evaluation	WR	NMRC : Silver Spring, MD	8.410	1.291	Nov 2017	0.692	Nov 2018	0.294	Nov 2019	-		0.294	Continuing	Continuing	Continuing
Development Test & Evaluation	Various	DUKE UNIV : Durham, NC	1.121	1.000	Jul 2018	1.013	Jul 2019	0.650	Nov 2019	-		0.650	Continuing	Continuing	Continuing
Development Test & Evaluation	C/CPFF	ROH : Arlington, VA	0.282	0.000	May 2018	0.030	May 2019	0.030	Nov 2019	-		0.030	Continuing	Continuing	Continuing
Development Test & Evaluation	Various	Various : Various	0.000	0.143	Mar 2018	1.334	Mar 2019	3.050	Mar 2020	-		3.050	Continuing	Continuing	Continuing
Development Test & Evaluation	C/FFP	WISCONSIN : Madison, WI	0.987	0.349	Feb 2018	0.335	Feb 2019	0.000		-		0.000	Continuing	Continuing	Continuing
Development Test & Evaluation	C/FFP	SUNY : Buffalo, NY	0.686	0.587	Apr 2018	0.607	Apr 2019	0.306	Nov 2019	-		0.306	Continuing	Continuing	Continuing
Development Test & Evaluation	WR	NSWC : Panama City, FL	0.039	0.120	Mar 2018	0.041	Nov 2018	0.000		-		0.000	0.000	0.200	-
		Subtotal	34.518	4.590		4.455		4.330		-		4.330	Continuing	Continuing	N/A

Remarks

Cost shown in "various" line reflects the funds that will be available in that fiscal year, based on projected budget, for sponsoring new research. Each year, this number reflects the residual after all ongoing research is funded, and dictates how many new projects can be sponsored that year. It does not reflect growth in the context of the annual allocation of funds, but rather fluctuates based on variations in cost and duration of previously sponsored work. Some years this line item decreases when several long-term expensive studies are selected for sponsorship the year before (as occurred in FY19 compared with FY18). The selection process is annually cyclical and at this time, we do not know what new studies will be selected for FY20 start dates. The "various" line item for FY20 merely reflects that numerous studies will conclude in FY19, making more funds available in FY20 for project selection. The anticipated research study areas for these new starts is identified in the R-2A and R-4 budget exhibits.

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Travel	Various	Various : Various	0.516	0.030	Oct 2017	0.032	Oct 2018	0.030	Oct 2019	-		0.030	Continuing	Continuing	Continuing
		Subtotal	0.516	0.030		0.032		0.030		-		0.030	Continuing	Continuing	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603713N / *Ocean Engineering Tech Dev*	Project (Number/Name) 0099 / *Deep Submergence Bio Med Dev*	

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	35.034	4.620		4.487		4.360		-		4.360	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603713N / *Ocean Engineering Tech Dev*	**Project (Number/Name)** 0099 / *Deep Submergence Bio Med Dev*

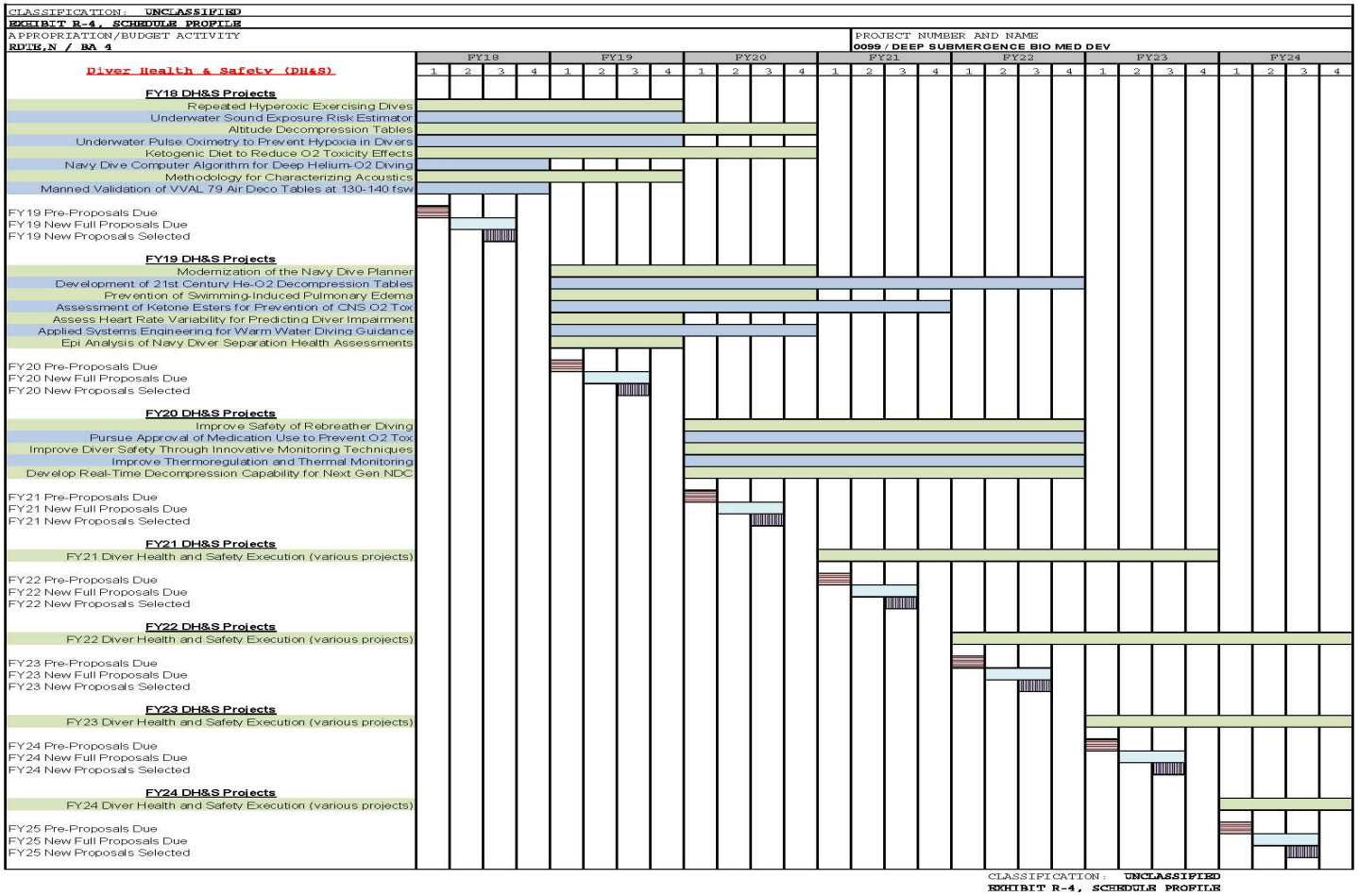


Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603713N / *Ocean Engineering Tech Dev*	**Project (Number/Name)** 0099 / *Deep Submergence Bio Med Dev*

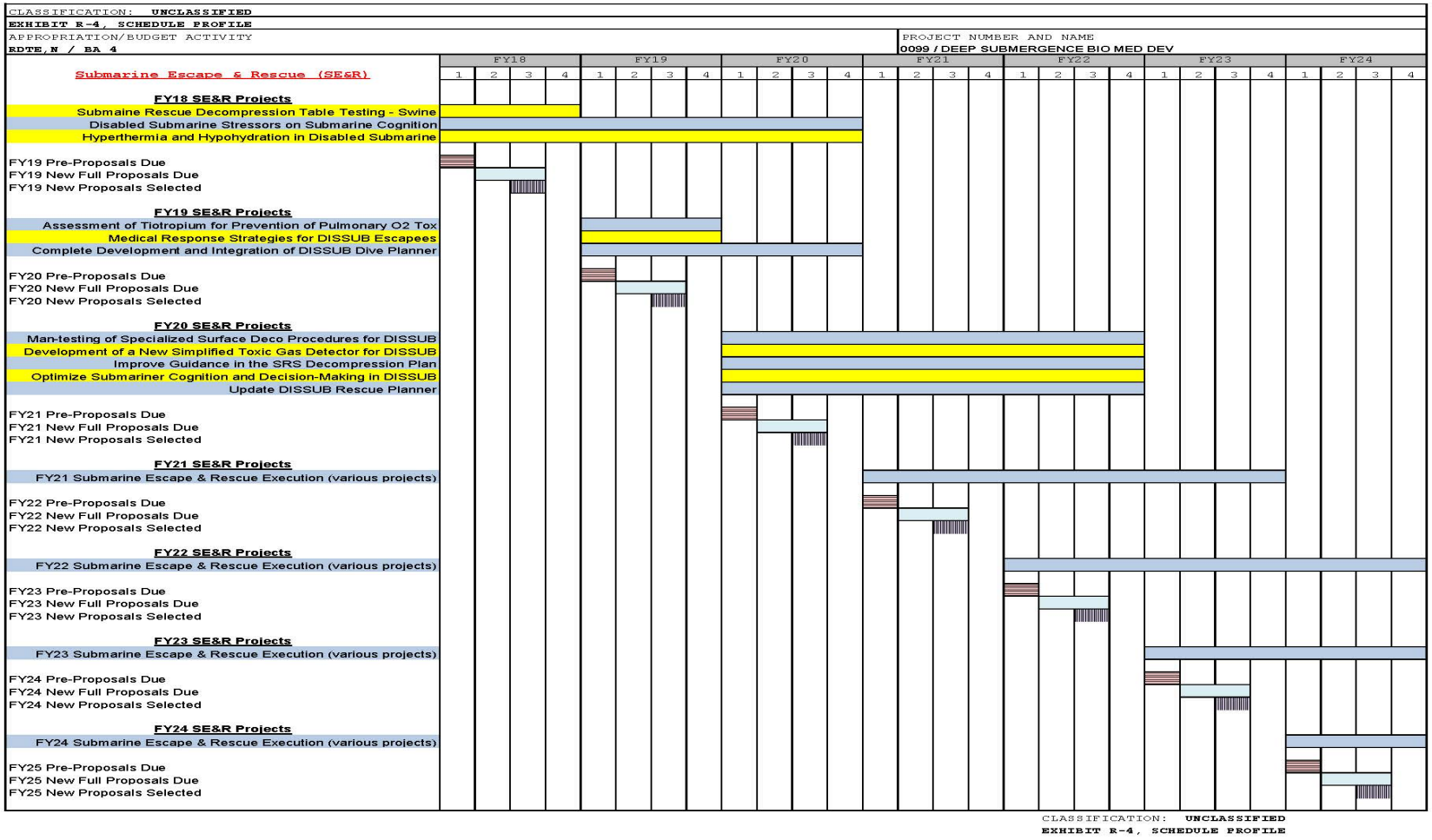


Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603713N / *Ocean Engineering Tech Dev*	**Project (Number/Name)** 0099 / *Deep Submergence Bio Med Dev*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 0099				
Diver Health & Safety (DH&S): FY18 DH&S Projects: Repeated Hyperoxic Exercising Dives	1	2018	4	2019
Diver Health & Safety (DH&S): FY18 DH&S Projects: Underwater Sound Exposure Risk Estimator	1	2018	4	2019
Diver Health & Safety (DH&S): FY18 DH&S Projects: Altitude Decompression Tables	1	2018	4	2020
Diver Health & Safety (DH&S): FY18 DH&S Projects: Underwater Pulse Oximetry to Prevent Hypoxia in Divers	1	2018	4	2019
Diver Health & Safety (DH&S): FY18 DH&S Projects: Ketogenic Diet to Reduce O2 Toxicity Effects	1	2018	4	2020
Diver Health & Safety (DH&S): FY18 DH&S Projects: Navy Dive Computer Algorithm for Deep Helium-O2 Diving	1	2018	4	2018
Diver Health & Safety (DH&S): FY19 Pre-Proposals Due	1	2018	1	2018
Diver Health & Safety (DH&S): Page/Group/Row: FY19 New Full Proposals Due	2	2018	3	2018
Diver Health & Safety (DH&S): Page/Group/Row: FY19 New Proposals Selected	3	2018	3	2018
Diver Health & Safety (DH&S): FY19 DH&S Projects: Modernization of the Navy Dive Planner	1	2019	4	2020
Diver Health & Safety (DH&S): FY19 DH&S Projects: Development of 21st Century He-O2 Decompression Tables	1	2019	4	2022
Diver Health & Safety (DH&S): FY19 DH&S Projects: Prevention of Swimming-Induced Pulmonary Edema	1	2019	4	2020
Diver Health & Safety (DH&S): FY19 DH&S Projects: Assessment of Ketone Esters for Prevention of CNS O2 Tox	1	2019	4	2021
Diver Health & Safety (DH&S): FY19 DH&S Projects: Assess Heart Rate Variability for Predicting Diver Impairment	1	2019	4	2019

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603713N / *Ocean Engineering Tech Dev*	**Project (Number/Name)** 0099 / *Deep Submergence Bio Med Dev*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Diver Health & Safety (DH&S): FY19 DH&S Projects: Applied Systems Engineering for Warm Water Diving Guidance	1	2019	4	2020
Diver Health & Safety (DH&S): FY19 DH&S Projects: 'Epi Analysis of Navy Diver Separation Health Assessments	1	2019	4	2019
Diver Health & Safety (DH&S): FY20 Pre-Proposals Due	1	2019	1	2019
Diver Health & Safety (DH&S): FY20 New Full Proposals Due	2	2019	3	2019
Diver Health & Safety (DH&S): FY20 New Proposals Selected	3	2019	3	2019
Diver Health & Safety (DH&S): FY20 DH&S Projects: Improve Safety of Rebreather Diving	1	2020	4	2022
Diver Health & Safety (DH&S): FY20 DH&S Projects: Pursue Approval of Medication Use to Prevent O2 Tox	1	2020	4	2022
Diver Health & Safety (DH&S): FY20 DH&S Projects: Improve Diver Safety Through Innovative Monitoring Techniques	1	2020	4	2022
Diver Health & Safety (DH&S): FY20 DH&S Projects: Improve Thermoregulation and Thermal Monitoring	1	2020	4	2022
Diver Health & Safety (DH&S): FY20 DH&S Projects: Develop Real-Time Decompression Capability for Next Gen NDC	1	2020	4	2022
Diver Health & Safety (DH&S): FY21 Pre-Proposals Due	1	2020	1	2020
Diver Health & Safety (DH&S): FY21 New Full Proposals Due	2	2020	3	2020
Diver Health & Safety (DH&S): FY21 New Proposals Selected	3	2020	3	2020
Diver Health & Safety (DH&S): 'FY21 DH&S Projects: 'FY21 Diver Health and Safety Execution (various projects)	1	2021	4	2023
Diver Health & Safety (DH&S): FY22 Pre-Proposals Due	1	2020	1	2020
Diver Health & Safety (DH&S): FY22 New Full Proposals Due	2	2020	3	2020
Diver Health & Safety (DH&S): FY22 New Proposals Selected	3	2020	3	2020
Diver Health & Safety (DH&S): 'FY22 DH&S Projects: 'FY22 Diver Health and Safety Execution (various projects)	1	2022	4	2024

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603713N / *Ocean Engineering Tech Dev*	**Project (Number/Name)** 0099 / *Deep Submergence Bio Med Dev*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Diver Health & Safety (DH&S): FY23 Pre-Proposals Due	1	2022	1	2022
Diver Health & Safety (DH&S): FY23 New Full Proposals Due	2	2022	3	2022
Diver Health & Safety (DH&S): FY23 New Proposals Selected	3	2022	3	2022
Diver Health & Safety (DH&S): 'FY23 DH&S Projects: 'FY23 Diver Health and Safety Execution (various projects)	1	2023	4	2024
Diver Health & Safety (DH&S): FY24 Pre-Proposals Due	1	2023	1	2023
Diver Health & Safety (DH&S): FY24 New Full Proposals Due	2	2023	3	2023
Diver Health & Safety (DH&S): FY24 New Proposals Selected	3	2023	3	2023
Diver Health & Safety (DH&S): 'FY24 DH&S Projects: 'FY24 Diver Health and Safety Execution (various projects)	1	2024	4	2024
Diver Health & Safety (DH&S): FY25 Pre-Proposals Due	1	2024	1	2024
Diver Health & Safety (DH&S): FY25 New Full Proposals Due	2	2024	3	2024
Diver Health & Safety (DH&S): FY25 New Proposals Selected	3	2024	3	2024
Submarine Escape & Rescue (SE&R): FY18 SE&R Projects: Submarine Rescue Decompression Table Testing - Swine	1	2018	4	2018
Submarine Escape & Rescue (SE&R): FY18 SE&R Projects: Disabled Submarine Stressors on Submarine Cognition	1	2018	4	2020
Submarine Escape & Rescue (SE&R): FY18 SE&R Projects: Hyperthermia and Hypohydration in Disabled Submarine	1	2018	4	2020
Submarine Escape & Rescue (SE&R): FY19 Pre-Proposals Due	1	2018	1	2018
Submarine Escape & Rescue (SE&R): FY19 New Full Proposals Due	2	2018	3	2018
Submarine Escape & Rescue (SE&R): FY19 New Proposals Selected	3	2018	3	2018
Submarine Escape & Rescue (SE&R): 'FY19 SE&R Projects: Assessment of Tiotripium for Prevention of Pulmonary O2 Tox	1	2019	4	2019
Submarine Escape & Rescue (SE&R): 'FY19 SE&R Projects: Medical Response Strategies for DISSUB Escapees	1	2019	4	2019

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603713N / *Ocean Engineering Tech Dev*	**Project (Number/Name)** 0099 / *Deep Submergence Bio Med Dev*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Submarine Escape & Rescue (SE&R): 'FY19 SE&R Projects: Complete Development and Integration of DISSUB Dive Planner	1	2019	4	2020
Submarine Escape & Rescue (SE&R): FY20 Pre-Proposals Due	1	2019	1	2019
Submarine Escape & Rescue (SE&R): FY20 New Full Proposals Due	2	2019	3	2019
Submarine Escape & Rescue (SE&R): FY20 New Proposals Selected	3	2019	3	2019
Submarine Escape & Rescue (SE&R): 'FY20 SE&R Projects: 'Man-testing of Specialized Surface Deco Procedures for DISSUB	1	2020	1	2022
Submarine Escape & Rescue (SE&R): 'FY20 SE&R Projects: Development of a New Simplified Toxic Gas Detector for DISSUB	1	2020	4	2022
Submarine Escape & Rescue (SE&R): 'FY20 SE&R Projects: Improve Guidance in the SRS Decompression Plan	1	2020	4	2022
Submarine Escape & Rescue (SE&R): 'FY20 SE&R Projects: Optimize Submariner Cognition and Decision-Making in DISSUB	1	2020	4	2022
Submarine Escape & Rescue (SE&R): 'FY20 SE&R Projects: Update DISSUB Rescue Planner	1	2020	4	2022
Submarine Escape & Rescue (SE&R): FY21 Pre-Proposals Due	1	2020	1	2020
Submarine Escape & Rescue (SE&R): FY21 New Full Proposals Due	2	2020	3	2020
Submarine Escape & Rescue (SE&R): FY21 New Proposals Selected	3	2020	3	2020
Submarine Escape & Rescue (SE&R): FY21 SE&R Projects: FY21 Submarine Escape & Rescue Execution (various projects)	1	2021	4	2023
Submarine Escape & Rescue (SE&R): FY22 Pre-Proposals Due	1	2021	1	2021
Submarine Escape & Rescue (SE&R): FY22 New Full Proposals Due	2	2021	3	2021
Submarine Escape & Rescue (SE&R): FY22 New Proposals Selected	3	2021	3	2021
Submarine Escape & Rescue (SE&R): FY22 SE&R Projects: FY22 Submarine Escape & Rescue Execution (various projects)	1	2022	1	2024
Submarine Escape & Rescue (SE&R): FY23 Pre-Proposals Due	1	2022	1	2022
Submarine Escape & Rescue (SE&R): FY23 New Full Proposals Due	2	2022	3	2022

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603713N / *Ocean Engineering Tech Dev*	**Project (Number/Name)** 0099 / *Deep Submergence Bio Med Dev*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Submarine Escape & Rescue (SE&R): FY23 New Proposals Selected	3	2022	3	2022
Submarine Escape & Rescue (SE&R): FY23 SE&R Projects: FY23 Submarine Escape & Rescue Execution (various projects)	1	2023	4	2024
Submarine Escape & Rescue (SE&R): FY24 Pre-Proposals Due	1	2023	1	2023
Submarine Escape & Rescue (SE&R): FY24 New Full Proposals Due	2	2023	3	2023
Submarine Escape & Rescue (SE&R): FY24 New Proposals Selected	3	2023	3	2023
Submarine Escape & Rescue (SE&R): FY24 SE&R Projects: FY24 Submarine Escape & Rescue Execution (various projects)	1	2024	4	2024
Submarine Escape & Rescue (SE&R): FY25 Pre-Proposals Due	1	2024	1	2024
Submarine Escape & Rescue (SE&R): FY25 New Full Proposals Due	2	2024	3	2024
Submarine Escape & Rescue (SE&R): FY25 New Proposals Selected	3	2024	3	2024

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603713N / *Ocean Engineering Tech Dev*	Project (Number/Name) 0394 / *Shallow Depth Diving EQ*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
0394: *Shallow Depth Diving EQ*	29.394	4.233	1.428	1.259	-	1.259	1.287	1.311	1.338	1.365	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This project develops systems to support submarine escape and rescue missions, and conventional diver operations. Diver operations include ship husbandry, salvage/ recovery, and submarine rescue operations to support national, as well as Navy, needs around the world. Modern certifiable diving systems that ensure diver safety and allow maximum work efficiency will replace currently antiquated systems. R&D will be performed in the areas of diver efficiency, visual enhancement, contaminated water diving, diver thermal protection, and recompression chamber technology.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Shallow Depth Diving EQ - Diving	1.709	1.379	1.209	0.000	1.209
Articles:	-	-	-	-	-

Description: Continued research into all engineering and equipment design aspects of manned diving, to include: life support, contaminated water, SCUBA, gas analysis, thermal protection, saturation diving, and divers tools.

FY 2019 Plans:

* Diver Augmented Visual Display (DAVD) Hi Res Sonar: Begin design work on a high resolution, high frequency, short range visualization system (HI RES SONAR) that will integrate with DAVD system. This will allow accurate, real time visualization for use when conducting underwater search, salvage, ships husbandry, or construction in low visibility waters.

* FLEX Chamber Development: Continue design of a flexible, double lock, recompression chamber. This year will see the completion of developmental pressure vessel testing, design of all of the internal components, as well as the control and gas supply systems.

* Modernized SCUBA Regulator Testing: Testing of five (5) COTS SCUBA regulator sets is planned for FY18 through FY20. Complete testing of three (3) of the remaining four (4) SCUBA regulators is planned for FY19.

FY 2020 Base Plans:

* Diver Augmented Visual Display: Hi Res Sonar: Continue design and testing of a high resolution, high frequency, short range visualization system (HI RES SONAR) that will integrate with DAVD system. This will

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603713N / *Ocean Engineering Tech Dev*	**Project (Number/Name)** 0394 / *Shallow Depth Diving EQ*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
allow accurate, real time visualization for use when conducting underwater search, salvage, ships husbandry, or construction in low visibility waters. * FLEX Chamber Development: Complete the design and fabrication of the prototype flexible, double lock, recompression chamber. This year will see the completion of all developmental work for the system. The full prototype model will be built, tested and delivered to the US Navy for follow-on independent testing. * Modernized SCUBA Regulator Testing: Testing of five (5) COTS SCUBA regulator sets is planned for FY18 through FY20. Complete testing of the final SCUBA regulator is planned for FY20 as well as the delivery of the final report comparing performance and recommending which to select. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** The decrease of $0.17M from PB19 is due to shifting from design to fabrication and testing of the DAVD system.					
Title: Shallow Depth Diving EQ - Submarine Rescue ***Articles:*** ***Description:*** Submarine rescue decompression system permits decompression of submarine crew rescued from a pressurized, disabled submarine of pressures up to 6 atmospheres (ATA). ***FY 2019 Plans:*** Engineering analysis of pressurized rescue skirt to address shallow water rescue capability gap. ***FY 2020 Base Plans:*** Engineering evaluation of system capability increases. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increase of 0.001 from FY19 to FY20 is due to inflation.	2.524 -	0.049 -	0.050 -	0.000 -	0.050 -
Accomplishments/Planned Programs Subtotals	4.233	1.428	1.259	0.000	1.259

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603713N / *Ocean Engineering Tech Dev*	**Project (Number/Name)** 0394 / *Shallow Depth Diving EQ*

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• OPN/0955: *Deep Subm Sys Proj (DSSP) Equip*	4.178	3.629	2.909	-	2.909	2.971	3.029	3.091	3.152	Continuing	Continuing
• OPN/1130: *Diving and Salvage Equipment*	10.619	10.706	11.854	-	11.854	10.654	10.881	11.078	11.299	0.000	128.194

Remarks

D. Acquisition Strategy

Diving Program acquisitions are executed and managed by SEA00C. Acquisitions are made for both COTS and developmental items as required to ensure adequate operational availability and safety of the diver. R&D projects are selected in March for a November award using a Broad Area Announcement.
Submarine Rescue Systems - prime integration contract is in place and final efforts in pursuit of certification are underway.

E. Performance Metrics

Diving - Semi-annual program review with NEDU.
Diving - Annual program review for each R&D project.
Diving & Submarine Rescue - Quarterly execution assessments.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603713N / *Ocean Engineering Tech Dev*	**Project (Number/Name)** 0394 / *Shallow Depth Diving EQ*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Systems Engineering - Design, Integration (PMS-391 TUP)	C/CPFF	Oceaneering : Hanover, MD	24.409	2.524	Oct 2017	0.000		0.000		-		0.000	0.000	26.933	-
Systems Engineering - Design, Integration (PMS-391)	WR	NUWC : Newport, RI	0.000	0.000		0.049	Jan 2019	0.000		-		0.000	0.000	0.049	-
Systems Engineering - Design, Integration (PMS-391)	Various	Various : Various	0.000	0.000		0.000		0.050	Dec 2019	-		0.050	0.000	0.050	-
Diving Equipment Product Development (00C)	C/CPFF	Phoenix : Largo, MD	0.000	0.430	Jan 2018	0.000		0.000		-		0.000	0.000	0.430	-
Diving Equipment Product Development (00C)	Various	Various : Various	2.622	0.000		0.400	Oct 2018	0.589	Oct 2019	-		0.589	Continuing	Continuing	Continuing
Diving Equipment Product Development (00C)	C/CPFF	PCCI : Alexandria, VA	0.329	0.880	Mar 2018	0.680	Jan 2019	0.463	Jan 2020	-		0.463	0.000	2.352	-
Diving Equipment Product Development (00C)	C/CPFF	Penn state UARC : Not Specified	0.400	0.200	Jan 2018	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Diving Equipment Product Development (00C)	WR	NSWC-PC : Panama City, FL	0.583	0.041	Nov 2017	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
		Subtotal	28.343	4.075		1.129		1.102		-		1.102	Continuing	Continuing	N/A

Remarks

Cost shown in various lines is due to the unknowns of who will be the Prime Contractor on the Divers Augmented Visual Display (DAVD): Hi Res Sonar project. Various is used as a generic header in this case. The funds are intended for the DAVD project.

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Developmental Test and Evaluation (00C)	WR	NEDU : Panama City, FL	0.451	0.075	Mar 2018	0.205	Jan 2019	0.051	Jan 2020	-		0.051	0.000	0.782	-
		Subtotal	0.451	0.075		0.205		0.051		-		0.051	0.000	0.782	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603713N / *Ocean Engineering Tech Dev*	**Project (Number/Name)** 0394 / *Shallow Depth Diving EQ*

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Travel (00C)	Various	NAVSEA : Washington, DC	0.140	0.013	Oct 2017	0.007	Oct 2018	0.026	Oct 2019	-		0.026	Continuing	Continuing	Continuing
SBIR Assessment	Various	Various : Various	0.443	0.070	Oct 2017	0.059	Oct 2018	0.051	Oct 2019	-		0.051	0.000	0.623	-
Program Management Support (00C)	C/CPFF	Unknown : Not Specified	0.017	0.000	Mar 2018	0.028	Mar 2019	0.029	Mar 2020	-		0.029	Continuing	Continuing	Continuing
		Subtotal	0.600	0.083		0.094		0.106		-		0.106	Continuing	Continuing	N/A

	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	29.394	4.233		1.428		1.259		-		1.259	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603713N / *Ocean Engineering Tech Dev*	**Project (Number/Name)** 0394 / *Shallow Depth Diving EQ*

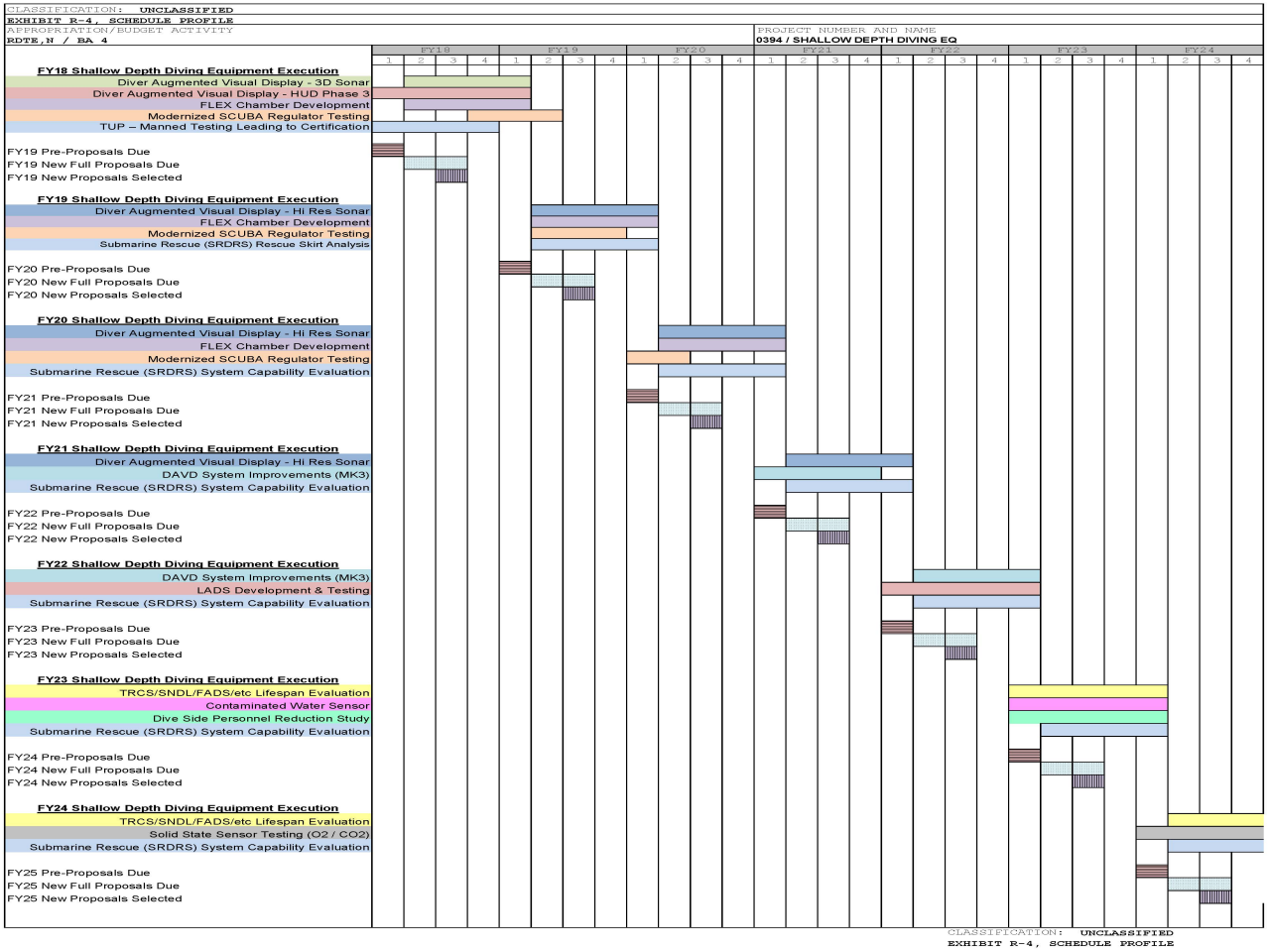


Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603713N / *Ocean Engineering Tech Dev*	**Project (Number/Name)** 0394 / *Shallow Depth Diving EQ*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 0394				
FY18 Shallow Depth Diving Equipment Execution: Diver Augmented Visual Display - 3D Sonar	2	2018	1	2019
FY18 Shallow Depth Diving Equipment Execution: Diver Augmented Visual Display - HUD Phase 3	1	2018	1	2019
FY18 Shallow Depth Diving Equipment Execution: FLEX Chamber Development	2	2018	1	2019
FY18 Shallow Depth Diving Equipment Execution: Modernized SCUBA Regulator Testing	4	2018	2	2019
FY18 Shallow Depth Diving Equipment Execution: TUP Manned Testing Leading to Certification	1	2018	4	2018
FY19 Pre-Proposals Due	1	2018	1	2018
FY19 New Full Proposals Due	2	2018	3	2018
FY19 New Proposals Selected	3	2018	3	2018
FY19 Shallow Depth Diving Equipment Execution: Diver Augmented Visual Display - Hi Res Sonar	2	2019	1	2020
FY19 Shallow Depth Diving Equipment Execution: FLEX Chamber Development	2	2019	1	2020
FY19 Shallow Depth Diving Equipment Execution: Modernized SCUBA Regulator Testing	2	2019	4	2019
FY19 Shallow Depth Diving Equipment Execution: Submarine Rescue (SRDRS) Rescue Skirt Analysis	2	2019	1	2020
FY20 Pre-Proposals Due	1	2019	1	2019
FY20 New Full Proposals Due	2	2019	3	2019
FY20 New Proposals Selected	3	2019	3	2019

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603713N / *Ocean Engineering Tech Dev*	**Project (Number/Name)** 0394 / *Shallow Depth Diving EQ*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
FY20 Shallow Depth Diving Equipment Execution: Diver Augmented Visual Display - Hi Res Sonar	2	2020	1	2021
FY20 Shallow Depth Diving Equipment Execution: FLEX Chamber Development	2	2020	1	2021
FY20 Shallow Depth Diving Equipment Execution: Modernized SCUBA Regulator Testing	1	2020	2	2020
FY20 Shallow Depth Diving Equipment Execution: Submarine Rescue (SRDRS) System Capability Evaluation	2	2020	1	2021
FY21 Pre-Proposals Due	1	2020	1	2020
FY21 New Full Proposals Due	2	2020	3	2020
FY21 New Proposals Selected	3	2020	3	2020
FY21 Shallow Depth Diving Equipment Execution: Diver Augmented Visual Display - Hi Res Sonar	2	2021	1	2022
FY21 Shallow Depth Diving Equipment Execution: DAVD System Improvements (MK3)	1	2021	4	2021
FY21 Shallow Depth Diving Equipment Execution: Submarine Rescue (SRDRS) System Capability Evaluation	2	2021	4	2021
FY22 Pre-Proposals Due	1	2021	1	2021
FY22 New Full Proposals Due	2	2021	3	2021
FY22 New Proposals Selected	3	2021	3	2021
FY22 Shallow Depth Diving Equipment Execution: DAVD System Improvements (MK3)	2	2022	1	2023
FY22 Shallow Depth Diving Equipment Execution: LADS Development & Testing	1	2022	1	2023
FY22 Shallow Depth Diving Equipment Execution: Submarine Rescue (SRDRS) System Capability Evaluation	2	2022	1	2023
FY23 Pre-Proposals Due	1	2022	1	2022
FY23 New Full Proposals Due	2	2022	2	2023
FY23 New Proposals Selected	3	2022	3	2023
'FY23 Shallow Depth Diving Equipment Execution: TRCS/SNDL/FADS/etc Lifespan Evaluation	1	2023	1	2024

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603713N / *Ocean Engineering Tech Dev*	**Project (Number/Name)** 0394 / *Shallow Depth Diving EQ*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
'FY23 Shallow Depth Diving Equipment Execution: Contaminated Water Sensor	1	2023	1	2024
'FY23 Shallow Depth Diving Equipment Execution: Dive Side Personnel Reduction Study	1	2023	1	2024
'FY23 Shallow Depth Diving Equipment Execution: Submarine Rescue (SRDRS) System Capability Evaluation	2	2023	1	2024
FY24 Pre-Proposals Due	1	2023	1	2023
FY24 New Full Proposals Due	2	2023	3	2023
FY24 New Proposals Selected	3	2023	3	2023
'FY24 Shallow Depth Diving Equipment Execution: TRCS/SNDL/FADS/etc Lifespan Evaluation	2	2024	4	2024
'FY24 Shallow Depth Diving Equipment Execution: Solid State Sensor Testing (O2 / CO2)	1	2024	4	2024
'FY24 Shallow Depth Diving Equipment Execution: Submarine Rescue (SRDRS) System Capability Evaluation	2	2024	4	2024
FY25 Pre-Proposals Due	1	2024	1	2024
FY25 New Full Proposals Due	2	2024	3	2024
FY25 New Proposals Selected	3	2024	3	2024

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy											Date: March 2019	
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0603721N *I Environmental Protection*							
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
Total Program Element	461.403	23.237	19.811	20.564	-	20.564	20.172	20.585	20.945	21.357	Continuing	Continuing
0401: *Shipboard Waste Mgmt*	359.356	7.889	7.776	7.979	-	7.979	8.810	8.991	9.143	9.321	Continuing	Continuing
0817: *Environmental Sustainability Development (NESDI)*	49.952	4.747	4.266	4.440	-	4.440	6.087	6.203	6.323	6.450	Continuing	Continuing
2015: *Environmental Restoration RDT&E*	0.000	2.525	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	2.525
9204: *Marine Mammal Research*	52.095	4.478	4.769	5.145	-	5.145	5.275	5.391	5.479	5.586	Continuing	Continuing
9205: *Marine Mammal Settlement*	0.000	3.000	3.000	3.000	-	3.000	0.000	0.000	0.000	0.000	0.000	9.000
9999: *Congressional Adds*	0.000	0.598	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	0.598

A. Mission Description and Budget Item Justification

This program develops and evaluates processes, hardware, systems, operational procedures, scientific methods, and environmental studies that will allow the Navy to operate in U.S., foreign, and international waters, air, space, and land areas while complying with environmental laws, regulations, Executive Orders, policies and international agreements.

Many environmental laws, regulations, and policies impose restrictions on Navy training and testing, vessels, aircraft, and facilities that interfere with operations and/or increase the cost of operations. The Navy must be able to conduct its national security mission in compliance with applicable environmental requirements in the U.S. and abroad without compromising performance, safety, or health, while simultaneously minimizing the cost of compliance. The projects for this Program Element (PE) support the Navy's compliance with the (a) Clean Water Act, (b) Act to Prevent Pollution from Ships, (c) International Convention for the Prevention of Pollution from Ships, (d) DoD Regulations on Vessels Owned or Operated by the Department of Defense, (e) OPNAV Environmental and Natural Resources Program Manual, (f) Uniform National Discharge Standards [UNDS] Phase I Standard, (EO) 13148, Greening the Government Through Leadership in Environmental Management, (g) Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990, (h) National Invasive Species Act of 1996, (i) Ballast Water Management for Control of Nonindigenous Species in Waters of the United States, (j) Clean Air Act, (k) Federal Insecticide, Fungicide, and Rodenticide Act, (l) Marine Mammal Protection Act, and (m) Endangered Species Act, (n) Comprehensive Environmental Response, Compensation, and Liability Act, and (o) Resource Conservation and Recovery Act. References (a) through (m) establish Level I environmental protection requirements. Project 0401, Shipboard Waste Management, supports efforts that enable Navy ships and submarines to comply with laws, regulations, and policies in six major areas: (1) Liquid Wastes, (2) UNDS Rulemaking, (3) Hazardous Materials and Pollution Prevention, (4) Hull Antifouling Paints, (5) Technical Authority, and (6) Ballast Water Exchange Improvements. Project 0817, Environmental Sustainability Development, supports the development and validation of technologies to enable Navy facilities to comply with environmental laws, regulations, and policies in a cost-effective manner.

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0603721N *I Environmental Protection*

The Marine Mammal Research (MMR) program is responsible for applied research and works to address the Navy's key research needs and transition the results and technologies for use within the Navy's at-sea environmental compliance and permitting processes in compliance with the Marine Mammal Protection Act and the Endangered Species Act, with the goals of improving marine species impact analysis (including marine mammal take estimates), mitigation measures and monitoring capabilities. Key points of the MMR mission are: (1) Improve the best available science regarding the potential impacts to marine species from Navy activities, (2) Expand the technology and methods available to the U.S. Navy marine species monitoring program (3) Preserve core Navy readiness capabilities. The This funding allows the Navy to avoid or reduce the chances of costly litigation for non-compliance.

$3.000M added in FY 2018 and FY2019 in accordance with settlement agreement under Marine Mammal Protection Act (new project created).

B. Program Change Summary ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	20.214	19.811	20.351	-	20.351
Current President's Budget	23.237	19.811	20.564	-	20.564
Total Adjustments	3.023	0.000	0.213	-	0.213
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	2.525	0.000			
• SBIR/STTR Transfer	-0.099	0.000			
• Program Adjustments	0.000	0.000	0.000	-	0.000
• Rate/Misc Adjustments	-0.001	0.000	0.213	-	0.213
• Congressional Add Adjustments	0.598	-	-	-	-

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2018	FY 2019
Project: 9999: *Congressional Adds*		
Congressional Add: *Program Increase*	0.598	0.000
Congressional Add Subtotals for Project: 9999	0.598	0.000
Congressional Add Totals for all Projects	0.598	0.000

Change Summary Explanation

The FY 2019 funding request was reduced by ($.104) million to reflect the Department of Navy's effort to support the Office of Management and Budget directed reforms for Efficiency and Effectiveness that include a lean, accountable, more efficient government.

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0603721N *I Environmental Protection*

Technical: FY19: TA reduced to support Ballast Water Management tasking related to procurement and testing of Navy approved Ballast Water Treatment System. Liquid Waste decrease due to completion of shipboard piping modifications for long-term assessment of sewage and graywater piping development, prevention, and cleaning. Non-copper Anti-fouling decrease reflects completion of in-situ testing of antifouling coatings.
Schedule: Not applicable.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy											Date: March 2019	
Appropriation/Budget Activity 1319 / 4					R-1 Program Element (Number/Name) PE 0603721N / *Environmental Protection*				Project (Number/Name) 0401 / *Shipboard Waste Mgmt*			
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
0401: *Shipboard Waste Mgmt*	359.356	7.889	7.776	7.979	-	7.979	8.810	8.991	9.143	9.321	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Navy ships and submarines must routinely operate in U.S., international, and foreign waters, and visit numerous U.S. and foreign ports. No body of water is without environmental restrictions that impact the movements and operations of Navy vessels. Environmental requirements tend to be most restrictive in port and in coastal waters, where the Navy's increasing littoral presence places ships and submarines in discharge-restricted waters for longer periods of time. Growing international cooperation in addressing global environmental concerns is resulting in expanding areas of ocean considered environmentally susceptible, where special prohibitions on ship discharges and operations are imposed. Navy vessels must comply with applicable environmental legal requirements while maintaining continued access to all waters for operations, exercises, training, and port access. The large crews and limited on-board space of Navy ships and submarines severely constrain their ability to hold wastes for return to port for shore side disposal.

Project 0401, Shipboard Waste Management, evaluates and develops shipboard environmental equipment, systems, technologies, processes, and practices to comply with environmental laws, regulations, Executive Orders, international agreements, foreign-country requirements, and DoD and Navy policies. The project focuses on providing engineering criteria, design guidance, and performance specifications for selecting, procuring, installing, integrating, and operating environmental equipment and systems on Navy ships and submarines, and on defining and developing processes, procedures and logistics support requirements. Environmental equipment, systems, processes and practices must meet legal and environmental requirements and be reliable, maintainable and achievable at sea, and impose no or low manning burden. Environmental equipment and systems must meet Navy-unique shipboard requirements (performance, space, weight, shock, vibration, electromagnetic compatibility, manning, automation, etc.), incorporate integrated logistics support, minimize life-cycle cost, and include validated acquisition, design, installation, and operating documentation. Shipboard processes and practices must be feasible and must be compatible with ship and submarine operational, maintenance, manning, habitability, health, and safety requirements. It also addresses afloat environmental issues other than shipboard wastes, e.g., access to environmental data for planning Fleet operations and exercises.

The Afloat Environmental Quality Program supports the designated Technical Warrant Holders for Environmental Systems & Materials Engineering, with responsibility and accountability for ensuring that ships and submarines are designed and upgraded, and can be operated, in compliance with existing and anticipated environmental requirements while minimizing total ownership cost and manning. This responsibility encompasses legacy platforms and new vessel designs, as well as Fleet operations exercises, and training.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**
Title: Technical Authority (TA)	1.654	1.500	1.450	0.000	1.450
Articles:	-	-	-	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603721N / *Environmental Protection*	**Project (Number/Name)** 0401 / *Shipboard Waste Mgmt*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Description: Funding in support of TA utilized to develop waste stream design criteria and guidance. This includes system/technology selection, processing capacity, interfaces, shipboard integration, test and qualification protocols, processes and practices, and performance specifications. ***FY 2019 Plans:*** - Develop and finalize DDG oil spill guidance to improve response to spills and content of spill messages - Continue market research on commercial waste management systems for detailed acquisition and evaluation. - Work with Fleet, acquisition programs, and technical authorities to review and provide comments on issues, risks, and opportunities so as minimize the cost and risk to the Navy. - Incorporate emergent ship spills and other oil spill discharge violations into the oil spill database. - Based on oil spill root cause analysis, identify solutions to reduce future risk. - Gain Fleet concurrence on oil spill risk reduction implementation plans. - Meet with NATO and foreign Navy data exchange partners to leverage lessons learned on afloat environmental compliance. - Continue development of environmental equipment/system requirements documentation, design criteria/ guidance, complete draft specifications on waste management equipment, standards, and certification protocols. - Update model of legacy US Navy engine air emissions. - Investigate impact of the use of environmentally sound refrigerants on refrigeration systems. ***FY 2020 Base Plans:*** -Implement DDG oil spill guidance and incorporate feedback from the Fleet. - Select commercial waste management systems for detailed acquisition and evaluation. - Work with Fleet, acquisition programs, and technical authorities to review and provide comments on issues, risks, and opportunities so as minimize the cost and risk to the Navy. - Continue to update the oil spill database by monitoring ship spills and other oil spill discharge violations. - Continue to analyze oil spill root causes, and prepare policy and/or hardware solutions to reduce future oil spills. - Meet with NATO and foreign Navy data exchange partners to leverage lessons learned on afloat environmental compliance. - Develop environmental equipment/system requirements documentation, design criteria/guidance, standards, and certification protocols based on evolving regulations and policy.					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603721N / *Environmental Protection*	**Project (Number/Name)** 0401 / *Shipboard Waste Mgmt*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
- Perform annual assessments of emergent air emission processes and technologies to enable effective compliance at minimal life cycle cost and risk to operations. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** FY20 decrease of $0.050 due to completion of draft hazardous material equipment handling specification.					
Title: Liquid Wastes	2.354	2.275	2.321	0.000	2.321
Articles:	-	-	-	-	-
Description: Navy ships must be able to operate anywhere in the world, train realistically, and visit any port without operational, safety, or health constraints arising due to international, Federal, and local environmental regulations. This effort addresses liquid wastes in two (2) major areas: Marine Sanitation Devices (MSDs) and Marine Pollution Control Devices. ***FY 2019 Plans:*** - Perform assessments of emergent commercial off the shelf Marine Pollution Control processes and technologies that would enable effective compliance at minimal life cycle cost and risk to operations. Identify systems for detailed acquisition and evaluation Oil Pollution Abatement: - Initiate shipboard evaluation of a commercial centrifugal Oil Water Separator (OWS) including system inspection and operational checks. - Adjudicate comments on militarized Navy centrifugal OWS specification and finalize document for publishing. - Demonstrate software modifications to secondary treatment system for OWS membrane regeneration, update Fleet procedure, as appropriate, and assess chemical cleaners Non-Oily Waste: - Initiate laboratory evaluation of Navy performance standard leveraging an Army procured commercial marine sanitation device for laboratory evaluation using Navy performance standards. - Continue long-term assessment of sewage and graywater piping development, prevention and cleaning.					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603721N / *Environmental Protection*	**Project (Number/Name)** 0401 / *Shipboard Waste Mgmt*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
- Finalize shipboard installation package, address cybersecurity requirements, and initiate shipboard evaluation of a vacuum instrumentation isolation ***FY 2020 Base Plans:*** - Perform assessments of emergent commercial off the shelf Marine Pollution Control processes and technologies that would enable effective compliance at minimal life cycle cost and risk to operations. Identify systems for detailed acquisition and evaluation Oil Pollution Abatement: - Complete shipboard evaluation of a commercial centrifugal oil water separator (OWS) - Initiate removal of centrifugal OWS from test ship platform; restore test ship platform to original configuration - Initiate laboratory evaluation of new Tank Level Indicator technology - Initiate development of Commercial Item Descriptions (CIDs) for bilge cleaners - Initiate laboratory evaluation of Navy militarized OWS. Non-Oily Waste (NOW): - Continue long-term assessment of sewage and graywater piping development, prevention and cleaning. - Determine requirements for detergents/cleaners for NOW treatment systems - Complete shipboard evaluation of Vacuum Instrumentation Isolation - Initiate laboratory evaluation of alternative vacuum pumps. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increase of $0.046 is for the completion of the centrifugal OWS shipboard evaluation and the cost to restore the shipboard test platform to the original configuration.					
Title: Hazardous Material Control and Management	0.995	1.015	0.937	0.000	0.937
Articles:	-	-	-	-	-
Description: A wide variety of Hazardous Materials (HM) are used to construct, operate and maintain Navy ships and submarines. These HMs include cleaning compounds, solvents, adhesives, sealants, corrosion preventive compounds, acids, alkalis, oxidizers, lubricants, functional fluids, and many other products. HM addresses environmental, safety and health risks to ship construction workers, Ship's Force (S/F), and shipyard workers.					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603721N / *Environmental Protection*	**Project (Number/Name)** 0401 / *Shipboard Waste Mgmt*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
FY20 decrease due to reduction in number of system evaluations. ***FY 2019 Plans:*** - Perform assessments of emergent commercial off the shelf hazardous material management processes and pollution prevention technologies that would enable effective compliance at minimal life cycle cost and risk to operations. - Identify hazardous material control/pollution prevention systems for detailed acquisition and evaluation. - Revise the NAVSEA Hazardous Material Avoidance Process. - Identify, research, and evaluate less hazardous or non-hazardous substitutes for high-risk hazardous materials. - Acquire, install and perform shipboard evaluation of automated cleaner dispensers. - Finalize commercial item description for automatic cleaner dispensers. - Procure, install and perform laboratory evaluation of Medical waste processing equipment for special solid waste (Feminine Hygiene Products, Pilot Urine bags, etc.) ***FY 2020 Base Plans:*** - Perform assessments of emergent commercial off the shelf hazardous material management processes and pollution prevention technologies that would enable effective compliance at minimal life cycle cost and risk to operations. - Identify hazardous material control/pollution prevention systems for detailed acquisition and evaluation. - Identify, research, and evaluate less hazardous or non-hazardous substitutes for high-risk hazardous materials. - Acquire, install and perform shipboard evaluation of Medical waste processing equipment for special solid waste (Feminine Hygiene Products, Pilot Urine bags, etc.) ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** FY20 decrease of $0.078 due to completion of paint can recycling evaluation efforts.					
Title: Ballast Water Management	1.736	1.836	2.021	0.000	2.021
Articles:	-	-	-	-	-
Description: The National Invasive Species Act (NISA) requires the Secretary of Defense to implement a Ballast Water Management (BWM) program to minimize the risk of introduction of unwanted species and pathogens from releases of ballast water.					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
FY20 increase to support BWM tasking related to testing of both commercial and modified commercial BWTS. ***FY 2019 Plans:*** - Perform assessments of emergent commercial off the shelf BWTS that would enable effective compliance at minimal life cycle cost and risk to operations. - Identify systems for detailed acquisition and evaluation. - Acquire modified commercial BWTS(s) for evaluation. - Continue full scale evaluation of commercial BWTS(s) to assess system performance, reliability, operability and maintainability, and suitability as a Navy shipboard system. - Determine ship services, consumables, manning required to run and maintain ballast water treatment systems. - Refine ballast water treatment system performance specification. ***FY 2020 Base Plans:*** - Continue assessments of emergent commercial off the shelf BWTS that would enable effective compliance at minimal life cycle cost and risk to operations. - Identify systems for detailed acquisition and evaluation. - Continue full scale evaluation of one commercial BWTS to assess system performance, reliability, operability and maintainability, and suitability as a Navy shipboard system. - Begin full scale evaluation of modified commercial BWTSs to assess system performance, reliability, operability and maintainability, and suitability as a Navy shipboard system. - Refine Navy ship installation guidance for meeting ballast water discharge standards considering damage control and stability requirements. - Acquire rapid tank management system for initial land based testing. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** FY20 increase of $0.185 to support BWM tasking related to testing of both commercial and modified commercial BWTSs.					
Title: Solid Waste Management	1.000	1.050	1.150	0.000	1.150
Articles:	-	-	-	-	-
Description: Solid Waste Management supports the Act to Prevent Pollution from Ships (APPS) which regulates all garbage discharges from ships at sea.					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603721N / *Environmental Protection*	**Project (Number/Name)** 0401 / *Shipboard Waste Mgmt*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
FY 2019 Plans: - Perform assessments of emergent commercial off the shelf solid waste management processes and technologies that would enable effective compliance at minimal life cycle cost and risk to operations. - Identify solid waste systems for detailed acquisition and evaluation. - Begin installation and testing preparation for the shipboard evaluation and Navy ship environmental testing of convertor, Marine Solid Waste Incinerator and/or Micro Auto Gasification System based on laboratory test results. - Refine Navy ship acquisition requirements for APPS compliant solid waste processing systems. ***FY 2020 Base Plans:*** - Perform assessments of emergent commercial off the shelf solid waste management processes and technologies that would enable effective compliance at minimal life cycle cost and risk to operations. - Identify solid waste systems for detailed acquisition and evaluation with emphasis on Submarine solid waste equipment. - Begin installation and testing preparation for the shipboard evaluation and Navy ship environmental testing of Innovative Submarine solid waste equipment. - Refine Navy ship acquisition requirements for APPS compliant solid waste processing systems. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** FY20 increase to investigate and spearhead design, integration and testing of innovative Submarine solid waste equipment.					
Title: Non-Copper Antifouling	0.150	0.100	0.100	0.000	0.100
Articles:	-	-	-	-	-
Description: The copper discharges from underwater hull coatings remain a regulatory concern. The effort focuses on characterizing advanced coating systems and their suitability for Navy-unique operational factors such as speed time profiles, drydocking intervals, and maintenance practices. ***FY 2019 Plans:*** - Complete in-situ testing and provide final report on performance. - Complete evaluation of NAVSEA screening and qualification test requirements for fouling release (with and without biocides) and antifouling coatings.					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603721N / *Environmental Protection*	**Project (Number/Name)** 0401 / *Shipboard Waste Mgmt*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
- Compare results from historical qualification tests with full scale data plus Office of Naval Research (ONR) Intersite Calibration Study and Fouling Release Coating Study data. - Finalize qualification procedure modifications as needed. ***FY 2020 Base Plans:*** - Prepare and submit final report on QPL testing of the 11 coatings. Results from historical qualification tests, ship patch testing will be included in the evaluation. - Initiate Navy assessment of risk in terms of transport of nonindigenous species, underwater hull/niche areas; evaluate historical hull/propeller fouling and cleaning reports; evaluate in context of ship active periods as well as coating type and age; evaluate in context of PLANNED changeover in hull fouling rating evaluation criteria Execute targeted inspections; and evaluate in context of existing and emerging country-specific requirements as well as IMO requirements. ***FY 2020 OCO Plans:*** N/A					
Accomplishments/Planned Programs Subtotals	7.889	7.776	7.979	0.000	7.979

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

RDT&E Contracts are Competitive Procurements.

E. Performance Metrics

Quarterly Program Reviews

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
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Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Ancillary Hardware Development	Various	Misc. Contracts : Not Specified	19.149	0.000		0.000		0.000		-		0.000	0.000	19.149	Continuing
Primary Hardware Development	C/CPFF	Oceaneering : Not Specified	1.000	0.000		0.000		0.000		-		0.000	0.000	1.000	Continuing
Systems Engineering	C/CPFF	John J. McMullen & Son : Not Specified	4.487	0.000		0.000		0.000		-		0.000	0.000	4.487	Continuing
		Subtotal	24.636	0.000		0.000		0.000		-		0.000	0.000	24.636	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Software Development	WR	SPAWAR : Charleston, SC	10.838	0.000		0.000		0.000		-		0.000	0.000	10.838	Continuing
		Subtotal	10.838	0.000		0.000		0.000		-		0.000	0.000	10.838	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Developmental Test & Evaluation	MIPR	US Army Corps of Engineers : Norfolk, VA	0.687	0.000		0.000		0.000		-		0.000	0.000	0.687	-
Developmental Test & Evaluation	WR	NSWCCD, Bethesda, MD : Bethesda, MD	214.666	6.250	Nov 2017	6.800	Nov 2018	7.600	Nov 2019	-		7.600	Continuing	Continuing	Continuing
Developmental Test & Evaluation	WR	NSWCIHD : Indian Head, MD	1.086	0.000		0.000		0.000		-		0.000	0.000	1.086	-
Developmental Test & Evaluation	WR	NRL,Wash,DC : Wash,DC	32.576	0.948	Nov 2017	0.500	Nov 2018	0.100	Nov 2019	-		0.100	Continuing	Continuing	Continuing
Developmental Test & Evaluation	WR	NSWCPD, Philladelphia, PA : Philladelphia, PA	0.472	0.441	Nov 2017	0.301	Nov 2018	0.279	Nov 2019	-		0.279	Continuing	Continuing	Continuing

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
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Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Developmental Test & Evaluation	WR	SPAWARSYSCEN : SD,CA	12.308	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Developmental Test & Evaluation	WR	Misc. Govt Labs : TBD	23.225	0.250	Nov 2017	0.175	Nov 2018	0.000	Nov 2019	-		0.000	0.000	23.650	-
Developmental Test & Evaluation	C/CPFF	SAIC : San Diego, CA	15.570	0.000		0.000		0.000		-		0.000	0.000	15.570	-
Developmental Test & Evaluation	C/CPFF	Misc. Contracts : TBD	13.103	0.000		0.000		0.000		-		0.000	0.000	13.103	-
Process Control Engineering	C/CPFF	M. Rosenblatt & Sons : Arlington, VA	6.547	0.000		0.000		0.000		-		0.000	0.000	6.547	Continuing
Developmental Test & Evaluation	C/CPFF	ONR : Arlington, VA	0.400	0.000		0.000		0.000		-		0.000	0.000	0.400	Continuing
Developmental Test & Evaluation	WR	Naval Postgraduate School : Monterey, CA	1.800	0.000		0.000		0.000		-		0.000	0.000	1.800	Continuing
Process Control Engineering	MIPR	EPA, Hdqtrs : Washington, DC	0.840	0.000		0.000		0.000		-		0.000	0.000	0.840	Continuing
		Subtotal	323.280	7.889		7.776		7.979		-		7.979	Continuing	Continuing	N/A

Remarks

Increased funding to NSWCCD greater than 2% for testing and evaluation of the centrifugal Oil Water Separator shipboard evaluation and the cost to restore the shipboard test platform to the original configuration; Ballast Water Management tasking related to testing of both commercial and modified commercial BWTSs; and to investigate and spearhead design, integration and testing of innovative Submarine solid waste equipment.

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Travel	Allot	NAVSEA HQ : Washington, DC	0.375	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
SBIR Assessment	TBD	Not Specified : Not Specified	0.227	0.000		0.000		0.000		-		0.000	0.000	0.227	Continuing
		Subtotal	0.602	0.000		0.000		0.000		-		0.000	Continuing	Continuing	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
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	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	359.356	7.889		7.776		7.979		-		7.979	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
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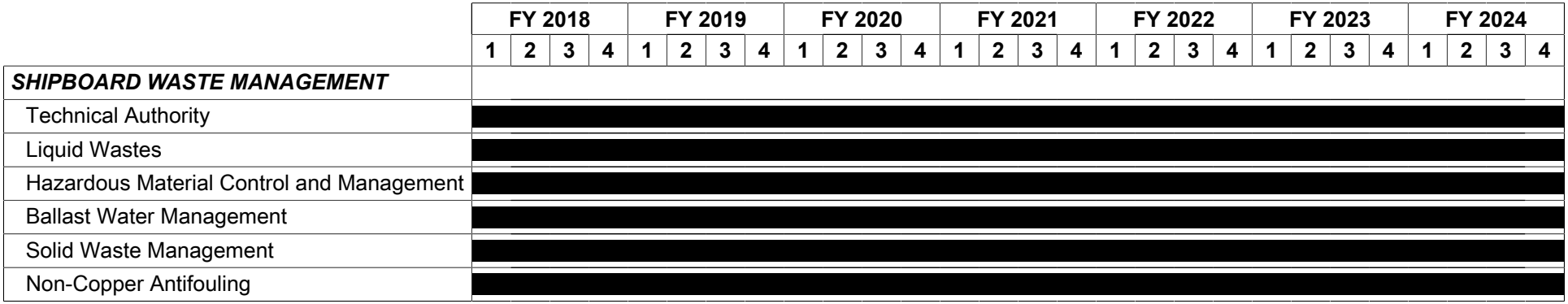


Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
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Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
SHIPBOARD WASTE MANAGEMENT				
Technical Authority	1	2018	4	2024
Liquid Wastes	1	2018	4	2024
Hazardous Material Control and Management	1	2018	4	2024
Ballast Water Management	1	2018	4	2024
Solid Waste Management	1	2018	4	2024
Non-Copper Antifouling	1	2018	4	2024

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
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COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
0817: *Environmental Sustainability Development (NESDI)*	49.952	4.747	4.266	4.440	-	4.440	6.087	6.203	6.323	6.450	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Inherent to the realization of the vision outlined in Sea Power 21 are certain environmental consequences that will, to a lesser or greater degree, be an impact on the Navy's ability to fully achieve the strategy outlined in the Navy Capability Pillars (NCP) SEA SHIELD, SEA STRIKE, SEA BASING and FORCEnet and the supporting initiatives of SEA WARRIOR, SEA TRIAL and SEA ENTERPRISE. Readiness and training are primary considerations for determining whether any fighting force is at its peak proficiency. The ability to train our forces in a realistic environment is paramount. Today's reality requires training and operating within environmental constraints (national and international laws and agreements), and searching for alternatives to comply with and alleviate those constraints. Moreover, as we develop new systems and technologies in support of Sea Power 21, the Navy must anticipate potential environmental regulations which, while not currently an issue, could in the future adversely impact our ability to protect and sustain our forces at home and abroad.

This program identifies pervasive Navy shore side environmental requirements and develops and validates information, new processes, and technologies that address requirements that pose significant impact on Naval shore activities in complying with environmental laws, regulations, orders, and policies. The goal of the program is to maximize opportunities for significant cost savings while minimizing personnel liabilities, operational costs, and regulatory oversight and preserving or enhancing the ability of Naval shore activities to accomplish their required missions and functions in support of the Navy's transformational strategy.

Environmental Enabling Capabilities -2 (EEC-2) MAXIMIZE TRAINING AND TESTING RANGE REQUIREMENTS WITHIN ENVIRONMENTAL CONSTRAINTS: This capability addresses environmental impacts and restrictions at Navy land and sea ranges, including munitions testing and manufacturing, to ensure Navy ranges are available to conduct required training and testing operations for the Fleet. Investments in EEC-2 provide validated knowledge, models, and processes to mitigate environmental impacts, restrictions, and costs at Navy training and test ranges to maximize the availability and utilization of the ranges. The results support operational readiness by providing the tools and technologies necessary for sustaining and managing Navy land and sea ranges related to unexploded ordnance (UXO) and munitions, encroachment, air quality, airborne noise, water quality, and wetlands. Capabilities gained include the ability to assess and determine the risks from underwater UXO, the evaluation and prioritization of ordnance contaminated sites for evaluation in environmental programs and the implementation of range specific best management practices by evaluating and modeling available process, procedures, and technologies.

Environmental Enabling Capabilities-3 (EEC-3)PLATFORM MAINTENANCE AND REPAIR WITH MINIMAL ENVIRONMENTAL FOOTPRINT: This capability focuses on minimizing or eliminating environmental impact related to Navy and Marine Corps weapon system repair and maintenance operations. Investments in EEC-3 provide valid knowledge, models, processes, and technologies to minimize regulated emissions, discharges and hazardous material usage during the repair and maintenance of ships, submarines, and surface/sub-surface vehicles and aircraft and air vehicles. The program supports Fleet operational readiness and Navy acquisition communities by investing in information to understand emerging environmental requirements and to develop innovative processes and technologies that result in savings while

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reducing the fleet environmental constraints related to platform maintenance. Capabilities and benefits gained include, but are not limited to, the reduction in the usage of heavy metals used in metal finishing (chromium and cadmium), reduced hazardous air pollutant (HAP) emissions, the development of best management practices and tools to minimize the use of hazardous materials, and the generation of hazardous wastes associated with maintaining and repairing ships, submarines, aircraft, and unmanned vehicles. Results of program investments will be leveraged across weapon system and platform acquisition to ensure continued reduction in lifecycle costs and long-term environmental compliance burdens to the Fleet.

Environmental Enabling Capabilities-4 (EEC-4). SUPPORT SHORE READINESS WITHIN ENVIRONMENTAL CONSTRAINTS: Naval shore establishment requires the capability to operate and maintain facilities and provide waterfront and airfield services to the fleet while complying with applicable environmental regulations and minimizing environmental impacts and costs. The program invests in knowledge and innovative processes and technologies that minimize infrastructure and operational costs, regulated emissions, while minimizing discharges and hazardous material usage from ship (waterfront) and aviation operations. Capabilities and benefits gained under EEC-4 include, reduced costs associated with wastewater treatment, elimination/reduction in the use of HAPs, ozone depleting substances (ODSs), volatile organic compounds (VOCs) and the associated reporting requirements, reduced hazardous waste and disposal costs, and improved storm water management.

Environmental Enabling Capabilities-5 (EEC-5). COST-EFFECTIVE MANAGEMENT OF ENVIRONMENTAL REGULATORY REQUIREMENTS: The environmental compliance regulations require base managers to permit, monitor and report on many processes associated with weapon system and platform operations. Naval shore environmental managers require the capability to efficiently and cost effectively manage these compliance requirements. Under EEC-5, the program invests in improved data collection, methods, and models to assess environmental impacts and ecological risk assessments of Naval Operations on harbors, U.S. waterways, and surrounding communities. Benefits include gaining standardized technical environmental management improvements/techniques related to source control, assessment, and monitoring. EEC-5 also provides validated knowledge, models, processes and technologies to improve environmental monitoring and reporting, and to reduce the cost of compliance with regulations applicable to coastal contamination and contaminated sediments.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Maximize Training & Testing Requirements Within Environmental Constraints	0.850	0.735	0.705	0.000	0.705
Articles:	-	-	-	-	-
FY 2019 Plans: FY 2019 Base Plans: - Continue providing validated knowledge, models, and processes to mitigate environmental impacts, restrictions, and costs of Navy training and test ranges to maximize the availability and utilization of the ranges. - Continue the initiative: Analysis of the Long-Term Fate of Munitions Constituents on Terrestrial Sites. - Complete the initiatives: X-ray inspection system to demilitarize targets. - Program to begin to evaluate Cost Effective Main Charge Remediation of Insensitive Munitions for Range Clearance.					
FY 2020 Base Plans: FY 2020 Base Plans:					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
-Continue providing validated knowledge, models, and processes to mitigate environmental impacts, restrictions, and costs of Navy training and test ranges to maximize the availability and utilization of the ranges. - Continue to evaluate the feasibility of Cost Effective Main Charge Remediation of Insensitive Munitions for Range Clearance. - Complete the initiatives: Analysis of the Long-Term Fate of Munitions Constituents on Terrestrial Sites. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Funding for this budget item decreased from $0.735M to $0.705M ($0.030M) due to completion of X-ray inspection system to demilitarize targets.					
Title: Platform Maintenance and Repair With Minimal Environmental Footprint	1.064	1.007	0.953	0.000	0.953
Articles:	-	-	-	-	-
FY 2019 Plans: FY 2019 Base Plans: - Continue providing innovative solutions for difficult and persistent shipyard environmental compliance issues. - Continue the initiatives: Demonstration Of Non-Chromated Adhesive Bond Primer For Metal Repair Bonding, Non-Isocyanate Polyurethane-Free Formulation Coatings for Aircraft and Support Equipment, Multi-Functional Surface Preparation Technology for Maintenance Painting, Demonstration of Optimized non-NMP (n-Methyl-2-pyrrolidone) Solvents for Immersion Chemical Depainting, Initiation Decision Report of Laser Coating Removal on Naval Aircraft Components, Elimination of Hexavalent Chromium from Magnesium Conversion Coating Processes at Fleet Readiness Centers, Low VOC Primers for Ground Support Equipment Application. - Complete the initiatives: User Friendly Oxygen Cleaning Alternatives to Navy Oxygen Cleaning (NOC), Enhanced Trivalent Chromium Pretreatment for Improved Coloration and Corrosion Performance of Aluminum Substrates, Naval Air Systems Command Solutions for Engine Washing. - Program to begin to examine Electromagnetic Interference Shielding Tape, Replacement of Cadmium in GSE Avionics Applications. ***FY 2020 Base Plans:*** FY2020 Base Plans: - Continue evaluations and demonstrations of innovative solutions for difficult and persistent aviation and shipyard platform sustainment issues related to hexavalent chrome, cadmium, volatile organic compounds					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603721N / *Environmental Protection*	**Project (Number/Name)** 0817 / *Environmental Sustainability Development (NESDI)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
(VOC) hazardous air pollutants (HAP) and other hazardous compounds at Naval Aviation Systems Command Fleet Readiness Centers and the Navy's shipyards. - Continue providing innovative solutions for difficult and persistent shipyard environmental compliance issues. - Continue evaluating the feasibility of Electromagnetic Interference Shielding Tape, Replacement of Cadmium in GSE Avionics Applications. - Continue the initiatives: Elimination of Hexavalent Chromium from Magnesium Conversion Coating Processes at Fleet Readiness Centers, Low VOC Primers for Ground Support Equipment Application. - Complete the initiatives: Demonstration of Non-Chromated Adhesive Bond Primer For Metal Repair Bonding, Non-Isocyanate Polyurethane-Free Formulation Coatings for Aircraft and Support Equipment, Multi-Functional Surface Preparation Technology for Maintenance Painting, Demonstration of Optimized non-NMP (n-Methyl-2-pyrrolidone) Solvents for Immersion Chemical Depainting, Initiation Decision Report of Laser Coating Removal on Naval Aircraft Components. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Funding for this budget item decreased from $1.007M to $0.953M (-$0.054M) due to completion of User Friendly Oxygen Cleaning alternatives to Navy Oxygen Cleaning (NOC), Enhanced Trivalent Chromium Pretreatment for improved coloration and corrosion performance of aluminum substrates, and Naval Air Systems Command Solutions for engine washing.					
Title: Support Shore Readiness within Environmental Constraints	1.187	1.039	1.068	0.000	1.068
Articles:	-	-	-	-	-
FY 2019 Plans: FY 2019 Base Plans: - Continue the initiatives: Demonstration of New Strategies for Enhanced Monitored Natural Recovery at Navy Sediment Sites, Improved Dewatering of Dredged Sediment, NPDES Copper Effluent Control System. - Continue optimization of ship to shore regulated garbage management, improved dewatering of dredge sediment and demonstration of new strategies for enhanced monitored natural recovery at Navy sediment sites. - Complete the initiatives: Analysis of Regulated Garbage Management Processes to Ensure Compliance with Animal and Plant Health Inspection Service Regulations, Evaluation and Implementation of Compliance Options for NPDES Cooling Water Intake Structures at Existing Facilities, Quantification of Polychlorinated Biphenyls (PCB) Paint Volatilization, Diver-less Deployment System for In-Situ Sediment Samplers.					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603721N / *Environmental Protection*	**Project (Number/Name)** 0817 / *Environmental Sustainability Development (NESDI)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
- Under Pier Sediment Pile Assessment Tools to be evaluated and started. ***FY 2020 Base Plans:*** FY 2020 Base Plans: - Continue evaluations and demonstrations of innovative solutions to minimize regulated emissions, discharges and hazardous material usage resulting specifically from waterfront support, aviation support, and other base operations. - Continue funding demonstration of New Strategies for Enhanced Monitored Natural Recovery at Navy Sediment Sites, NPDES Copper Effluent Control System with increase field work. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Funding for this budget item increased from $1.039M to $1.068M ($0.029M) due to increased field work for demonstration of New Strategies for enhanced monitored natural recovery at Navy sediment sites and Under Pier Sediment Pile Assessment Tools.					
Title: Cost-Effective Management of Environmental Regulatory Requirements	1.646	1.485	1.714	0.000	1.714
Articles:	-	-	-	-	-
FY 2019 Plans: FY 2019 Base Plans: - Complete the initiatives: Forward Looking Infrared Camera for Advanced Discharge Characterization, Smart Electronic Tools for Navy Environmental Compliance Monitoring and Reporting, Study of Waste Management and Minimization for AFFF Wastewater. - New program evaluate and demonstration/validation of Air Filtration for Indoor Air Quality, Stormwater Piping-Based Pollutant Best Management Practice, Improving Site Closure Decision-Making with Time-Integrated Groundwater Samples. ***FY 2020 Base Plans:*** FY 2020 Base Plans: - Continue providing validated knowledge, models, processes and systems to improve environmental monitoring and reporting, and reduce the cost of compliance with regulations and management of coastal contamination and contaminated sediments.					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603721N / *Environmental Protection*	**Project (Number/Name)** 0817 / *Environmental Sustainability Development (NESDI)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
- Continue to evaluate the feasibility of Air Filtration for Indoor Air Quality, Stormwater Piping-Based Pollutant Best Management Practice, Improving Site Closure Decision-Making with Time-Integrated Groundwater Samples. - Continue the initiatives: Addressing Temporal Variability in Industrial Buildings during Vapor Intrusion Assessments, Demonstrating the Effectiveness of Novel Treatment Technologies for the Removal of Poly- and Perfluoroalkyl Substances from Groundwater, In-situ Automatic Stormwater Sampling Device for Use at Tidally Impacted Sampling Locations, Development and Demonstration of a Portable, Temporary Barrier to Aid in Cargo and Equipment Inspections to Prevent Brown Treesnake Dispersal. - Complete the initiatives: Utility Vault Water Treatment, Preventative Management of Contaminated Silt, Using Stable-Isotope Labeled Tracers to Validate Natural Attenuation of RDX in Groundwater, In Situ Treatment of 1,4-Dioxane using Enhanced Biodegradation, Demonstration of Improved Toxicity Methodology to Link Stormwater Discharges to Receiving Water Impacts, Sewer Gas Elimination Technology, Impact of Sediment Resuspension by Propeller Wash and Shore Sediment Dynamics on Remediation Options. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Funding for this budget item increased from $1.485M to $1.713M ($0.228M) due to increased field work for Addressing Temporal Variability in Industrial Buildings during Vapor Intrusion Assessments, In-situ Automatic Stormwater Sampling Device for use at Tidally Impacted Sampling Locations, Demonstrating the Effectiveness of Novel Treatment Technologies for the Removal of Poly- and Perfluoroalkyl Substances from Groundwater, and Temporary Barrier to Aid in Cargo and Equipment Inspections to Prevent Brown Treesnake Dispersal.					
Accomplishments/Planned Programs Subtotals	4.747	4.266	4.440	0.000	4.440

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

This project is categorized as Non-ACAT (Non Acquisition). The project delivers a broad spectrum of products that require a variety of acquisition processes to implement. Equipment products for naval stations and other mission funded activities are often procured directly through the base operating budget. Equipment products for Shipyards and other Navy Working Capital Fund (NWCF) activities costing over $250K are procured through their Capital Investment Program (CIP). For both types

of activities, equipment products costing less than $250K, and process changes not requiring the purchase of new equipment such as consumable material or product substitutions, are funded through the activity's operating budgets. Occasionally there is a technology that must be implemented as a specialized facility. These are acquired through the Military Construction (MILCON) Program. All these acquisition processes are pursued using a common strategy that satisfies the needs of all the critical stakeholders: 1) fleet end user; 2) funding sponsor for the Navy end user; 3) other stakeholders with cognizance over the Navy process or operation being changed, 4) cognizant environmental federal, state, and local regulators; and 5) the private or government organization that will produce the product.

E. Performance Metrics

Quarterly Budget Reviews

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603721N / *Environmental Protection*	**Project (Number/Name)** 0817 / *Environmental Sustainability Development (NESDI)*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
EEC 2	Various	EXWC : PT HUENEME, CA	6.325	0.500	Oct 2017	0.410	Oct 2018	0.400	Oct 2019	-		0.400	Continuing	Continuing	Continuing
EEC 2	Various	SSC : SAN DIEGO, CA	5.904	0.350	Dec 2017	0.325	Dec 2018	0.305	Dec 2019	-		0.305	Continuing	Continuing	Continuing
EEC 3	WR	NAWC : PATUXENT RIVER, MD	2.091	0.202	Mar 2018	0.135	Mar 2019	0.120	Mar 2020	-		0.120	Continuing	Continuing	Continuing
EEC 3	Various	NSWC : BETHESDA, MD	3.850	0.192	Nov 2017	0.175	Feb 2019	0.197	Feb 2020	-		0.197	Continuing	Continuing	Continuing
EEC 3b	Various	EXWC : PT HUENEME, CA	1.412	0.050	Mar 2018	0.077	Mar 2019	0.069	Mar 2020	-		0.069	Continuing	Continuing	Continuing
EEC 4	Various	EXWC : PT HUENEME, CA	8.380	0.540	Mar 2018	0.404	Mar 2019	0.390	Mar 2020	-		0.390	Continuing	Continuing	Continuing
EEC 4	Various	NSWC : BETHESDA, MD	4.388	0.307	Nov 2017	0.260	Nov 2018	0.255	Nov 2019	-		0.255	Continuing	Continuing	Continuing
EEC 4a	Various	SSC : SAN DIEGO, CA	3.565	0.340	Jan 2018	0.375	Apr 2019	0.423	Apr 2020	-		0.423	Continuing	Continuing	Continuing
EEC 5	Various	EXWC : PT HUENEME, CA	3.576	0.500	Nov 2017	0.433	Nov 2018	0.489	Nov 2019	-		0.489	Continuing	Continuing	Continuing
EEC 5	Various	SSC : SAN DIEGO, CA	1.810	0.395	Feb 2018	0.350	Feb 2019	0.494	Feb 2020	-		0.494	Continuing	Continuing	Continuing
EEC 5	Various	NAWC : PATUXENT RIVER, MD	1.327	0.050	Jun 2018	0.100	Jun 2019	0.095	Jun 2020	-		0.095	Continuing	Continuing	Continuing
EEC 5	Various	NSWC : BETHESDA, MD	2.290	0.504	Jan 2018	0.387	Jan 2019	0.385	Jan 2020	-		0.385	Continuing	Continuing	Continuing
EEC 5	WR	NAWCWD : CHINA LAKE, CA	1.360	0.122	Dec 2017	0.140	Dec 2018	0.150	Dec 2019	-		0.150	Continuing	Continuing	Continuing
EEC 5	WR	NAWC : LAKE HURST, NJ	0.831	0.075	Nov 2017	0.075	Nov 2018	0.100	Nov 2019	-		0.100	Continuing	Continuing	Continuing
EEC 3	WR	FRC - SE : JACKSONVILLE, FL	1.685	0.380	May 2018	0.380	May 2019	0.305	May 2020	-		0.305	Continuing	Continuing	Continuing
EEC 3	Various	NSWC : San Diego, CA	0.060	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603721N / *Environmental Protection*	**Project (Number/Name)** 0817 / *Environmental Sustainability Development (NESDI)*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
EEC 3	WR	FRC - CE : Cherry Point, NC	0.380	0.075	Jun 2018	0.075	Jun 2019	0.085	Jan 2020	-		0.085	Continuing	Continuing	Continuing
EEC 3	Various	FRC-SW : San Diego, CA	0.718	0.165	Mar 2018	0.165	Mar 2019	0.178	Mar 2020	-		0.178	Continuing	Continuing	Continuing
		Subtotal	49.952	4.747		4.266		4.440		-		4.440	Continuing	Continuing	N/A

Remarks

Performing Activities: Naval Surface Warfare Center, Carderock Division (NSWC/CD); Engineering and Expeditionary Warfare Center (EXWC), Port Hueneme, CA; Naval Surface Warfare Center, Indian Head Division (NSWC/IH); Space and Warfare Systems Center, San Diego (SSC/SD); Naval Air Warfare Center Aircraft Division Patuxent River (NAWCAD/PAX); Naval Air Warfare Center (NAWCWD/China Lake); Naval Air Warfare Center Aircraft Division Lakehurst (NAWCAD/Lakehurst); Fleet Readiness Center Southeast, Jacksonville FL (FRC-SE); Fleet Readiness Center Southwest, San Diego (FRC-SW), Fleet Readiness Center East, Cherry Point (FRC-CE). Total Prior Years Cost: Subtotal does not include performing activities from prior years that are no longer performing activities. Award Dates: About 55% of the project is executed via contracts awarded by the performing activities. More rigorous contracting, funding and performer work induction processes are slightly increasing project management costs. Contracting and financial management offices across the performing organizations may be understaffed. Projects are derived from field level needs and awarded competitively to performing organizations, the portfolio mix of cost category/performing organization naturally changes from fiscal year to fiscal year. Due to this, some individual line items in the R-3 will increase at greater than a 2% escalation factor.

Explanation of increases greater than 2% between FY2019 and FY2020:
-EEC3 NSWC Bethesda MD increased from 0.175 to 0.197 due to increased project management costs and increase in field work for continuing projects.
-EEC4a SSC San Diego CA increased from 0.375 to 0.423 due to increased project management costs and increase in field work for continuing projects such as Demonstration of New Strategies for Enhanced Monitored Natural Recovery at Navy Sediment Sites.
-EEC5 EXWC PT Hueneme CA increased from 0.433 to 0.489 due to increase in project management costs and field work for continuing projects such as Addressing Temporal Variability in Industrial Buildings during Vapor Intrusion Assessments, Demonstrating the Effectiveness of Novel Treatment Technologies for the Removal of Poly- and Perfluoroalkyl Substances from Groundwater and Temporary Barrier to Aid in Cargo and Equipment Inspections to Prevent Brown Treesnake Dispersal.
-EEC5 SSC San Diego CA increased from 0.350 to 0.494 due to increase in project management costs and field work in continuing projects such as In-situ Automatic Stormwater Sampling Device for Use at Tidally Impacted Sampling Locations.
-EEC5 NAWCWD China Lake CA increased from 0.140 to 0.150 due to increased costs to support overall program management.
-EEC5 NAWC Lake Hurst NJ increased from 0.075 to 0.100 due to increased costs for program web site management.
-EEC3 FRC CE Cherry Point NC increased from 0.075 to 0.085 due to increase in field work for continuing projects such as Electromagnetic Interference Shielding Tape, Replacement of Cadmium in GSE Avionics Applications.
-EEC3 FRC SW San Diego CA increased from 0.165 to 0.177 due to increase in field work for continuing projects such as Electromagnetic Interference Shielding Tape, Replacement of Cadmium in GSE Avionics Applications.

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	49.952	4.747		4.266		4.440		-		4.440	Continuing	Continuing	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603721N / *Environmental Protection*	Project (Number/Name) 0817 / *Environmental Sustainability Development (NESDI)*	

	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603721N / *Environmental Protection*	**Project (Number/Name)** 0817 / *Environmental Sustainability Development (NESDI)*

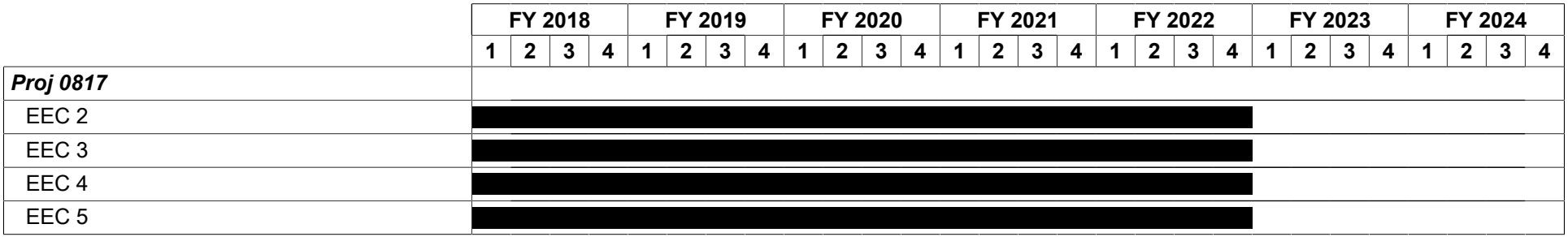


Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603721N / *Environmental Protection*	**Project (Number/Name)** 0817 / *Environmental Sustainability Development (NESDI)*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 0817				
EEC 2	1	2018	4	2022
EEC 3	1	2018	4	2022
EEC 4	1	2018	4	2022
EEC 5	1	2018	4	2022

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy											Date: March 2019	
Appropriation/Budget Activity 1319 / 4					R-1 Program Element (Number/Name) PE 0603721N / *Environmental Protection*				Project (Number/Name) 2015 / *Environmental Restoration RDT&E*			
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
2015: *Environmental Restoration RDT&E*	0.000	2.525	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	2.525
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Navy's Environmental Restoration minimizes risk to human health and the environment and restore contaminated sites to productive use. RDT&E improves identification, investigation, removal and remedial actions to address and clean up environmental contamination at Navy installations.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Per- and Poly- fluorinated alkyl Substances (PFAS)	2.525	0.000	0.000	0.000	0.000
Articles:	-	-	-	-	-
FY 2019 Plans: N/A					
FY 2020 Base Plans: N/A					
FY 2020 OCO Plans: N/A					
Accomplishments/Planned Programs Subtotals	2.525	0.000	0.000	0.000	0.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

RDTEN Contracts are Competitive Procurements.

E. Performance Metrics

Quarterly Program Reviews

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603721N / *Environmental Protection*	Project (Number/Name) 2015 / *Environmental Restoration RDT&E*	

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
PFAS	Various	EXWC : Port Hueneme	0.000	2.525	Sep 2018	0.000		0.000		-		0.000	0.000	2.525	-
		Subtotal	0.000	2.525		0.000		0.000		-		0.000	0.000	2.525	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	2.525		0.000		0.000		-		0.000	0.000	2.525	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603721N / *Environmental Protection*	**Project (Number/Name)** 2015 / *Environmental Restoration RDT&E*

	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Proj 2015																												
Per- and Poly- fluorinated alkyl Substances (PFAS)					[redacted]																							

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603721N / *Environmental Protection*	**Project (Number/Name)** 2015 / *Environmental Restoration RDT&E*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 2015				
Per- and Poly- fluorinated alkyl Substances (PFAS)	4	2018	4	2019

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy											Date: March 2019	
Appropriation/Budget Activity 1319 / 4					R-1 Program Element (Number/Name) PE 0603721N / *Environmental Protection*				Project (Number/Name) 9204 / *Marine Mammal Research*			
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
9204: *Marine Mammal Research*	52.095	4.478	4.769	5.145	-	5.145	5.275	5.391	5.479	5.586	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Navy has been and will continue to be subject to litigation with regard to the potential injuring, killing or biologically significant disturbance of marine animals by the use of intense underwater sound. Since Fleet operation and training areas coincide with known or probable habitats, migration routes, or breeding areas of marine mammals and other protected marine species, the possibility exists that such incidents are likely to continue in the future. The increasing public interest and pressure has resulted in escalating Fleet costs. For example, Fleet and SYSCOM development activities have been interrupted; modified, or altogether cancelled and environmental regulations have, among other things, required new ship construction shock trials to obtain Federal permits and conduct extensive environmental planning that can take several years to complete. The incorporation of mitigation measures in Fleet training operations to minimize the potential adverse effects on protected marine animals can significantly reduce the realism of these operations. In addition, the testing, evaluation, and deployment of new sonar detection and monitoring systems that use active acoustics are under intense public scrutiny for their potential adverse effects on whales and other marine mammals. Navy needs scientific evidence to substantiate its claims of limited or inconsequential adverse effects to marine life from operations.

This project primarily focuses on the development of planning, monitoring, and mitigating tools to aid the Fleet in minimizing contact with and the potential harassment of protected marine animals during operations, exercises, training, and undersea surveillance and weapons testing. These new capabilities will encompass historical and newly acquired data and analytical models that together can predict marine animal habitats (where they are likely to be), and their natural and expected behavior (diving patterns, prey localization, calling activity, etc.). This project consists of three major areas that will help ensure Navy compliance with the Marine Mammal Protection Act (MMPA) and Endangered Species Act (ESA).
These areas are (1) Marine Ecology and Population Dynamics - determine the likelihood of the presence of marine mammals or other protected species by developing habitat and ecological models. Refine marine animal survey techniques to optimize the accuracy of abundance estimates in small ocean regions of Navy interest.
(2) Criteria, Thresholds, and Mitigation - Establish criteria and thresholds from which to measure potential impact on marine mammals and other marine species from Navy training operations. Determine the effectiveness and usefulness of various mitigation measures in relation to the potential impact of Navy operations on marine mammals; and (3) Mitigation Methodologies - Determine the observation, detection and classification measures required to develop effective monitoring and mitigation procedures for Fleet and SYSCOM use. Focus on improving marine animal monitoring capabilities over current methods by developing new technologies or improving existing technologies that improve monitoring and mitigation effectiveness, reduce cost and minimize impacts on readiness activities.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**
Title: Marine Ecology and Population Dynamics	0.815	0.900	0.900	0.000	0.900
Articles:	-	-	-	-	-
FY 2019 Plans:					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603721N / *Environmental Protection*	**Project (Number/Name)** 9204 / *Marine Mammal Research*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Continue ongoing research on the topics of density estimation from passive acoustic monitoring, standards/ metrics development, and development of an automated sonar detector. Ongoing work on the topic of density estimation from passive acoustic monitoring are in the height of the fieldwork/data collection stage in FY2019. The ongoing work on the topic of standards/metrics development is now in the second half of the project and should be focused on refinements/testing of the passive acoustic monitoring metadata database system and standards development. The ongoing work to develop an automated sonar detector will be focused on comparing available detectors to determine which one is performing the best. None of the ongoing studies in these topic areas are scheduled to be completed in FY2019. One study is expected to be initiated in FY2019 in response to a need to collect data on potential impacts to coral from Navy activities. In addition, based on feedback from the Fleets and SYSCOMS, there is a need for continued investment in passive acoustic data analysis tools in FY2019.					
FY 2020 Base Plans: FY2020 Base Plans: Within the area of 'Marine Ecology and Population Dynamics', ongoing work covers topics such as standards/ metrics development and development of an automated sonar detector to standardize analysis of acoustic data. Two ongoing studies will continue into FY2021: -Acoustic Metadata Management for Navy Fleet Operations -Standardizing Methods and Nomenclature for Automated Detection of Navy Sonar In addition, at least two studies are expected to be initiated in FY2019 (would be ongoing in FY2020) in response to the following needs collected from Navy personnel: -data on potential impacts to coral from Navy activities in order to validate current required mitigation measures -improved passive acoustic data analysis tools Two studies are expected to be completed in FY2020: -Blue and fin whale density estimation in the US Pacific Fleet Southern California Offshore Range using PAM data -DECAF-TEA: Density Estimation for Cetaceans from Acoustic Fixed sensors in Testing and Evaluation Areas					
FY 2020 OCO Plans:					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603721N / *Environmental Protection*	**Project (Number/Name)** 9204 / *Marine Mammal Research*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
N/A					
Title: Criteria and Thresholds, Physiology and Behavior, and Effects of Sound	2.452	2.654	3.030	0.000	3.030
Articles:	-	-	-	-	-

FY 2019 Plans:
Continue ongoing research on the topics of hearing (in birds, harbor porpoises and harbor seals), temporary threshold shift (in harbor porpoises and harbor seals), effects on fish from underwater explosions, behavioral response studies (beaked whales, fin whales, sperm whales), and in-situ explosive sound and propagation characterization. Most ongoing studies are in the middle of the data collection/fieldwork stage in FY2019, but two projects are the final data analysis and report writing stage.

Two studies are expected to be completed in FY2019:
-Frequency-dependent growth and recovery of temporary threshold shift in bottlenose dolphins, and
-Temporary threshold shift in harbor porpoises due to naval sonar sounds and recovering of hearing.

Funding in this topic area is particularly important because the results are needed by the end of 2020 to update the criteria and thresholds for the Phase IV acoustic effects modeling. If emergent needs are identified in FY2018, then they would need to be funded in late FY2018/early 2019 to meet the 2020 goal.

FY 2020 Base Plans:
FY2020 Base Plans:
Within the area of 'Criteria and Thresholds, Physiology and Behavior, and Effects of Sound', ongoing work covers topics such as hearing, temporary threshold shift, behavioral response studies, and effects from underwater explosions.

One ongoing study will continue into FY2021:
-Multi-spaced measurement of underwater sound fields from explosive sources

In addition, at least one study is expected to be initiated in FY2019 (would be ongoing in FY2020) in response to the following needs collected from Navy personnel:
-data on sea turtle hearing/TTS
-data on mysticete hearing

Eight studies are expected to be completed by the end of FY2020:

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
-Hearing and estimated noise impacts in three species of Auk: Implications for the marbled murrelet -Hawaiian Monk seal auditory sensitivity study -Frequency-dependent growth and recovery of temporary threshold shift in bottlenose dolphins -TTS in harbor seals due to fatiguing noise of several frequencies -Temporary threshold shift in harbor porpoises due to naval sonar sounds and recovering of hearing -The effects of underwater explosions on fish -Cuvier's beaked whale and fin whale behavior during military sonar operations -3S3-Behavioral responses of sperm whales to naval sonar -Measuring the effect of range on the behavioral response of marine mammals through the use of Navy sonar and small source playbacks Funding within the area of 'Criteria and Thresholds, Physiology and Behavior, and Effects of Sound' is expected to increase for FY2020. Funding in this topic area is particularly important in FY2020 because the results are needed by the end of 2020 to update the criteria and thresholds for the Phase IV acoustic effects modeling. Therefore most of the projects will be in the final stages of trying to push to get final results in time to support this deadline. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Funding for this budget item increased from $2.654M to $3.036M ($0.382M). The additional funding requested would be used to support an emergent need for sea turtle Temporary Threshold Shift (TTS) data and to ensure that our eight studies scheduled to be completed in FY20 are completed on time. The sea turtle TTS project is a collaboration project with NOAA planned to begin in FY19 and is an opportunity to leverage additional funding from another federal organization. The eight studies schedule to be completed in FY20 (listed individually in R-2A) will be in the final stages of collecting remaining data, finalizing analysis, writing reports, and publishing results (hearing, behavioral response and TTS data) in peer-reviewed journals by the end of 2020. These results include needed to support updating the criteria and thresholds for the Phase IV acoustic effects modeling. These data are essential to ensuring that the Navy's take estimates are as accurate as possible for the Phase IV compliance documentation.					
Title: Mitigation Methodologies: Monitoring, New Technology, and Risk Assess	1.211	1.215	1.215	0.000	1.215
Articles:	-	-	-	-	-
FY 2019 Plans:					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Continue ongoing research on monitoring technology and development of the M3R (Marine Mammal Monitoring on Navy Ranges) system. None of the ongoing studies are scheduled to be completed in FY2019. After an analysis of the status of the passive acoustic monitoring technologies and tagging demonstrations are complete, it is anticipated that there will be a need to fund follow-on efforts in FY 2019. ***FY 2020 Base Plans:*** FY2020 Base Plans: Within the area of 'Mitigation Methodologies', ongoing work covers demonstration and validation of new technologies for monitoring and mitigation. One ongoing study will continue into FY2021: -M3R (Marine Mammal Monitoring on Navy Ranges) In addition, at least two studies are expected to be initiated in FY2019 (would be ongoing in FY2020) in response to the following need collected from Navy personnel: -demonstration and validation of passive acoustic sensors and platforms (UUVs, tags, fixed) for marine mammal monitoring None of the ongoing studies are scheduled to be completed in FY2020. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** N/A					
Accomplishments/Planned Programs Subtotals	4.478	4.769	5.145	0.000	5.145

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
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D. Acquisition Strategy

RDTEN Contracts are Competitive Procurements.

E. Performance Metrics

Quarterly Program Reviews

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
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Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Mar Ecol & Pop Dynamics	Various	EXWC : Port Hueneme, CA	2.422	0.555	Nov 2017	0.745	Oct 2018	0.745	Oct 2019	-		0.745	Continuing	Continuing	Continuing
Criteria & Thresholds	SS/CPFF	NMMF : San Diego, CA	0.135	0.049	Nov 2017	0.000		0.000		-		0.000	0.000	0.184	-
Mitigation Methods	SS/CPFF	SDSU : San Diego, CA	0.216	0.358	Nov 2017	0.000		0.000		-		0.000	0.000	0.574	-
Criteria & Thresholds	SS/CPFF	SEAMARCO : Netherlands	0.276	0.040	Nov 2017	0.000		0.000		-		0.000	0.000	0.316	-
Mitigation Methods	WR	OASIS Technologies, Inc. : Lexington, MA	1.338	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Criteria & Thresholds	SS/CPFF	U Saint Andrews : United Kingdom	0.163	0.343	Nov 2017	0.400	Oct 2018	0.000		-		0.000	0.000	0.906	-
Mitigation Methods	SS/CPFF	Biowaves : San Diego, CA	0.139	0.000		0.000		0.000		-		0.000	0.000	0.139	-
Mitigation Methods	SS/CPFF	Syracuse U : Syracuse, NY	0.000	0.030	Nov 2017	0.000		0.000		-		0.000	0.000	0.030	-
Criteria & Thresholds	SS/CPFF	WHOI : Falmouth, MA	0.000	0.138	Nov 2017	0.200	Oct 2018	0.000		-		0.000	0.000	0.338	-
Mitigation Methods	WR	SPAWAR : San Diego, CA	0.988	0.085	Nov 2017	0.100	Oct 2018	0.200	Oct 2019	-		0.200	Continuing	Continuing	Continuing
Criteria & Thresholds	SS/CPFF	MARECOTEL : Seabeck, WA	0.000	0.560	Nov 2017	0.600	Oct 2018	0.600	Oct 2019	-		0.600	0.000	1.760	-
Mitigation Methods	SS/CPFF	Scripps Institute : San Diego, CA	0.751	0.297	Nov 2017	0.200	Oct 2018	0.000		-		0.000	Continuing	Continuing	Continuing
Criteria & Thresholds	SS/CPFF	U Washington : Seattle, WA	0.000	0.403	Nov 2017	0.300	Oct 2018	0.000		-		0.000	0.000	0.703	-
Mitigation Methods	SS/CPFF	Oregon State Univ : OR & HI	0.754	0.055	Nov 2017	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Criteria & Thresholds	Various	EXWC : Port Hueneme, CA	0.000	0.613	Jan 2018	0.651	Jan 2019	1.830	Jan 2020	-		1.830	0.000	3.094	-
Mar Ecol & Pop Dynamics	WR	NAVAIR : Lakehurst, NJ	0.377	0.130	Nov 2017	0.075	Oct 2018	0.075	Oct 2019	-		0.075	Continuing	Continuing	Continuing

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603721N / *Environmental Protection*	**Project (Number/Name)** 9204 / *Marine Mammal Research*

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Mitigan Methods	Various	EXWC : Port Hueneme, CA	0.000	0.183	Jan 2018	0.515	Jan 2019	0.715	Jan 2020	-		0.715	Continuing	Continuing	Continuing
Mar Ecol & Pop Dynamics	SS/CPFF	BMC Inc. : Chicago, IL	0.441	0.100	Nov 2017	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Mitigation Methods	WR	NUWC : Newport, RI	10.657	0.194	Nov 2017	0.400	Oct 2018	0.300	Oct 2019	-		0.300	Continuing	Continuing	Continuing
Mar Ecol & Pop Dynamics	WR	NPGS : Monterey, CA	3.579	0.030	Nov 2017	0.030	Oct 2018	0.030	Oct 2019	-		0.030	Continuing	Continuing	Continuing
Mar Ecol & Pop Dynamics	MIPR	NOAA: Various : La Jolla, CA	3.511	0.000		0.050	Oct 2018	0.050	Oct 2019	-		0.050	Continuing	Continuing	Continuing
Mitigation Methods	SS/CPFF	Scripps Institute : La Jolla, CA	9.715	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Mitigation Methods	SS/CPFF	Oregon State Univ. : Corvallis, OR	2.066	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Criteria & Thresholds	WR	NUWC : Newport, RI	0.000	0.000		0.100	Oct 2018	0.300	Oct 2019	-		0.300	0.000	0.400	-
Criteria & Thresholds	SS/CPFF	SPAWAR : San Diego, CA	3.775	0.315	Nov 2017	0.403	Oct 2018	0.300	Oct 2019	-		0.300	Continuing	Continuing	Continuing
Criteria & Thresholds	SS/CPFF	Cascadia Research Collective : Olympia, WA	8.249	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Criteria & Thresholds	SS/CPFF	San Diego State Univ : San Diego, CA	2.543	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
		Subtotal	52.095	4.478		4.769		5.145		-		5.145	Continuing	Continuing	N/A

Remarks

Individual projects are derived from field level needs and awarded competitively to performing organizations, the portfolio mix of cost category/performing organization naturally changes from fiscal year to fiscal year.

The following increases are above 2% from FY19 to FY20:
- Mitigation Methods: SPAWAR: San Diego, CA; Increase from $0.100 to $0.200. Increase due to added projects from FY18 that has increase efforts in FY20.
- Mitigation Methods: EXWC: Port Hueneme, CA; Increase from $0.515 to $0.715. Increase due to planned FY19/20 projects that will be awarded competitively by EXWC to performing organizations based on subject matter expertise required by Navy need.
- Criteria & Thresholds: NUWC: Newport, RI; Increase from $0.100 to $0.300. Increase due to increase on existing projects due to field year.(Clarity: Field Year means that the project will have a field effort (in this situation: Data Collection at Sea) in FY2020. This will increase cost.)
- Criteria & Thresholds: EXWC: Port Hueneme, CA; Increase from $0.651 to $1.590. Increase due to planned FY19/20 projects that will be awarded competitively by EXWC to performing organizations based on subject matter expertise required by Navy need.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603721N / *Environmental Protection*	Project (Number/Name) 9204 / *Marine Mammal Research*	

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	52.095	4.478		4.769		5.145		-		5.145	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603721N / *Environmental Protection*	**Project (Number/Name)** 9204 / *Marine Mammal Research*

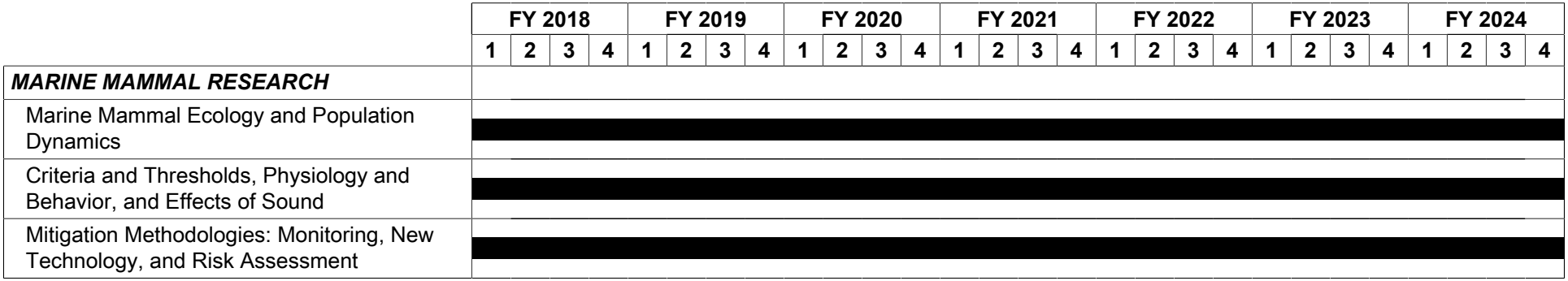


Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603721N / *Environmental Protection*	**Project (Number/Name)** 9204 / *Marine Mammal Research*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
MARINE MAMMAL RESEARCH				
Marine Mammal Ecology and Population Dynamics	1	2018	4	2024
Criteria and Thresholds, Physiology and Behavior, and Effects of Sound	1	2018	4	2024
Mitigation Methodologies: Monitoring, New Technology, and Risk Assessment	1	2018	4	2024

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
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COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
9205: *Marine Mammal Settlement*	0.000	3.000	3.000	3.000	-	3.000	0.000	0.000	0.000	0.000	0.000	9.000
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Navy developed the Surveillance Towed Array Sensory System (SURTASS) Low Frequency Active (LFA) sonar system to meet the requirement for improved capability to detect quieter and harder to find foreign submarines at greater distances. The Navy employs SURTASS LFA systems onboard up to four U.S. Navy surveillance ships for routine training, testing, and military operations in the Atlantic, Pacific, and Indian Oceans and the Mediterranean Sea. Employment of these systems has been the subject of litigation over the last two decades. The U.S. Navy, the National Oceanic and Atmospheric Administration (NOAA), and the Natural Resources Defense Council et al. entered into a settlement agreement, which has been filed with the U.S. District Court for the Northern District of California, to resolve claims alleged by the plaintiffs that the Navy and NOAA violated the Marine Mammal Protection Act (MMPA), the Endangered Species Act (ESA), and the National Environmental Policy Act (NEPA). The purpose of this funding is to comply with the terms of the settlement agreement filed with the court. Under the terms of the settlement, the Navy agrees to spend $9M over the course of three years from fiscal year 2018 through 2020 to fund research projects within the following research topic areas: 1) Developing capacity to protect acoustic habitats, including in national marine sanctuaries managed under the National Marine Sanctuaries Act 16 U.S.C. 1431 et seq., and high-risk areas for protected species; 2) improve marine mammal density and distribution modeling in data poor areas to assist with the identification of areas of biological importance; and 3) density data collection. Funding of this research will ensure compliance with the settlement agreement and will ensure that SURTASS training, testing and operational activities are able to proceed without interruption.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: MARINE MAMMAL SETTLEMENT	3.000	3.000	3.000	0.000	3.000
Articles:	-	-	-	-	-
FY 2019 Plans: Work in FY2019 under topic area 1 will be focused on conducting soundscape monitoring and fieldwork within National Marine Sanctuaries on the East Coast, West Coast, and Hawaii. This will include deployment and maintenance of passive acoustic monitoring equipment, gliders, telemetry stations; organization and communication regarding analysis techniques; and potentially some initial analysis of data collected. Work under topic area 2 will be focused on holding a follow-up workshop and continuing to collaborate with the workgroup experts on priority research areas to advance density spatial modeling methods among federal agencies.					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Work under topic area 3 will include planning for what experts will be included in the workgroup and for the elicitation process that will occur in FY2020. ***FY 2020 Base Plans:*** FY2020 Base Plans: Work under topic area 1 will be focused on continuing soundscape monitoring and fieldwork within National Marine Sanctuaries on the East Coast, West Coast, and Hawaii. This includes deployment and maintenance of passive acoustic monitoring equipment, gliders, and telemetry stations. In addition, analysis of data collected and final products will be completed. Work under topic area 2 will be focused on continued development of new modeling techniques to address key issues identified by the working group. A workshop will be held in FY2020 to bring the workgroup together to go over progress made and provide recommendations to support final products. Work under topic area 3 will focus on analysis of density data collected during FY2019. Per settlement requirements, funding under Project 9205 will remain stable at $3M per year (over FY18-20). FY2020 will be the last year of funding. ***FY 2020 OCO Plans:*** N/A					
Accomplishments/Planned Programs Subtotals	3.000	3.000	3.000	0.000	3.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

RDTEN Contracts are Competitive Procurements.

E. Performance Metrics

Quarterly Program Reviews

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
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Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
SURTASS	MIPR	NOAA, HQ : Silver Spring, MD	0.000	2.500	Oct 2017	2.500	Oct 2018	1.800	Oct 2019	-		1.800	0.000	6.800	-
SURTASS	WR	EXWC : Port Hueneme, CA	0.000	0.500	Oct 2017	0.500	Oct 2018	1.200	Oct 2019	-		1.200	0.000	2.200	-
		Subtotal	0.000	3.000		3.000		3.000		-		3.000	0.000	9.000	N/A

Remarks

Annual funding in the amount of $3M are required to comply with the settlement. Funding will likely be disbursed as indicated below and all monies are required in the 1st Quarter of the Fiscal Year (Oct 1 2019).

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	3.000		3.000		3.000		-		3.000	0.000	9.000	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603721N / *Environmental Protection*	**Project (Number/Name)** 9205 / *Marine Mammal Settlement*

	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Proj 9205																												
SURTASS Marine Mammal Settlement: SURTASS Marine Mammal Settlement	[redacted]																											

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603721N / *Environmental Protection*	**Project (Number/Name)** 9205 / *Marine Mammal Settlement*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 9205				
SURTASS Marine Mammal Settlement: SURTASS Marine Mammal Settlement	1	2018	4	2020

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy											Date: March 2019	
Appropriation/Budget Activity 1319 / 4					R-1 Program Element (Number/Name) PE 0603721N / *Environmental Protection*				Project (Number/Name) 9999 / *Congressional Adds*			
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
9999: *Congressional Adds*	0.000	0.598	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	0.598
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Inherent to the realization of the vision outlined in Sea Power 21 are certain environmental consequences that will, to a lesser or greater degree, be an impact on the Navy's ability to fully achieve the strategy outlined in the Navy Capability Pillars (NCP) SEA SHIELD, SEA STRIKE, SEA BASING and FORCEnet and the supporting initiatives of SEA WARRIOR, SEA TRIAL and SEA ENTERPRISE. Readiness and training are primary considerations for determining whether any fighting force is at its peak proficiency. The ability to train our forces in a realistic environment is paramount. Today's reality requires training and operating within environmental constraints (national and international laws and agreements), and searching for alternatives to comply with and alleviate those constraints. Moreover, as we develop new systems and technologies in support of Sea Power 21, the Navy must anticipate potential environmental regulations which, while not currently an issue, could in the future adversely impact our ability to protect and sustain our forces at home and abroad.

This program identifies pervasive Navy shore side environmental requirements and develops and validates information, new processes, and technologies that address requirements that pose significant impact on Naval shore activities in complying with environmental laws, regulations, orders, and policies. The goal of the program is to maximize opportunities for significant cost savings while minimizing personnel liabilities, operational costs, and regulatory oversight and preserving or enhancing the ability of Naval shore activities to accomplish their required missions and functions in support of the Navy's transformational strategy.

Environmental Enabling Capabilities-5 (EEC-5). COST-EFFECTIVE MANAGEMENT OF ENVIRONMENTAL REGULATORY REQUIREMENTS: The environmental compliance regulations require base managers to permit, monitor and report on many processes associated with weapon system and platform operations. Naval shore environmental managers require the capability to efficiently and cost effectively manage these compliance requirements. Under EEC-5, the program invests in improved data collection, methods, and models to assess environmental impacts and ecological risk assessments of Naval Operations on harbors, U.S. waterways, and surrounding communities. Benefits include gaining standardized technical environmental management improvements/techniques related to source control, assessment, and monitoring. EEC-5 also provides validated knowledge, models, processes and technologies to improve environmental monitoring and reporting, and to reduce the cost of compliance with regulations applicable to coastal contamination and contaminated sediments.

B. Accomplishments/Planned Programs ($ in Millions)	**FY 2018**	**FY 2019**
Congressional Add: Program Increase	0.598	0.000
FY 2018 Accomplishments: FY18 funds will be applied to: -Study of Waste Management and Minimization for Aqueous Film Forming Foam (AFFF) Wastewater, Demonstrating the Effectiveness of Novel Treatment Technologies for the Removal of Poly- and Perfluoroalkyl (PFOS/PFOA) Substances from Groundwater, Low-VOC and Low-HAP Wipe Solvent and Paint Thinner Demonstration/Validation, Preventative Management of Contaminated Silt, Impact of Sediment Resuspension by		

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603721N / *Environmental Protection*	**Project (Number/Name)** 9999 / *Congressional Adds*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019
Propeller Wash and Shore Sediment Dynamics on Remediation Options, Background analysis and tracer study to identify metal contaminant source contributions to stormwater runoff. ***FY 2019 Plans:*** N/A		
Congressional Adds Subtotals	0.598	0.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

Quarterly Budget Reviews

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
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Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
EEC5	Various	EXWC : Port Hueneme, CA	0.000	0.278	Oct 2018	0.000		0.000		-		0.000	0.000	0.278	-
EEC5	WR	SSC : San Diego, CA	0.000	0.100	Oct 2018	0.000		0.000		-		0.000	0.000	0.100	-
EEC5	WR	NSWC : Bethesda, MD	0.000	0.075	Oct 2018	0.000		0.000		-		0.000	0.000	0.075	-
EEC5	Various	FRC SE : Jacksonville, FL	0.000	0.065	Oct 2018	0.000		0.000		-		0.000	0.000	0.065	-
EEC5	Various	NAWC : Patuxent River, MD	0.000	0.040	Oct 2018	0.000		0.000		-		0.000	0.000	0.040	-
EEC5	Various	NAWC : China Lake, CA	0.000	0.040	Oct 2018	0.000		0.000		-		0.000	0.000	0.040	-
		Subtotal	0.000	0.598		0.000		0.000		-		0.000	0.000	0.598	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	0.598		0.000		0.000		-		0.000	0.000	0.598	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603721N / *Environmental Protection*	**Project (Number/Name)** 9999 / *Congressional Adds*

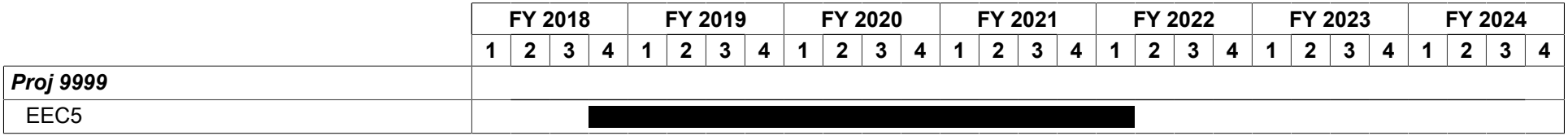


Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603721N / *Environmental Protection*	**Project (Number/Name)** 9999 / *Congressional Adds*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 9999				
EEC5	4	2018	1	2022

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy											Date: March 2019	
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0603724N *I Navy Energy Program*							
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
Total Program Element	395.296	42.425	32.656	26.514	-	26.514	26.915	27.465	28.002	28.560	Continuing	Continuing
0829: *ENERGY CONSERVATION (ADV)*	77.280	7.769	5.489	5.607	-	5.607	5.736	5.856	5.971	6.091	Continuing	Continuing
0838: *Mobility Fuels (ADV)*	91.827	7.782	7.921	8.281	-	8.281	8.330	8.505	8.664	8.837	Continuing	Continuing
0928: *Shore Energy Technology*	52.209	1.773	1.704	1.869	-	1.869	1.887	1.924	1.964	2.002	Continuing	Continuing
0996: *Aircraft Energy Conservation*	142.568	7.614	10.542	10.757	-	10.757	10.962	11.180	11.403	11.630	Continuing	Continuing
9999: *Congressional Adds*	31.412	17.487	7.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	55.899

A. Mission Description and Budget Item Justification

This program supports projects to evaluate, adapt, and demonstrate energy related technologies for Navy aircraft and ship operations to: (a) increase fuel-related weapons systems capabilities such as range and time on station; (b) reduce energy costs; (c) apply energy technologies that improve environmental compliance; (d) examine restrictive fuel specification requirements to reduce cost and increase availability worldwide; (e) provide guidance to fleet operators for the safe use of commercial grade or off-specification fuels; and (f) make needed periodic changes to fuel specifications to ensure fuel quality and avoid fleet operating problems. This program supports the achievement of legislated, White House, Department of Defense, and Navy energy management goals.

JUSTIFICATION FOR BUDGET ACTIVITY: This program is funded under ADVANCED COMPONENT DEVELOPMENT AND PROTOTYPES because it includes all efforts necessary to evaluate integrated technologies, representative models or prototype systems in a high fidelity and realistic operating environment.

B. Program Change Summary ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	25.623	25.656	26.452	-	26.452
Current President's Budget	42.425	32.656	26.514	-	26.514
Total Adjustments	16.802	7.000	0.062	-	0.062
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	7.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	3.846	0.000			
• SBIR/STTR Transfer	-1.044	0.000			
• Program Adjustments	0.000	0.000	0.000	-	0.000
• Rate/Misc Adjustments	0.000	0.000	0.062	-	0.062

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy				Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*		R-1 Program Element (Number/Name) PE 0603724N *I Navy Energy Program*		
• Congressional Add Adjustments	14.000	-	-	-

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2018	FY 2019
Project: 9999: *Congressional Adds*		
Congressional Add: *Program Increase*	3.846	0.000
Congressional Add: *Program Increase: Renewable Energy Development*	9.641	7.000
Congressional Add: *Natural Gas Technologies*	4.000	0.000
Congressional Add Subtotals for Project: 9999	17.487	7.000
Congressional Add Totals for all Projects	17.487	7.000

Change Summary Explanation

Schedule:

0838 - Emerging Platform CONOPS added FY20 1Qtr through 4Qtr FY24 and Maintain Operational Compatibility 1Qtr FY18 through 4Qtr FY24 is to support the increased requirements of emerging systems and operational scenarios placed on tactical fuels and the need to conduct testing to ensure acceptable fuel performance or identify the fuel property and/or chemistry that needs to be modified. Mitigation of Field Fuel Deficiencies and Fuel Quality Surveillance changes are added for clarity.

Technical: Not applicable.

The funding decreases in FY 2018 and FY 2019 reflect a shift in Department of the Navy (DoN) priorities and an urgent requirement to address emergent, critical unfunded requirements in FY 2018. The decrease aligns Energy program funding to the previous amounts executed prior to FY 2011.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603724N / *Navy Energy Program*	Project (Number/Name) 0829 / *ENERGY CONSERVATION (ADV)*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
0829: *ENERGY CONSERVATION (ADV)*	77.280	7.769	5.489	5.607	-	5.607	5.736	5.856	5.971	6.091	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

A. MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION:

The Energy Conversation Advanced Project is designed to develop and implement energy and maintenance saving improvements into existing Fleet assets. This energy conservation project, managed through NAVSEA 05T, will identify mature potential energy saving areas, by involvement with Fleet representatives, Life-Cycle Managers (LCMs), NAVSEA Technical Warrant Holders, In-Service Engineering Agents (ISEAs), PEOs, TMA/TMI, Industry, and Academia. The project directly supports SECNAV and CNO goals to reduce energy consumption and increase operational capability (i.e., increase time on station). Current focus is on Energy Monitoring and Assessment Technologies aimed at reducing energy consumption on operation ships with potential technology target areas that include: Power Generation and Storage systems, Hull Hydrodynamics, Underwater Hull Husbandry, Heating, Ventilation & Air Conditioning (HVAC) Systems, Thermal Management, Main Propulsion Systems, Electrical Systems and Auxiliary Systems. Potential energy saving proposals, Energy Conservation Concepts (ECC), are developed each FY for evaluation by functional category. Based on review of a business case and a technical community review projects are selected for development. Not all proposed ECCs are pursued and changes to planned funding between functional categories or fiscal years can occur based on the technology maturity level, ship schedule changes, or other factors affecting the projected development or testing timeline.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Power Generation and Storage Sub Project	0.600	0.000	0.000	0.000	0.000
Articles:	-	-	-	-	-
Description: (U) Power Generation & Storage System Sub Project - This project area will accomplish prototype development, laboratory and Fleet testing to determine overall effectiveness of technologies focused on improving efficiency of current power generation & storage methodologies. ***FY 2019 Plans:*** N/A ***FY 2020 Base Plans:*** N/A ***FY 2020 OCO Plans:*** N/A					
Title: Hull Hydrodynamic Sub Project	0.277	0.000	0.000	0.000	0.000

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603724N / *Navy Energy Program*	**Project (Number/Name)** 0829 / *ENERGY CONSERVATION (ADV)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Articles:	-	-	-	-	-
Description: (U) Hull Hydrodynamic Sub Project - This project area will accomplish prototype development, modeling, laboratory and Fleet testing of ship modifications to propellers and/or hull appendages to determine overall mission and cost effectiveness of these improvements. ***FY 2019 Plans:*** N/A ***FY 2020 Base Plans:*** N/A ***FY 2020 OCO Plans:*** N/A					
Title: Underwater Hull Husbandry Sub Project	0.213	0.000	0.000	0.000	0.000
Articles:	-	-	-	-	-
Description: (U) Hull Husbandry Sub Project - Project funds will be utilized to identify and evaluate new underwater hull/propeller coating systems and underwater hull cleaning and maintenance techniques to reduce hydrodynamic drag on the hull and thereby increase fuel efficiency. ***FY 2019 Plans:*** N/A ***FY 2020 Base Plans:*** N/A ***FY 2020 OCO Plans:*** N/A					
Title: Electrical Systems Sub Project	0.390	0.000	0.000	0.000	0.000
Articles:	-	-	-	-	-
Description: (U) Electrical Systems Sub Project - Project funds will be utilized to identify and perform land based and shipboard testing of ship electrical system improvements to reduce energy. ***FY 2019 Plans:***					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603724N / *Navy Energy Program*	**Project (Number/Name)** 0829 / *ENERGY CONSERVATION (ADV)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
N/A ***FY 2020 Base Plans:*** N/A ***FY 2020 OCO Plans:*** N/A					
Title: Auxiliary Systems Sub Project ***Articles:*** ***Description:*** (U) Auxiliary Systems Sub Project -- Project funds will be utilized to identify, test and evaluate new technologies for shipboard auxiliary systems aimed at reducing fuel consumption. ***FY 2019 Plans:*** N/A ***FY 2020 Base Plans:*** N/A ***FY 2020 OCO Plans:*** N/A	0.154 -	0.000 -	0.000 -	0.000 -	0.000 -
Title: Thermal Management Sub Project ***Articles:*** ***Description:*** (U) Thermal Management Sub Project - Project funds will be utilized to identify and evaluate potential uses for Thermal Management techniques designed to reduce overall shipboard heat generation as well as incorporating waste heat recovery techniques to reduce the shipboard electrical demand on HVAC and other systems. ***FY 2019 Plans:*** Continue exploration of waste heat technologies and methods for shipboard application. Provide report of findings with recommendations. Continue to identify additional energy saving/capability improvement technologies in Thermal Management that may be applicable to navy ships. Prepare proposals and business case analyses for promising technologies with potential to reduce fossil fuel consumption. ***FY 2020 Base Plans:***	0.372 -	0.413 -	0.000 -	0.000 -	0.000 -

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603724N / *Navy Energy Program*	**Project (Number/Name)** 0829 / *ENERGY CONSERVATION (ADV)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
N/A ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** FY19 funding is an investigative study to identify potential applications for possible waste heat recovery applications. Funding limitations in FY20 with other higher priorities will delay pursuit of shipboard applications for evaluation.					
Title: Main Propulsion Systems Sub Project ***Articles:*** ***Description:*** (U) Propulsion Systems Sub Project - Project funds will be utilized to identify requirements and perform land based and ship board testing of ship propulsion system improvements, on Gas Turbine, Steam, and Diesel Engine systems to reduce overall fuel consumption and lower maintenance costs. ***FY 2019 Plans:*** N/A ***FY 2020 Base Plans:*** N/A ***FY 2020 OCO Plans:*** N/A	0.350 -	0.000 -	0.000 -	0.000 -	0.000 -
Title: Energy Monitoring & Assessment ***Articles:*** ***Description:*** This project area will focus on methods of capturing and displaying energy related data to shipboard personnel as actionable information for ships force to employ energy conservation measures underway and in port as mission requirements permit. ***FY 2019 Plans:*** Provide engineering, technical and programmatic support of energy initiatives that put in place shore and shipboard monitoring and assessment tools aimed at optimizing ships' energy profiles and increasing operational capabilities. Continue GENISYS development efforts and shipboard evaluation including integration of GENISYS with enterprise Remote Monitoring (eRM) capabilities to support future fleet-wide implementation. Continue to identify additional energy saving/capability improvement technologies and monitoring methodologies	5.413 -	5.076 -	5.607 -	0.000 -	5.607 -

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603724N / *Navy Energy Program*	**Project (Number/Name)** 0829 / *ENERGY CONSERVATION (ADV)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
and prepare proposals and business case analyses for promising technologies with potential to reduce fossil fuel. ***FY 2020 Base Plans:*** Provide engineering, technical and programmatic support of energy initiatives that put in place shore and shipboard monitoring and assessment tools aimed at optimizing ships' energy profiles and increasing operational capabilities. Continue GENISYS development efforts and shipboard evaluation including integration of GENISYS with enterprise Remote Monitoring (eRM) capabilities to support future fleet-wide implementation. Support expanding the use of the data collected by GENISYS to support Maritime Energy Operational Command and Control requirements currently being developed by DASN RD&A and US Fleet Forces Command. Continue to identify additional energy saving/capability improvement technologies and monitoring methodologies and prepare proposals and business case analyses for promising technologies with potential to reduce fossil fuel. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increase of 0.531M is required to support continuation of high profile GENISYS program management and the transition from development to shipboard test and evaluation phase in FY20.					
Accomplishments/Planned Programs Subtotals	7.769	5.489	5.607	0.000	5.607

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

RDT&E Contracts are Competitive Procurements.

E. Performance Metrics

Quarterly Program Reviews

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603724N / *Navy Energy Program*	**Project (Number/Name)** 0829 / *ENERGY CONSERVATION (ADV)*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Systems Engineering	C/CPFF	NAVSEA HQ : Washington, DC	0.000	1.110	Jan 2018	0.000		0.200	Jan 2020	-		0.200	0.000	1.310	-
Systems Engineering	WR	NSWC DD : Dahlgren, MD	0.100	0.000		0.000		0.000		-		0.000	0.000	0.100	-
Systems Engineering	WR	NSWC PHila : Philadelphia, PA	1.655	1.079	Nov 2017	0.328	Nov 2018	0.100	Nov 2019	-		0.100	0.000	3.162	-
Primary Hardware Development	WR	NSWC Carderock : Bethesda, MD	8.983	0.000		0.000		0.000		-		0.000	0.000	8.983	-
Systems Engineering	WR	NSWC PHD : Port Hueneme, CA	0.100	0.000		0.000		0.000		-		0.000	0.000	0.100	-
Systems Engineering	C/CPAF	NSWC Carderock : Bethesda, MD	6.635	0.313	Nov 2018	0.000		0.000		-		0.000	0.000	6.948	-
Engineering Development	WR	NSWC Carderock : Bethesda, MD	8.369	0.000		0.000		0.000		-		0.000	0.000	8.369	-
Demonstration & Evaluation	WR	NSWC Carderock : Bethesda, MD	8.149	0.000		0.000		0.000		-		0.000	0.000	8.149	-
System Development	C/BOA	NAWC-AD : Lakehurst, NJ	1.300	1.286	Jan 2018	2.169	Jan 2019	0.883	Jan 2020	-		0.883	0.000	5.638	-
Primary Hardware Development	C/CPAF	NSWC PHila : Philadelphia, PA	0.000	0.000		0.000		0.000		-		0.000	0.000	0.000	-
System Engineering	WR	NSWC CR : Crane, Indiana	0.000	0.300	Dec 2018	0.000		0.000		-		0.000	0.000	0.300	-
System Engineering	WR	NUWC NPT : Newport, Rhode Is	0.000	0.193	Dec 2018	0.000		0.000		-		0.000	0.000	0.193	-
		Subtotal	35.291	4.281		2.497		1.183		-		1.183	0.000	43.252	N/A

Remarks

Increase of 0.200M in Systems Engineering (NAVSEA HQ) is for GENISYS product development support and decrease of 0.228M (NSWC PHILA) is due to reduced engineering support required in identifying and design development of new technology initiatives under FY20 budget level. Decrease of 1.286M in System Development (NAWC-AD) reflects transition of GENISYS product development to Test and Evaluation in FY20.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603724N / *Navy Energy Program*	Project (Number/Name) 0829 / *ENERGY CONSERVATION (ADV)*	

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Development Support	WR	NSWC Carderock : Bethesda, MD	2.843	0.000	Jan 2018	0.344	Nov 2018	0.217	Nov 2019	-		0.217	Continuing	Continuing	Continuing
Software Support	WR	NSWC Carderock : Bethesda, MD	0.522	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Integrated Logistics Support	WR	NSWC Carderock : Bethesda, MD	1.200	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Study Anaylsis	WR	NSWC Carderock : Bethesda, MD	1.174	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Development Support	C/CPAF	NSWC SSES : Philadelphia, PA	0.878	0.000		0.100	Jan 2019	0.050	Jan 2020	-		0.050	0.000	1.028	-
Development Support	C/CPFF	NAVSEA HQ : Washington, DC	0.249	1.316	Dec 2018	0.479	Jan 2019	0.421	Jan 2020	-		0.421	0.000	2.465	-
Software Support	C/CPAF	NSWC SSES : Philadelphia, PA	0.281	0.000		0.000		0.000		-		0.000	0.000	0.281	-
Software Support	C/CPAF	NAVSEA HQ : Washington, DC	1.200	0.000		0.000		0.000		-		0.000	0.000	1.200	-
Development Support	WR	NSWC PHila : Philadelphia, PA	2.146	0.150	Dec 2017	0.494	Nov 2018	0.397	Nov 2019	-		0.397	0.000	3.187	-
Development Support	C/CPAF	SUPSHIP : Bath, MA	0.000	0.000		0.000		0.000		-		0.000	0.000	0.000	-
Development Support	WR	NSWC DD : Dahlgren, Va	0.000	0.050	Dec 2018	0.000		0.000		-		0.000	0.000	0.050	-
		Subtotal	10.493	1.516		1.417		1.085		-		1.085	Continuing	Continuing	N/A

Remarks

Decrease of 0.239M in Development Support (NSWC PHILA and NSWC Carderock) is due to reduction in engineering efforts to investigate and develop designs for new fuel saving technologies under FY20 budget level.

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Developmental Test & Evaluation	WR	NSWC Carderock : Bethesda, MD	9.961	0.000		0.085	Dec 2018	0.000		-		0.000	Continuing	Continuing	Continuing

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603724N / *Navy Energy Program*	Project (Number/Name) 0829 / *ENERGY CONSERVATION (ADV)*	

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Operational Test & Evaluation	WR	NSWC Carderock : Bethesda, MD	10.645	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
LIve Fire Test & Evaluation	WR	NSWC Carderock : Bethesda, MD	0.382	0.000		0.000		0.000		-		0.000	0.000	0.382	-
Developmental Test & Evaluation	C/CPAF	NSWC Philadelphia : Philadelphia, PA	0.383	0.000		0.000		0.000		-		0.000	0.000	0.383	-
Developmental Test & Evaluation	WR	NSWC SSES : Philadelphia, PA	0.549	0.369	Feb 2018	0.000		0.000		-		0.000	0.000	0.918	-
Developmental Test & Evaluation	WR	APL : Washington, DC	0.000	0.000		0.085	Jan 2019	0.000		-		0.000	0.000	0.085	-
System Development	C/BOA	NAWC-AD : Lakehurst, NJ	0.000	0.000		0.000		1.924	Jan 2020	-		1.924	0.000	1.924	-
		Subtotal	21.920	0.369		0.170		1.924		-		1.924	Continuing	Continuing	N/A

Remarks

Increase of 1.755M is due to transition of GENISYS from development to shipboard Test and Evaluation phase and integration with shipboard Consolidated Afloat Networks and Enterprise Services (CANES).

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management Support	WR	NSWC Philadelphia : Philadelphia, PA	6.680	0.420	Nov 2017	0.000		0.000		-		0.000	0.000	7.100	-
Travel	Allot	NAVSEA HQ : Washington, DC	0.189	0.013	Dec 2017	0.007	Dec 2018	0.007	Dec 2019	-		0.007	0.000	0.216	-
Total Assets	WR	NSWC Carderock : Bethesda, MD	0.352	0.000		0.000		0.000		-		0.000	0.000	0.352	-
Program Management Support	C/CPFF	NAVSEA HQ : Washington, DC	1.680	0.813	Jan 2018	1.378	Jan 2019	1.388	Jan 2020	-		1.388	0.000	5.259	-
Program Management Support	WR	NSWC Carderock : Bethesda, MD	0.675	0.357	Nov 2017	0.020	Mar 2019	0.020	Mar 2020	-		0.020	0.000	1.072	-
		Subtotal	9.576	1.603		1.405		1.415		-		1.415	0.000	13.999	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603724N / *Navy Energy Program*	Project (Number/Name) 0829 / *ENERGY CONSERVATION (ADV)*	

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	77.280	7.769		5.489		5.607		-		5.607	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603724N / *Navy Energy Program*	**Project (Number/Name)** 0829 / *ENERGY CONSERVATION (ADV)*

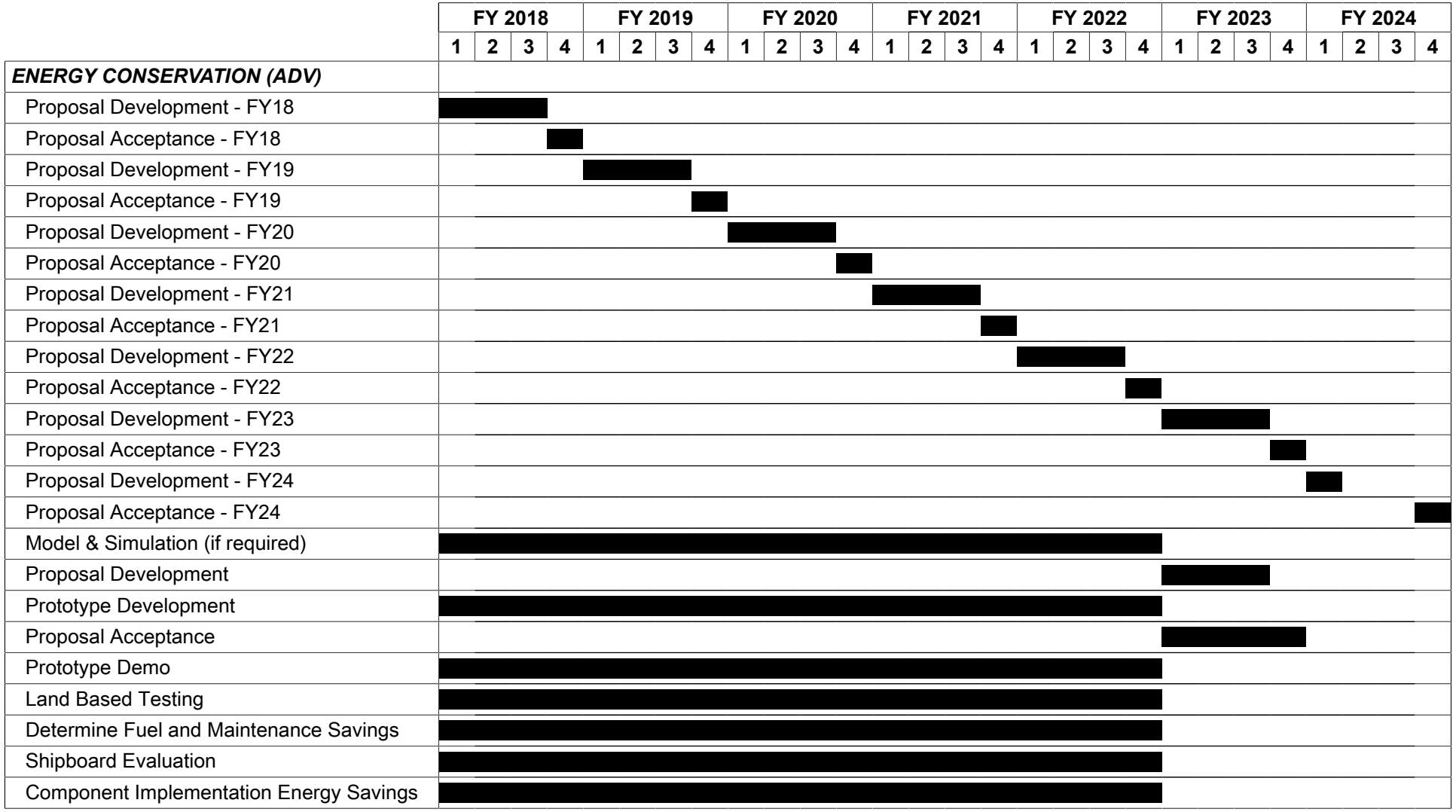


Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603724N / *Navy Energy Program*	**Project (Number/Name)** 0829 / *ENERGY CONSERVATION (ADV)*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
ENERGY CONSERVATION (ADV)				
Proposal Development - FY18	1	2018	3	2018
Proposal Acceptance - FY18	4	2018	4	2018
Proposal Development - FY19	1	2019	3	2019
Proposal Acceptance - FY19	4	2019	4	2019
Proposal Development - FY20	1	2020	3	2020
Proposal Acceptance - FY20	4	2020	4	2020
Proposal Development - FY21	1	2021	3	2021
Proposal Acceptance - FY21	4	2021	4	2021
Proposal Development - FY22	1	2022	3	2022
Proposal Acceptance - FY22	4	2022	4	2022
Proposal Development - FY23	1	2023	3	2023
Proposal Acceptance - FY23	4	2023	4	2023
Proposal Development - FY24	1	2024	1	2024
Proposal Acceptance - FY24	4	2024	4	2024
Model & Simulation (if required)	1	2018	4	2022
Proposal Development	1	2023	3	2023
Prototype Development	1	2018	4	2022
Proposal Acceptance	1	2023	4	2023
Prototype Demo	1	2018	4	2022
Land Based Testing	1	2018	4	2022
Determine Fuel and Maintenance Savings	1	2018	4	2022
Shipboard Evaluation	1	2018	4	2022

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603724N / *Navy Energy Program*	**Project (Number/Name)** 0829 / *ENERGY CONSERVATION (ADV)*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Component Implementation Energy Savings	1	2018	4	2022

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603724N / *Navy Energy Program*	Project (Number/Name) 0838 / *Mobility Fuels (ADV)*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
0838: *Mobility Fuels (ADV)*	91.827	7.782	7.921	8.281	-	8.281	8.330	8.505	8.664	8.837	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This project represents the Navy's only RDTE investment designed to maintain its capability to operate as a "smart" customer for aviation and ship tactical fuels that are an operationally critical, single point of failure, $4.0 billion per year consumable requiring worldwide availability and interoperability.

Recent field problems have demonstrated the adverse effects that fuel-related problems can have on ship and aircraft performance, durability, and readiness. The potential risk and adverse operational impacts of fuel-related problems over the next decade, given the evolving production technologies, changing feedstocks, more stringent environmental regulations and the introduction of new operational requirements and platforms will continue to increase.

This project provides data through laboratory, component, engine, fuel system, and platform tests, which relate the effects of changes in the Navy fuel properties and chemistry to the performance and durability of Naval ship, aircraft, ground and fuel distribution systems. The information is required to: (a) assure interoperability with fuel procured from commercial/ international specifications, (b) determine the extent to which unnecessarily restrictive military specification requirements can be relaxed to reduce cost and increase availability
worldwide, (c) provide guidance to fleet operators for the safe use of off-specification fuels or emerging CONOPS requiring the use of non-traditional fuels,(d) assure operational interoperability with evolving changes in fuel production technology, feedstocks, environmental regulations and tactical system demands, (e) improve the capability and reduce the cost of field fuel quality surveillance and (f) facilitate rapid identification and resolution of field identified fuel deficiencies.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Naval Tactical Fuels	7.782	7.921	8.281	0.000	8.281
Articles:	-	-	-	-	-
Description: Perform development, test and evaluation work on Naval tactical fuels to: a) assure interoperability with commercial/international fuel specifications, b) determine the extent to which unnecessarily restrictive military specification features can be relaxed to reduce cost and increase availability worldwide; c) provide guidance to fleet operators for the safe use of off-specification or non-primary fuels , d) validate periodic changes to the Navy tactical fuel specifications to ensure fuel quality and avoid fleet operating problems while accommodating evolutionary changes in the fuel supply industry and e) improve fleet methods to ensure fuel quality and performance.					
FY 2019 Plans:					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603724N / *Navy Energy Program*	**Project (Number/Name)** 0838 / *Mobility Fuels (ADV)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Conduct rig and component tests to assure interoperability with changing worldwide commercial aviation fuel specifications. Continue development of analytical tools to facilite rapid mitigation of field-identified aviation and ship propulsion fuel deficiencies. Continue development data analytic techniques to rapidly evaluate fuel chemical composition, performance and field databases. Field trial advance fuel quality surveillance tools . ***FY 2020 Base Plans:*** Develop and evaluate forward-positioned fuel chemistry and property Quality Surveillance sensor systems. Continue development of interactive data visualization and data science tools to rapidly analyze fuel property, composition, performance, and logistics data. Field trial advance fuel contamination quality surveillance technology. Conduct lab, rig and component tests to assure interoperability with evolving commercial specification and platform requirements. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** The $36K increase will support the development of the Fuels Quality Surveillance sensor systems.					
Accomplishments/Planned Programs Subtotals	7.782	7.921	8.281	0.000	8.281

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Testing efforts will be competitively contracted, and performed under Cost Plus Fixed Fee and Firm Fixed Price contracts.

E. Performance Metrics

Program will assess changes and develop data, test methods and hardware performance analysis for all Naval aircraft and ships. Program will evaluate fuel chemistry and properties and develop technologies to identify and assess impact of differences.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603724N / *Navy Energy Program*	Project (Number/Name) 0838 / *Mobility Fuels (ADV)*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Systems Engineering	WR	NRL : Washington, D.C.	5.052	1.100	Dec 2017	0.800	Dec 2018	1.000	Dec 2019	-		1.000	Continuing	Continuing	Continuing
Systems Engineering	WR	NAWCAD : Patuxent River, MD	16.818	2.297	Dec 2017	2.046	Dec 2018	2.187	Dec 2019	-		2.187	Continuing	Continuing	Continuing
Systems Engineering	WR	NSWC : Philadelphia, PA	3.778	0.150	Jan 2018	0.500	Jan 2019	0.500	Jan 2020	-		0.500	Continuing	Continuing	Continuing
Systems Engineering	WR	NSWC : Bethesda, MD	0.312	0.050	Feb 2018	0.100	Mar 2019	0.000		-		0.000	0.000	0.462	-
Systems Engineering	C/FFP	Various : Various	0.960	1.123	Mar 2018	0.652	Apr 2019	1.021	Apr 2020	-		1.021	0.000	3.756	3.756
Prior year Prod Dev no longer funded in the FYDP	Various	Various : Various	0.161	0.000		0.000		0.000		-		0.000	0.000	0.161	-
		Subtotal	27.081	4.720		4.098		4.708		-		4.708	Continuing	Continuing	N/A

Remarks

1. NRL $200K increase due to workload requirement to support FY20 field fuel property and chemistry sensor project
2. NAWC $96K increase due to increase in test consumable costs
6. VARIOUS $369K increase due to increase workload requirement to support FY20 field fuel property and chemistry sensor project.

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Test Fuel	C/FFP	Various : Various	2.000	0.000		0.000		0.000		-		0.000	0.000	2.000	2.000
Test Fuel	C/FFP	Applied Research Associates : Albuquerque, NM	3.858	0.000		0.000		0.000		-		0.000	0.000	3.858	3.858
Hardware Testing	WR	NAWCAD : Patuxent River, MD	4.449	0.200	Dec 2017	0.200	Dec 2018	1.000	Dec 2019	-		1.000	Continuing	Continuing	Continuing
Hardware Testing	C/CPFF	Life Cycle Engineering : Charleston, SC	12.980	2.000	Dec 2017	1.943	Apr 2019	2.000	Mar 2020	-		2.000	0.000	18.923	18.923
Hardware Testing	SS/CPFF	Rolls Royce : Indianapolis, IN	2.912	0.000		0.000		0.000		-		0.000	0.000	2.912	2.912

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603724N / *Navy Energy Program*	**Project (Number/Name)** 0838 / *Mobility Fuels (ADV)*

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Hardware Testing	C/CPFF	Univ of Dayton Research Inst : Dayton, OH	0.889	0.000		0.400	Feb 2019	0.000		-		0.000	0.000	1.289	1.289
Hardware Testing	WR	US Naval Academy : Annapolis, MD	0.098	0.050	May 2018	0.050	Apr 2019	0.040	Apr 2020	-		0.040	0.000	0.238	-
Hardware Testing	C/CPFF	General Electric : Lynn, MA	1.237	0.000		0.000		0.000		-		0.000	0.000	1.237	1.237
Hardware Testing	WR	NSWC : Philadelphia, PA	0.080	0.000		0.000		0.000		-		0.000	0.000	0.080	-
Hardware Testing	C/FFP	Various : Various	6.183	0.500	Jan 2018	0.920	Feb 2019	0.223	Mar 2020	-		0.223	0.000	7.826	7.826
Hardware Testing	WR	NSWC : Port Hueneme, CA	0.200	0.000		0.000		0.000		-		0.000	0.000	0.200	-
Hardware Testing	C/CPFF	DL Mgmt Services JT Venture : Plainfield, IL	0.004	0.000		0.000		0.000		-		0.000	0.000	0.004	0.004
Fuel Delivery	MIPR	DLA-Energy : Ft. Belvoir, VA	0.647	0.000		0.000		0.050	Jan 2020	-		0.050	0.000	0.697	-
Fuel Blend Testing	WR	Naval Medical Research Unit : Dayton, OH	0.042	0.000		0.000		0.000		-		0.000	0.000	0.042	-
Prior year T & E no longer funded in the FYDP	Various	Various : Various	21.212	0.000		0.000		0.000		-		0.000	0.000	21.212	-
		Subtotal	56.791	2.750		3.513		3.313		-		3.313	Continuing	Continuing	N/A

Remarks

3. NAWC $800K increase due to transition of testing in house previously performed by contractor and increase requirement to support in house and field fuel property and chemistry sensor project.
4. LCE increase of $57K due to increase test costs
14. DLA increase of $50K due to test fuel transportation costs from Patuxent River storage location to contractor test sites.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603724N / *Navy Energy Program*	**Project (Number/Name)** 0838 / *Mobility Fuels (ADV)*

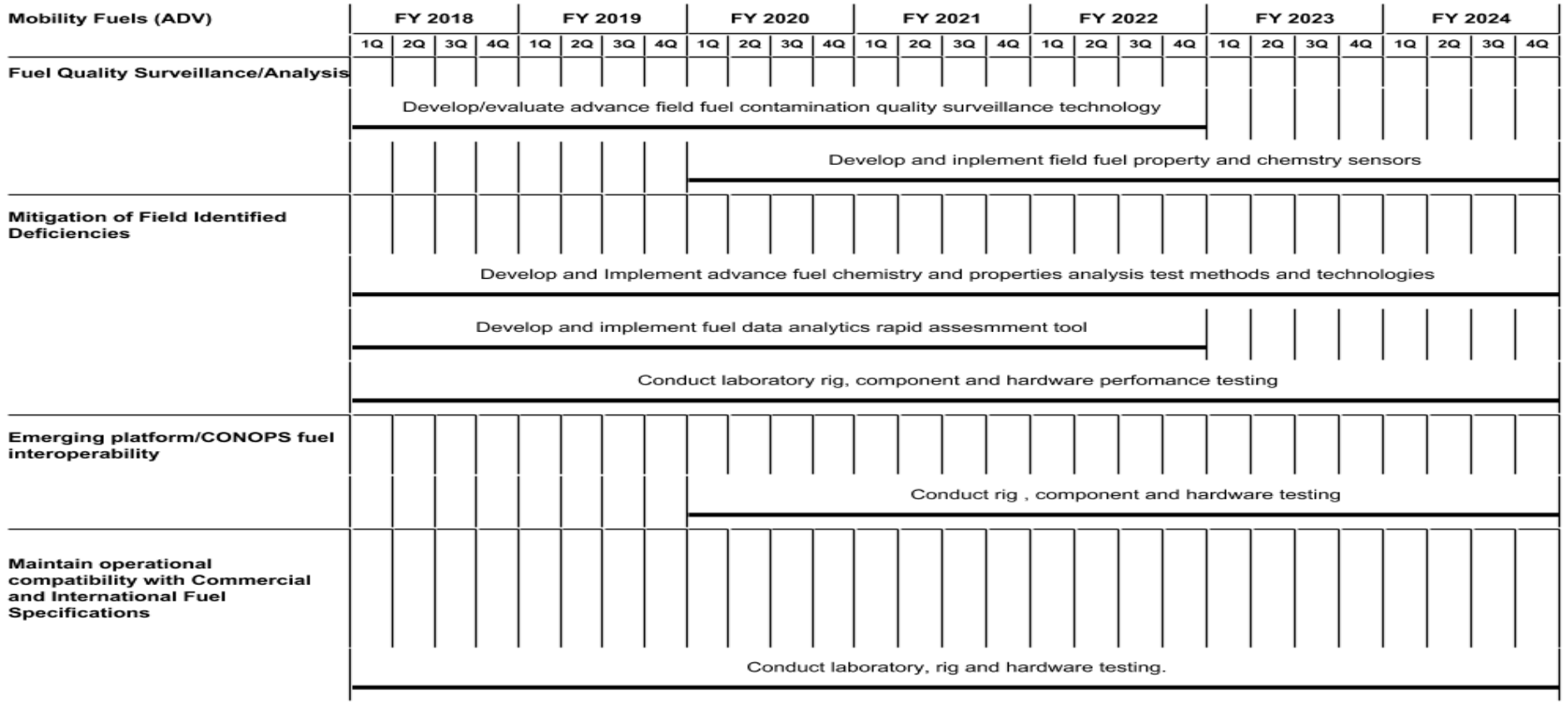
Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management Support	WR	NAWCAD : Patuxent River, MD	1.291	0.300	Dec 2017	0.300	Dec 2018	0.250	Dec 2019	-		0.250	Continuing	Continuing	Continuing
Program Management Support	WR	NAVSUP : San Diego, CA	0.027	0.000		0.000		0.000		-		0.000	0.000	0.027	Continuing
Program Management Support	C/FFP	Coord Research Council : Alpharetta, GA	0.050	0.010	Nov 2017	0.010	Nov 2018	0.010	Nov 2019	-		0.010	0.000	0.080	0.080
Program Management Support	WR	NAVSEA : Washington, DC	0.004	0.002	Nov 2017	0.000		0.000		-		0.000	0.000	0.006	-
Prior year Mgmt Supp no longer funded in the FYDP	Various	Various : Various	6.583	0.000		0.000		0.000		-		0.000	0.000	6.583	-
		Subtotal	7.955	0.312		0.310		0.260		-		0.260	Continuing	Continuing	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	91.827	7.782		7.921		8.281		-		8.281	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603724N / *Navy Energy Program*	**Project (Number/Name)** 0838 / *Mobility Fuels (ADV)*



2020DON - 0603724N - 0838

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603724N / *Navy Energy Program*	**Project (Number/Name)** 0838 / *Mobility Fuels (ADV)*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Mobility Fuels (ADV)				
Fuel Quality Surveillance/Analysis: Develop/evaluate advance field fuel contamination quality surveillance technology	1	2018	4	2022
Fuel Quality Surveillance/Analysis: Develop and implement field fuel property and chemstry sensors	1	2020	4	2024
Mitigation of Field Identified Deficiencies: Develop and Implement advance fuel chemistry and properties analysis test methods and technologies	1	2018	4	2024
Mitigation of Field Identified Deficiencies: Develop and implement fuel data analytics rapid assesmment tool	1	2018	4	2022
Mitigation of Field Identified Deficiencies: Conduct laboratory rig, component and hardware perfomance testing	1	2018	4	2024
Emerging platform/CONOPS fuel interoperability: Conduct rig, component and hardware testing	1	2020	4	2024
Maintain operational compatibility with Commercial and International Fuel Specifications: Conduct laboratory, rig and hardware testing.	1	2018	4	2024

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy											Date: March 2019	
Appropriation/Budget Activity 1319 / 4					R-1 Program Element (Number/Name) PE 0603724N / *Navy Energy Program*				Project (Number/Name) 0928 / *Shore Energy Technology*			
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
0928: *Shore Energy Technology*	52.209	1.773	1.704	1.869	-	1.869	1.887	1.924	1.964	2.002	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Legislation, Executive Orders (EO), and SECNAV Guidance direct DoN to reduce fossil fuel use and increase energy resiliency through efficiency, reliability, and alternative energy sources. This guidance includes the National Defense Authorization Act of 2010, which directs DOD to source 25% of its energy from renewable sources by 2025, EO13514, which directs DOD to reduce greenhouse gas emissions by 2020, and SECNAV energy goals, which direct that 50% of DoN's energy come from alternative sources by 2020. Further, studies by the Defense Science Board and others have stressed the dangerous reliance of DOD on vulnerable grid power and unreliable imported oil.

This Energy RDT&E Project will test, evaluate, and validate components as well as demonstrate cost-effective and technical viability of energy security and efficiency, and technologies. All efforts will be coordinated across DOD and with other agencies as appropriate. Specifically, this project aims to pursue three areas of development, testing and evaluation: (A) Modeling and possible prototype testing of new energy sources for use at Naval installations with potential for widespread applicability to energy security; (B) It will support demonstration and validation of advanced electric grid management systems, known as "Smart Grid" and "Micro Grid" technology, for use at Naval installations to enable improved energy security; (C) Demonstration and Validation of Alternative Energy, Energy Efficiency, and Smart Energy Management Technology: This project will support the testing, demonstration, validation, and application of innovative facility energy efficiency and alternative energy technology.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**
Title: Shore Energy Technology	1.773	1.704	1.869	0.000	1.869
Articles:	-	-	-	-	-
FY 2019 Plans: - Continue demonstration, testing, and evaluation of improved and low cost smart and microgrid energy management technologies to enable energy security. - Continue demonstration of cyber secure technologies utilizing cyber testbed. - Test, validate and demonstrate wireless controls. Obtain Risk Management Framework certification, install, and test in operational environment. - Installation and demonstration of energy efficient wastewater treatment of both mobile and stationary facilities to save energy and water. Test systems in operational environment. - Demonstration and validation of cyber security technologies for energy controls systems in an operational environment to enable a cyber secure environment.					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603724N / *Navy Energy Program*	**Project (Number/Name)** 0928 / *Shore Energy Technology*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
- Initiate new projects in energy resiliency including cyber security of energy controls systems. ***FY 2020 Base Plans:*** - Development and demonstration of large scale energy storage sites to include cyber security measures for execution. - Development of adaptable microgrids that utilize artifial intellegence and high voltage solid state power electronics using renewable energy test bed. - Development and demonstration of predictive modeling, neural network, and predictive energy tools. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increase of $155K in FY20 budget due to additional investment in the demonstration of large scale energy storage in operational locations.					
Accomplishments/Planned Programs Subtotals	1.773	1.704	1.869	0.000	1.869

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Demonstration and validation are conducted for maximum transfer and interaction with industry such as to influence the industry COTS with the results of this demonstration and prototype validation. Acquisition is based on performance specifications enabled by this project.

E. Performance Metrics

The program will be coordinated across DOD and with other agencies as appropriate.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603724N / *Navy Energy Program*	Project (Number/Name) 0928 / *Shore Energy Technology*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Renewable Energy	Various	EXWC : Port Hueneme, CA	42.260	0.000	Dec 2017	0.000		0.040	Dec 2019	-		0.040	Continuing	Continuing	Continuing
Energy Efficiency, Security and Systems (Includes cybersecurity)	Various	EXWC : Port Hueneme, CA	4.627	1.773	Oct 2017	1.704	Oct 2018	1.374	Oct 2019	-		1.374	Continuing	Continuing	Continuing
Energy Storage	Various	EXWC : Port Hueneme, CA	5.322	0.000	Dec 2017	0.000		0.455	Dec 2019	-		0.455	Continuing	Continuing	Continuing
		Subtotal	52.209	1.773		1.704		1.869		-		1.869	Continuing	Continuing	N/A

Remarks

-Renewable Energy: ($0.00 FY19-$0.040 in FY20): Increase in FY20 budget due to additional investment in demonstration of advanced large-scale energy collection technologies in operational locations.

-Energy Storage: ($0.00 FY19-$0.455 in FY20): Increase in FY20 budget due to additional investment in the demonstration of large scale energy storage in operational locations.

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	52.209	1.773		1.704		1.869		-		1.869	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603724N / *Navy Energy Program*	**Project (Number/Name)** 0928 / *Shore Energy Technology*

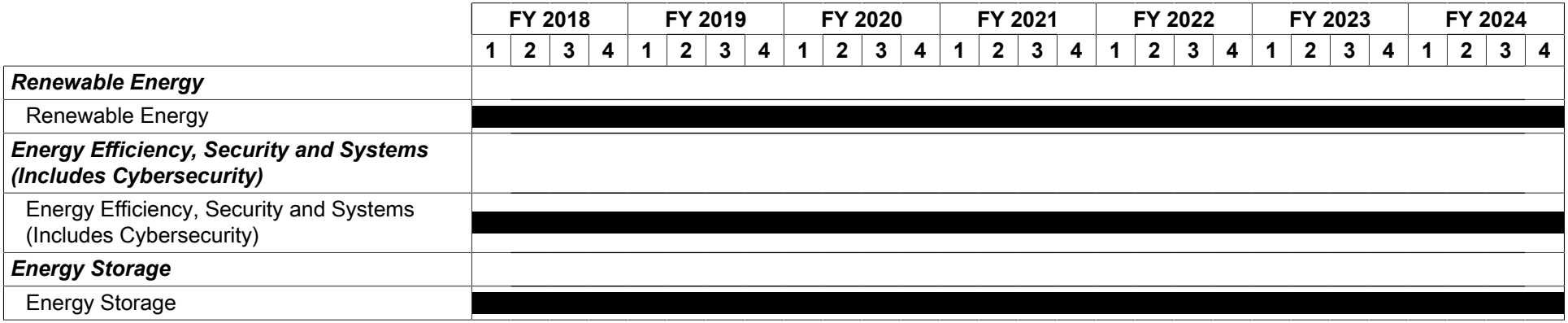


Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603724N / *Navy Energy Program*	**Project (Number/Name)** 0928 / *Shore Energy Technology*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Renewable Energy				
Renewable Energy	1	2018	4	2024
Energy Efficiency, Security and Systems (Includes Cybersecurity)				
Energy Efficiency, Security and Systems (Includes Cybersecurity)	1	2018	4	2024
Energy Storage				
Energy Storage	1	2018	4	2024

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy											Date: March 2019	
Appropriation/Budget Activity 1319 / 4					R-1 Program Element (Number/Name) PE 0603724N / *Navy Energy Program*				Project (Number/Name) 0996 / *Aircraft Energy Conservation*			
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
0996: *Aircraft Energy Conservation*	142.568	7.614	10.542	10.757	-	10.757	10.962	11.180	11.403	11.630	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Naval aviation must operate independently worldwide often with limited logistics support. Improving an aircraft's energy efficiency has a direct relationship to enhanced combat capability in austere operating environments. This program engages technical experts from across Naval aviation, industry, and academia to identify potential energy efficiency best practices and technologies for development, testing and assessment to determine technical viability and potential benefit to mission capability.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Aircraft Energy Conservation	7.614	10.542	10.757	0.000	10.757
Articles:	-	-	-	-	-
FY 2019 Plans: Continue identification, validation and implementation of energy conservation/efficiency concepts, best practices and metrics. Field aviation energy fleet dashboard. Initiate fielding of algorithm to optimize trim/reduce drag of F-18 during flight. Continue evaluation of engine technology to improve efficiency of MQ-8C and F-18.					
FY 2020 Base Plans: Continue identification, testing and assessment of energy efficiency best practices, technologies and metrics. Conduct MQ-8C engine efficiency technology air vehicle integration testing. Continue fielding and assessing algorithm to optimize trim/reduce drag of F-18 during flight. Assess potential to expand Naval Aviation Energy Dashboard with maintenance/reliability metrics.					
FY 2020 OCO Plans: N/A					
FY 2019 to FY 2020 Increase/Decrease Statement: The $215k increase will accelerate the testing and validation of energy efficiency best practices and technologies.					
Accomplishments/Planned Programs Subtotals	7.614	10.542	10.757	0.000	10.757

C. Other Program Funding Summary ($ in Millions)

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603724N / *Navy Energy Program*	**Project (Number/Name)** 0996 / *Aircraft Energy Conservation*

C. Other Program Funding Summary ($ in Millions)

Remarks

D. Acquisition Strategy

This is a non-acquisition program that develops, evaluates, and validates mature technologies in support of energy efficiency and increased mission capability.

E. Performance Metrics

Actual performance of energy conservation initiatives are measured against initially projected fuel savings measured in barrels of fuel saved based on aircraft demonstration testing.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603724N / *Navy Energy Program*	Project (Number/Name) 0996 / *Aircraft Energy Conservation*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Systems Engineering	WR	NAWCAD : Patuxent River, MD	5.645	1.724	Nov 2017	1.917	Dec 2018	2.257	Dec 2019	-		2.257	Continuing	Continuing	Continuing
Systems Engineering	C/CPFF	Lockheed Martin : Fort Worth, TX	0.684	0.000		0.000		0.000		-		0.000	0.000	0.684	0.684
Systems Engineering	C/FFP	The Boeing Co. : St. Louis, MO	0.400	0.000		0.000		0.000		-		0.000	0.000	0.400	0.400
Systems Engineering	C/CPFF	TBD : TBD	0.064	0.000		0.000		0.000		-		0.000	0.000	0.064	0.064
Systems Engineering	C/CPFF	The Boeing Company : Seattle, WA	1.150	0.000		0.600	Jan 2019	0.000		-		0.000	0.000	1.750	1.750
Systems Engineering	C/CPFF	Various : Various	3.669	4.340	Mar 2018	5.425	Mar 2019	3.100	Mar 2020	-		3.100	0.000	16.534	19.034
Prior year Sys Eng no longer funded in the FYDP	Various	Various : Various	2.464	0.000		0.000		0.000		-		0.000	0.000	2.464	-
Systems Engineering	C/BA	Deloitte Consulting : Alexandria, VA	0.700	0.900	Jan 2018	1.200	Apr 2019	1.000	Apr 2020	-		1.000	0.000	3.800	3.800
		Subtotal	14.776	6.964		9.142		6.357		-		6.357	Continuing	Continuing	N/A

Remarks

NAWC Systems Engineering NAWCAD increase of $344K - Increase due to requirement for additional in-house SME labor to incorporate maintenance/reliability metrics to Naval Aviation Energy dashboard.

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Hardware Testing	C/CPFF	PWA : Hartford, CT	99.851	0.000		0.000		0.000		-		0.000	0.000	99.851	99.851
Hardware Testing	WR	NAWCAD : Patuxent River, MD	4.585	0.300	Jan 2018	0.000		1.000	Jan 2020	-		1.000	Continuing	Continuing	Continuing
Hardware Testing	C/CPFF	Lockheed : Fort Worth, TX	15.674	0.000		0.000		0.000		-		0.000	0.000	15.674	15.674
Prior year T&E no longer funded in the FYDP	Various	Various : Various	0.100	0.000		0.000		0.000		-		0.000	0.000	0.100	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603724N / *Navy Energy Program*	Project (Number/Name) 0996 / *Aircraft Energy Conservation*	

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Test and Evaluation	C/CPFF	The Boeing Company : Seattle, WA	1.500	0.000		0.000		0.000		-		0.000	0.000	1.500	1.500
Hadware Testing	C/CPFF	Various : Various	0.000	0.000		1.000	Mar 2019	3.000	Mar 2020	-		3.000	0.000	4.000	4.000
		Subtotal	121.710	0.300		1.000		4.000		-		4.000	Continuing	Continuing	N/A

Remarks

Test & Evaluation VARIOUS increase of $2M and NAWC $1M increase due to required support of engine/airframe integration testing

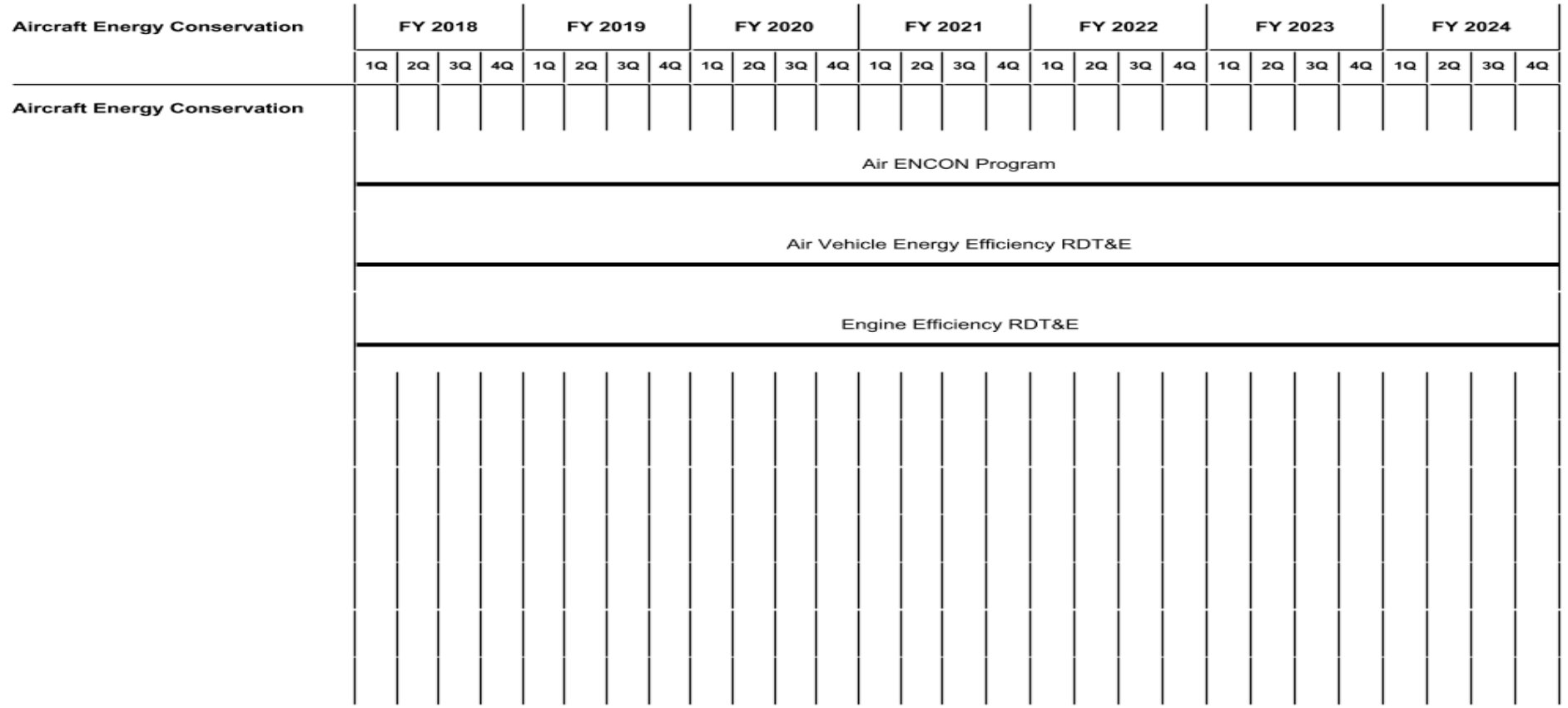
Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management Support	WR	NAWCAD : Patuxent River, MD	1.570	0.350	Nov 2017	0.400	Dec 2018	0.400	Nov 2019	-		0.400	Continuing	Continuing	Continuing
Program Management Support	C/FFP	Deloitte Consulting : Alexandria, VA	2.415	0.000		0.000		0.000		-		0.000	0.000	2.415	2.415
Program Management Support	WR	NAWCWD : China Lake, CA	0.010	0.000		0.000		0.000		-		0.000	0.000	0.010	-
Prog Mgnt no longer funded in the FYDP	Various	Various : Various	2.087	0.000		0.000		0.000		-		0.000	0.000	2.087	-
		Subtotal	6.082	0.350		0.400		0.400		-		0.400	Continuing	Continuing	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	142.568	7.614		10.542		10.757		-		10.757	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603724N / *Navy Energy Program*	**Project (Number/Name)** 0996 / *Aircraft Energy Conservation*



2020DON - 0603724N - 0996

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603724N / *Navy Energy Program*	**Project (Number/Name)** 0996 / *Aircraft Energy Conservation*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Aircraft Energy Conservation				
Aircraft Energy Conservation: Air ENCON Program	1	2018	4	2024
Aircraft Energy Conservation: Air Vehicle Energy Efficiency RDT&E	1	2018	4	2024
Aircraft Energy Conservation: Engine Efficiency RDT&E	1	2018	4	2024

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603724N / *Navy Energy Program*	Project (Number/Name) 9999 / *Congressional Adds*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
9999: *Congressional Adds*	31.412	17.487	7.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	55.899
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Congressional Add for Hydrokinetic Energy Research

Congressional Add for Natural Gas Technologies.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019
Congressional Add: Program Increase ***FY 2018 Accomplishments:*** N/A ***FY 2019 Plans:*** N/A	3.846	0.000
Congressional Add: Program Increase: Renewable Energy Development ***FY 2018 Accomplishments:*** NAVFAC will continue to research and develop land- and ocean-based energy generation and energy efficiency technologies, and renewable energy systems, that have the potential to reduce the cost of energy and increase energy security, reliability and resiliency at Department of Defense facilities. NAVFAC will also continue its program of marine and hydrokinetic energy development and demonstration activities in coordination with other Federal agencies and entities. ***FY 2019 Plans:*** NAVFAC will continue to research and develop land- and ocean-based energy generation and energy efficiency technologies, and renewable energy systems, that have the potential to reduce the cost of energy and increase energy security, reliability and resiliency at Department of Defense facilities. NAVFAC will also continue its program of marine and hydrokinetic energy development and demonstration activities in coordination with other Federal agencies and entities.	9.641	7.000
Congressional Add: Natural Gas Technologies ***FY 2018 Accomplishments:*** N/A ***FY 2019 Plans:*** N/A	4.000	0.000
Congressional Adds Subtotals	17.487	7.000

C. Other Program Funding Summary ($ in Millions)

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603724N / *Navy Energy Program*	**Project (Number/Name)** 9999 / *Congressional Adds*

C. Other Program Funding Summary ($ in Millions)

Remarks

D. Acquisition Strategy

RDTEN Contracts are Competitive Procurements

E. Performance Metrics

Quarterly Program Reviews

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603724N / *Navy Energy Program*	**Project (Number/Name)** 9999 / *Congressional Adds*

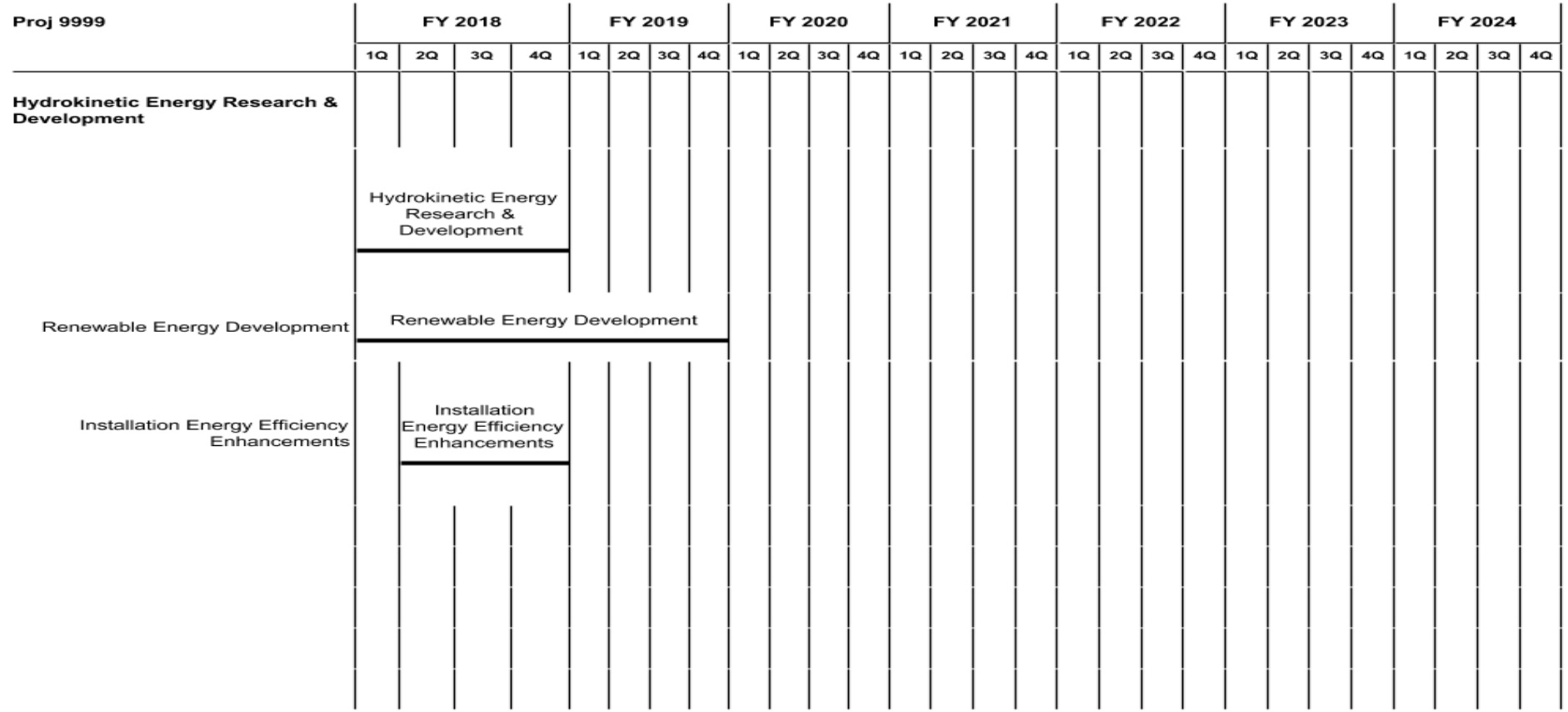
Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Hydrokinetic Energy Research & Development	Various	EXWC : Port Hueneme, CA	12.069	3.846	Jan 2019	0.000		0.000		-		0.000	0.000	15.915	-
Renewable Energy Development	Various	EXWC : Port Hueneme, CA	14.507	9.641	Jan 2019	7.000	Jan 2020	0.000		-		0.000	0.000	31.148	-
Installation Energy Efficiency Enhancements	Various	EXWC : Port Hueneme, CA	4.836	0.000		0.000		0.000		-		0.000	0.000	4.836	-
Natural Gas Technology	Various	EXWC : Port Hueneme, CA	0.000	4.000	Jan 2019	0.000		0.000		-		0.000	0.000	4.000	-
		Subtotal	31.412	17.487		7.000		0.000		-		0.000	0.000	55.899	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	31.412	17.487		7.000		0.000		-		0.000	0.000	55.899	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603724N / *Navy Energy Program*	**Project (Number/Name)** 9999 / *Congressional Adds*



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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603724N / *Navy Energy Program*	**Project (Number/Name)** 9999 / *Congressional Adds*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 9999				
Hydrokinetic Energy Research & Development: Hydrokinetic Energy Research & Development	1	2018	4	2018
Hydrokinetic Energy Research & Development: Renewable Energy Development: Renewable Energy Development	1	2018	4	2019
Hydrokinetic Energy Research & Development: Installation Energy Efficiency Enhancements: Installation Energy Efficiency Enhancements	2	2018	4	2018

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy											Date: March 2019	
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0603725N *I Facilities Improvement*							
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
Total Program Element	14.009	2.794	5.301	3.440	-	3.440	3.284	3.303	3.357	3.424	Continuing	Continuing
0995: *Naval Facilities System*	9.835	1.763	4.078	2.240	-	2.240	2.129	2.134	2.174	2.217	Continuing	Continuing
3155: *Force Protection Ashore*	4.174	1.031	1.223	1.200	-	1.200	1.155	1.169	1.183	1.207	Continuing	Continuing

A. Mission Description and Budget Item Justification

Mission Description and Budget Item Justification:

This program provides for capabilities to: a) overcome performance limitations and reduce the life cycle cost of shore facilities and, b) provide protection against terrorist attacks for shore installations and their operations. The program focuses on technical and operational issues of specific Navy interest, where there are no unbiased test validated Commercial Off the Shelf (COTS) solutions available, and where timely capabilities may not materialize without specific demonstration or validation by the Navy. Additionally, the program completes the development of technologies originating from Navy, DOD and other sources of Science and Technology programs, including the National Science Foundation (NSF), the National Institute of Standards and Technology (NIST) and Department of Energy (DOE). Validated technologies are implemented in the Navy's Military Construction (MILCON) and Facilities, Sustainment Restoration and Modernization (FSRM) program, and Antiterrorism and Force Protection (ATFP) Other Procurement, Navy (OP,N) program.

Project 0995 addresses the following Navy facilities requirements during FY 2014 through FY 2020: Advance Technology for Waterfront Facilities Repair and Enhancements, Facilities Technologies to Reduce the Cost of Facilities Sustainment, Restoration and Modernization for reducing the total ownership cost (TOC) of future and existing Facilities and addressing natural and catastrophic risk of critical Naval Waterfront Facilities.

Force Protection Ashore Project 3155 addresses selective topics in modeling, and material technologies to reduce the vulnerability of installations; and reduce the acquisition and operating costs of protective technologies. The demonstrations and validations provide the independent, technical and operational test data for the development of competitive performance specifications to acquire the required capabilities. The ATFP project is coordinated with other DOD programs.

Project 3347: The Development of advanced Environmental Control Unit (ECU) for expeditionary force camp shelters project is a transition of a DOE FY12-14 funded project and is a continuation in technology development, and was transitioned to NAVFAC starting FY 2015.

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy					Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*			R-1 Program Element (Number/Name) PE 0603725N *I Facilities Improvement*		
B. Program Change Summary ($ in Millions)	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**
Previous President's Budget	2.837	5.301	3.399	-	3.399
Current President's Budget	2.794	5.301	3.440	-	3.440
Total Adjustments	-0.043	0.000	0.041	-	0.041
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-3.846	0.000			
• SBIR/STTR Transfer	-0.197	0.000			
• Program Adjustments	0.000	0.000	0.000	-	0.000
• Rate/Misc Adjustments	0.000	0.000	0.041	-	0.041
• Congressional Add Adjustments	4.000	-	-	-	-

Change Summary Explanation

Increase from FY18 to FY19 is due to a $2M increase for Port Damage Repair Joint Capability Technology Demonstration.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603725N / *Facilities Improvement*	Project (Number/Name) 0995 / *Naval Facilities System*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
0995: *Naval Facilities System*	9.835	1.763	4.078	2.240	-	2.240	2.129	2.134	2.174	2.217	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This program provides the Navy with new engineering capabilities that are required to overcome specific performance limitations of Naval shore facilities while reducing the cost of sustaining the Naval shore infrastructure. The program focuses available RDT&E resources on satisfying facility requirements where the Navy is a major stakeholder or where there are no tested validated Commercial Off the Shelf (COTS) solutions available, and a timely solution will not emerge without a Navy sponsored demonstration and validation. The program completes the development and validation of facility technologies originating in Navy science and technology programs, plus a variety of other sources which includes the National Science Foundation (NSF) and the National Institute of Standards and Technology (NIST). This program introduces the idea of resilient facilities and infrastructure thru hardening, rapid assessment, and recovery. Validated technologies are implemented in the Navy's Military Construction (MILCON) and Facilities Sustainment Restoration and Modernization Programs (FSRM). The Duncan Hunter National Defense Authorization Act of 2009 laid down very specific guidelines for the correction of corrosion deficiencies in DoD shore facilities which is estimated to be $1.9B (DOD Annual Cost of Corrosion for the Department of Defense Facilities and Infrastructure July 2010).

Project 0995 addresses two Navy facilities requirements: 1) waterfront facilities repair, upgrade and service life extension; and, 2) validation testing/performance monitoring of critical facilities (such as dry docks, piers, runways, magazines, etc.), testing and evaluation of the performance of alternative materials, and surfacing concepts, and, methods and corrosion technologies to reduce the cost of Sustainment, Restoration and Modernization (SRM).

Waterfront facilities, repair, upgrade and service life extension:
An urgent requirement exists for early identification of strategies and solution recommendations for seismic risk at Naval Facilities, and especially nuclear capable waterfront facilities. Recent Pacific Rim earthquakes have heightened anxiety levels on perceived huge risks to Navy waterfront facilities in the region. The sub-project will provide analysis and solution recommendations for facilities impacted by seismic risk. Waterfront facilities repair and upgrade: About 75% of the Navy's waterfront facilities are over 45 years old. They were designed for a service life of 25 years which was to satisfy the mission requirements existing at that time. The over aged reinforced concrete requires costly and repetitive repairs. Besides providing more pier side ship maintenance and thus reduce dry dock costs, these piers must be strengthened to support concentrated crane loads up to 140 tons when piers were originally not designed for concentrated loads. Piers were previously designed to service one or possibly two particular ship classes. Berthing flexibility is now limited by mooring and utility arrangements. This sub-project addresses new material design methods, and retrofit methods which extends the service life of existing waterfront facilities by an additional 15 or more years. The project also addresses updating the mission based service, environmental, and protection loading requirements imposed by changes in platforms, operations and threats. Other initiatives include: leveraging Building Information Modeling (BIM) technology to provide for enhanced facilities management processes and waterfront utilities service enhancements using models to achieve flexible berthing arrangements consistent with current and future platform mooring configurations and hotel service requirements including Facilities and Infrastructure Integrated Product Support for Acquisition Category (ACAT) Programs.

Technologies to reduce the cost of Sustainment, Restoration and Modernization (SRM):

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603725N / *Facilities Improvement*	**Project (Number/Name)** 0995 / *Naval Facilities System*

Technologies to reduce the cost of SRM issues of high operational significance are addressed on a priority basis. The Navy portion of corrosion deficiencies at DoD shore facilities is estimated to be $433M (DOD Annual Cost of Corrosion for the Department of Defense Facilities and Infrastructure July 2010). This effort will demonstrate and validate the cost and reliability of advanced corrosion technologies in order to assure their acceptance and implementation in traditionally conservative public works and construction industries. These facility corrosion technologies will accelerate the validation commercialization, and wide-spread implementation required to reduce the cost of correcting, the deficiencies in the Navy SRM backlog. The sub-projects include the continuing effort to validate, test and conduct performance monitoring of enhanced facility designs and coatings for facilities and equipment.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Waterfront facilities, repair, upgrade and service life extension:	0.707	2.831	0.769	0.000	0.769
Articles:	-	-	-	-	-
FY 2019 Plans: - Expansion of Facilities Resiliency (Hardening, Rapid Assessment and Recovery) projects to further demonstrate and validate technologies. - Funding the Asia Pacific Stability Initiative (APSI), which is a one-time funded requirement to complete repair for the Port Damage Repair Joint Capability Technology Demonstration (PDR/JCTD). The primary purpose of the funding will be to execute the final operational utility assessment (OUA) through procurement of equipment, as well as development of an engineering performance specification for transition. The work will be done at both Naval Facilities Engineering and Expeditionary Warfare Center (Port Hueneme, CA) and at the Army Engineering Research and Development Center (Vicksburg, MS). ***FY 2020 Base Plans:*** FY20 Plans to include: -Funding the development of methodologies for Field Carrier Landing Practice (FCLP) pavement repairs and material selection capable of withstanding repeated exposure to Joint Strike Fighter (JSF) F-35 Short Take-Off and Vertical Landing (STOVL) conditions. -Funding technologies that facilitate the assessment, repair and continued operation of Strategic Airlift (STRATLIFT) sorties. -Funding technologies to physically harden critical facility elements that enable fleet operations. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Decrease of $2.062M in controls due to port facility assessment technology research concluding and transitioning in FY19.					
Title: Sustainment, Restoration & Modernization:	1.056	1.247	1.471	0.000	1.471

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603725N / *Facilities Improvement*	**Project (Number/Name)** 0995 / *Naval Facilities System*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Articles:	-	-	-	-	-
FY 2019 Plans: FY19 Plans to include: - Develop, test and validate new concepts new concepts and technologies in the areas of corrosion. This includes the continued demonstration of cost (Return on Investment / ROI) and reliability of advanced corrosion technologies to assure their acceptance and implementation by conservative Public Works and construction industries. Identify technologies and products for accelerated implementation to reduce costs and reduce deficiencies in the Navy SRM backlog. Findings will transition into Unified Facilities Criteria (UFC) Project, in accordance with DoD Instruction 4120.24. ***FY 2020 Base Plans:*** -Funding strategies and technologies to better maintain and modernize Navy undersea facility infrastructure, focusing on harvesting, distribution and supply of subsea power and communications. -Funding technologies that will significantly reduce the sustainment cost of installations. This includes technologies that mitigate corrosion, facilitate inspection and assessment, increase longevity and reduce the cost of construction and reduce the cost of maintenance by developing systems that are more reliable and maintainable by the user. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increase of $224K in controls due to expanding investment in implementation of "Internet of things," SCADA, and cybersecurity initiatives that require 5G wireless broadband access.					
Accomplishments/Planned Programs Subtotals	1.763	4.078	2.240	0.000	2.240

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

The Projects identified in this budget have been carefully selected to respond to both the facilities support for new Acquisition Category Programs, to address TOC considerations of an evolving and aging infrastructure, and to facilitate rational risk based decisions and solutions to protect and decrease risk levels for Department of the Navy-critical infrastructure and facilities. Each project has been assessed to ensure that it is addressing legitimate risks and requirements of the shore establishment. The results of these projects will be the development of design and construction criteria and or components that directly impact the shore facilities.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603725N / *Facilities Improvement*	**Project (Number/Name)** 0995 / *Naval Facilities System*

E. Performance Metrics

Quarterly Program Reviews are conducted with the major performers to include funds status discussion, schedule review, assessment of plan to actual to meet benchmarks at midyear and end-of-year for PY1 and CY, and review of accomplishments and issues to date.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603725N / *Facilities Improvement*	**Project (Number/Name)** 0995 / *Naval Facilities System*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Waterfront Facilities, Repair, Upgrade and Services Life Extension	Various	NAVFAC EXWC : Pt Hueneme, CA	3.589	0.707	Dec 2017	2.831	Oct 2018	0.769	Oct 2019	-		0.769	Continuing	Continuing	Continuing
Sustainment, Restoration and Modernization	Various	NAVFAC EXWC : Pt Hueneme, CA	6.246	1.056	Oct 2017	1.247	Oct 2018	1.471	Oct 2019	-		1.471	Continuing	Continuing	Continuing
		Subtotal	9.835	1.763		4.078		2.240		-		2.240	Continuing	Continuing	N/A

Remarks

-Sustainment, Restoration and Modernization: ($1.247 FY19-$1.471 in FY20): Increase of 224K in FY20 budget due to expanding investment in Implementation of "Internet of things," SCADA, and cybersecurity initiatives that require 5G wireless broadband access.

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	9.835	1.763		4.078		2.240		-		2.240	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603725N / *Facilities Improvement*	**Project (Number/Name)** 0995 / *Naval Facilities System*

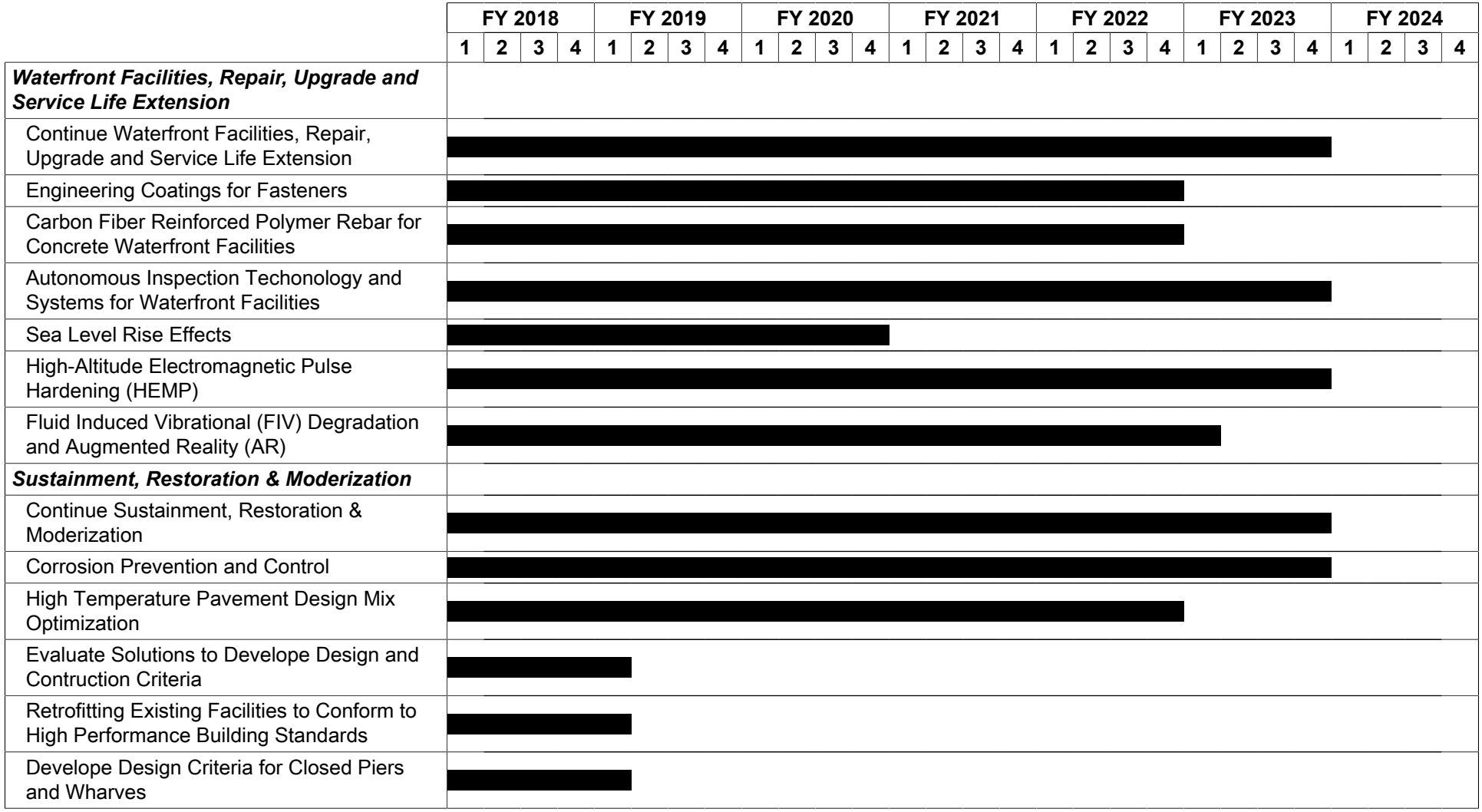


Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603725N / *Facilities Improvement*	**Project (Number/Name)** 0995 / *Naval Facilities System*

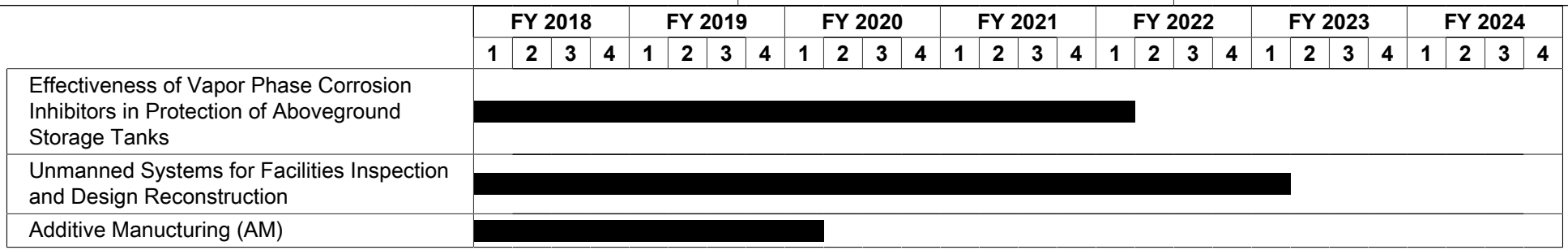


Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603725N / *Facilities Improvement*	**Project (Number/Name)** 0995 / *Naval Facilities System*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Waterfront Facilities, Repair, Upgrade and Service Life Extension				
Continue Waterfront Facilities, Repair, Upgrade and Service Life Extension	1	2018	4	2023
Engineering Coatings for Fasteners	1	2018	4	2022
Carbon Fiber Reinforced Polymer Rebar for Concrete Waterfront Facilities	1	2018	4	2022
Autonomous Inspection Techonology and Systems for Waterfront Facilities	1	2018	4	2023
Sea Level Rise Effects	1	2018	4	2020
High-Altitude Electromagnetic Pulse Hardening (HEMP)	1	2018	4	2023
Fluid Induced Vibrational (FIV) Degradation and Augmented Reality (AR)	1	2018	1	2023
Sustainment, Restoration & Moderization				
Continue Sustainment, Restoration & Moderization	1	2018	4	2023
Corrosion Prevention and Control	1	2018	4	2023
High Temperature Pavement Design Mix Optimization	1	2018	4	2022
Evaluate Solutions to Develope Design and Contruction Criteria	1	2018	1	2019
Retrofitting Existing Facilities to Conform to High Performance Building Standards	1	2018	1	2019
Develope Design Criteria for Closed Piers and Wharves	1	2018	1	2019
Effectiveness of Vapor Phase Corrosion Inhibitors in Protection of Aboveground Storage Tanks	1	2018	1	2022
Unmanned Systems for Facilities Inspection and Design Reconstruction	1	2018	1	2023
Additive Manucturing (AM)	1	2018	1	2020

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603725N / *Facilities Improvement*	Project (Number/Name) 3155 / *Force Protection Ashore*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
3155: *Force Protection Ashore*	4.174	1.031	1.223	1.200	-	1.200	1.155	1.169	1.183	1.207	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Protection of Navy installations against terrorist activities requires deployment of advanced technology for force protection capabilities. This antiterrorism and force protection (AT/FP) ashore project will develop, demonstrate and validate technologies for the following: access control and integrated perimeter security surveillance sensors and intelligent electronic security systems for automated intruder detection (Installation Protection); perimeter security; waterside protection against craft and swimmer intrusion; secure and efficient operations centers and emergency management centers including human and information support systems (Command and Control). Programs currently being evaluated are, standard-based enterprise physical security system integration and automation; Command, Control, and Communications (C3) capabilities for emergency operations; integrated and networked mass notification systems (MNS); Waterside intelligent video security systems; integrated over-the-water sensors and analytics for automated course of action planning; identifying and interdicting malevolent threats - watercraft, swimmers, divers, and unmanned underwater vessels (UUVs) to reduce injury and death to the warfighter and damage to high value units (HVUs)(Waterside Protection). Through demonstration and validation of risk modeling and simulation models, the potential of emerging technologies will be evaluated and installation security strategies that reduce manpower and other costs will be formulated. Multiple systems with sensors and cameras are being deployed on Navy installations to be used for threat assessment. These systems are not integrated and there is not a centralized location or system that all the data can be analyzed. The Sensor Assessment Cell (SAC) brings all these sensor feeds into one location and the Physical Security Information Management (PSIM) software provides an integrated picture so that an intelligent assessment can be made. Current AT/FP systems to be integrated include Automated Vehicle Gates (AVG), Regional Alarms/Local Alarms (AMAS), Navy Munition Command enclave (NMC), and Electronic Harbor Security System. These demonstrations and validations derive advanced technology from science and technology programs of government academia and industry. The technology evaluation and validation produces data for performance specifications used for competitive procurement. All work will be coordinated with other programs and through industry forums as appropriate.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Force Protection Ashore	1.031	1.223	1.200	0.000	1.200
Articles:	-	-	-	-	-
FY 2019 Plans: FY 2019 Base Plans: - Continue Installation Protection Capability Development - Airborne Threat project to detect, assess and classify for the defense against full-scale and man-deployable airborne threats (e.g., UAV, drones, remote-control [R/C] platforms).Emphasis on mobile Counter UAS systems and direct control of UAS system. Testing at NAWC China Lake. Test plan and test report deliverables-[$330K] - Developmental Test & Evaluation (DT); NAWCAD/ONR. - Continue Command and Control Capability Development Virtual Field Support project to improve efficiency,					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603725N / *Facilities Improvement*	**Project (Number/Name)** 3155 / *Force Protection Ashore*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
effectiveness and reliability of the recovery of operational availability during critical system failures (corrective maintenance) and specialized routine maintenance (preventative maintenance). Integrate system interfaces in a virtual environment to include CUAS and EHSS. Deliverables include software source code, binaries, and software manuals - [$220K] - Developmental Test & Evaluation (DT); SSC Atlantic. - Continue Waterside Protection - Boat Barriers project to access performance, environmental, and operational impact and added benefits of next generation boat barriers using bidirectional technology. Independent Testing of boat barriers by John Hopkins APL. Deliverables include testing of boat barrier, test plan and test reports [$369K] - Developmental Test & Evaluation (OT). - Sensor Assessment Cell (SAC) Project to develop, test and integrate a system of AT/FP sensors/camera's and provide an integrated picture to trained operators, who will assess information provided to them via a Physical Security Information System(PSIM) and determine if the event captured should trigger a dispatch of first responders. Test and develop CONOPS for regionally monitoring all alarms and sensors at a central location and interfacing with ENERMS directly. Deliverables include SAC testing at the SW region RDC, test plan and test report. [$304K].					
FY 2020 Base Plans: FY 2020 Base Plans: - Continue Counter Unmanned Aerial Systems (CsUAS) - Used to detect, assess and classify airborne threat for the defense against full scale and man deployable UAV, Drones, R/C platforms. Emphasis on spoof and kill-on-kill technologies. [450K] - Initiate Access Control Point (ACP) Video Analytics - Using Video Analytics to Detect, Assess and Classify Vehicles or Personnel attempting to enter or leave an ACP. Emphasis on foot traffic, small footprint vehicles (Scooter, Bicycle), wrong-way detection. [250K] - Initiate Waterside Intelligent Video Security System (WSIVDS) - Integrated over-the-water sensors and analytics for automated course of action planning. Identifying and interdicting malevolent threats (watercraft, swimmers, divers, and unmanned underwater vessels (UUVs)) for the protection of personnel and High Value Units (HVU). [$500K]					
FY 2020 OCO Plans: N/A					
FY 2019 to FY 2020 Increase/Decrease Statement:					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603725N / *Facilities Improvement*	**Project (Number/Name)** 3155 / *Force Protection Ashore*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Decrease of $23K in controls due to near completion of Virtual Field Support project. FY2020 is the last year of project.					
Accomplishments/Planned Programs Subtotals	1.031	1.223	1.200	0.000	1.200

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Demonstration and validation is conducted for maximum transfer and interaction with industry such as to influence the industry COTS with the results of this demonstration and prototype validation. Acquisition is based on performance specifications enabled by this project.

E. Performance Metrics

Quarterly program reviews to include funds status, schedule review and assessment of plan to actual.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603725N / *Facilities Improvement*	**Project (Number/Name)** 3155 / *Force Protection Ashore*

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Command and Control Capability Development: Government Engineering Support	Various	SPAWAR : San Diego, CA	0.499	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Installation Protection: Airborne Threat	WR	NAWCAD/ONR : Pax River, MD	0.538	0.369	Feb 2018	0.330	Nov 2018	0.450	Dec 2019	-		0.450	0.000	1.687	-
Access Control Point (ACP)	Various	SPAWAR : San Diego, CA	0.000	0.000		0.000		0.250	Dec 2019	-		0.250	0.000	0.250	-
Waterside Intelligent Video Security System (WSIVDS)	Various	SPAWAR : San Diego, CA	0.000	0.000		0.000		0.500	Dec 2019	-		0.500	0.000	0.500	-
Command and Control Capability Development: Virtual Field Support	WR	SPAWAR : San Diego, CA	0.425	0.252	Feb 2018	0.220	Nov 2018	0.000		-		0.000	0.000	0.897	-
Waterside Protection: Boat Barriers	C/CPFF	CTTSO : CTTSO	0.267	0.410	Feb 2018	0.369	Nov 2018	0.000		-		0.000	0.000	1.046	-
Sensor Assessment Cell (SAC) Capability Development	Various	SPAWAR : San Diego, CA	0.000	0.000		0.304	Nov 2018	0.000		-		0.000	0.000	0.304	-
Installation Protection Capability Development - Integrated Physical Security and Access Control Automation: Spiral Development	Various	NSWC : Dahlgren, VA	0.597	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Installation Protection Capability Development -Integrated Physical Security and Access Control Automation:Test & Evaluation (DT)	Various	NSWC : Dahlgren, VA	0.449	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Installation Protection Capability Development - Integrated Physical Security and Access	Various	SPAWAR : San Diego, CA	0.332	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603725N / *Facilities Improvement*	Project (Number/Name) 3155 / *Force Protection Ashore*	

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Control Automation:Test & Evaluation (OT)															
Water Protection - Common Information Exchange Spiral Development	WR	SSC-PAC : SSC-PAC	0.244	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Installation Protection - Versatile Access Control Spiral Development	WR	NSWC : Dahlgren, VA	0.339	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Waterside Protection - Boat Barrier Electronic Infrastructure - Spiral Development	WR	SSC-PAC : SSC-PAC	0.484	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
		Subtotal	4.174	1.031		1.223		1.200		-		1.200	Continuing	Continuing	N/A

Remarks

-Installation Protection: Airborne Threat: ($0.330 FY19-$0.450 in FY20): Increase due to increase in scope of testing to include kinetic solutions for airborne threats. Testing kinetic solutions is at a higher cost.

- Access Control Point (ACP): ($0.00 FY19-$0.250 in FY20): Increase due to new start in pilot program to design/test smart active barriers at an ACP.

- Waterside Intelligent Video Security System (WSIVDS): ($0.00 FY19-$0.500 in FY20): Increase due to new Start in pilot program to design/test new technologies for the detection of swimmers and UUAV's.

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	4.174	1.031		1.223		1.200		-		1.200	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603725N / *Facilities Improvement*	**Project (Number/Name)** 3155 / *Force Protection Ashore*

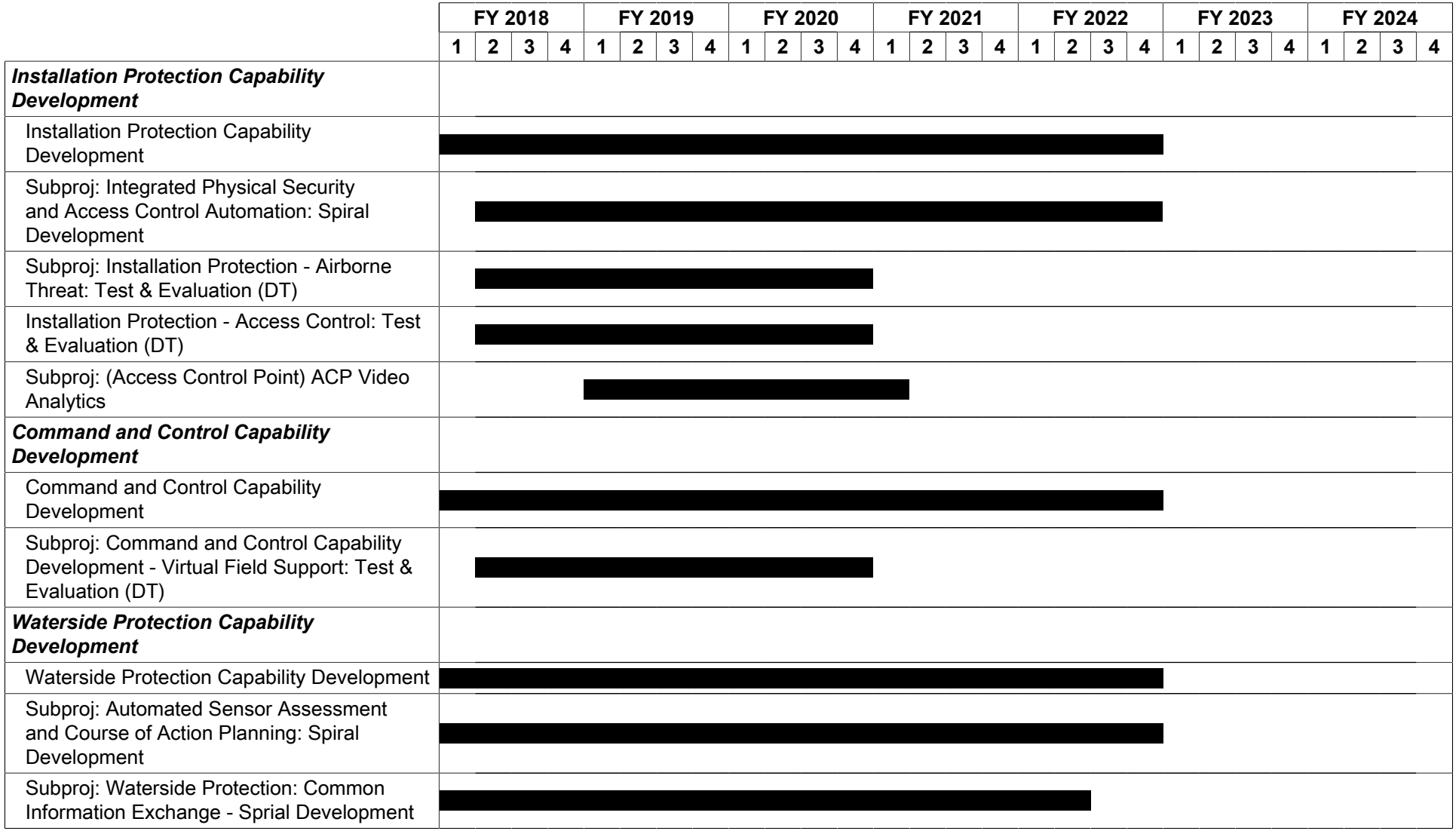


Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603725N / *Facilities Improvement*	**Project (Number/Name)** 3155 / *Force Protection Ashore*

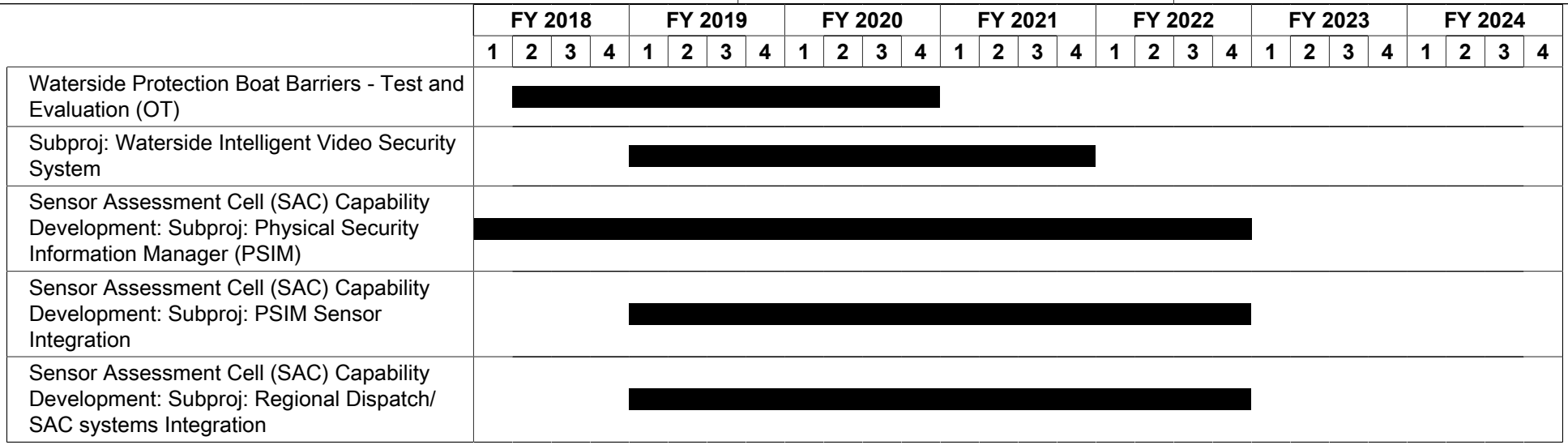


Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603725N / *Facilities Improvement*	**Project (Number/Name)** 3155 / *Force Protection Ashore*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Installation Protection Capability Development				
Installation Protection Capability Development	1	2018	4	2022
Subproj: Integrated Physical Security and Access Control Automation: Spiral Development	2	2018	4	2022
Subproj: Installation Protection - Airborne Threat: Test & Evaluation (DT)	2	2018	4	2020
Installation Protection - Access Control: Test & Evaluation (DT)	2	2018	4	2020
Subproj: (Access Control Point) ACP Video Analytics	1	2019	1	2021
Command and Control Capability Development				
Command and Control Capability Development	1	2018	4	2022
Subproj: Command and Control Capability Development - Virtual Field Support: Test & Evaluation (DT)	2	2018	4	2020
Waterside Protection Capability Development				
Waterside Protection Capability Development	1	2018	4	2022
Subproj: Automated Sensor Assessment and Course of Action Planning: Spiral Development	1	2018	4	2022
Subproj: Waterside Protection: Common Information Exchange - Sprial Development	1	2018	2	2022
Waterside Protection Boat Barriers - Test and Evaluation (OT)	2	2018	4	2020
Subproj: Waterside Intelligent Video Security System	1	2019	4	2021
Sensor Assessment Cell (SAC) Capability Development: Subproj: Physical Security Information Manager (PSIM)	1	2018	4	2022
Sensor Assessment Cell (SAC) Capability Development: Subproj: PSIM Sensor Integration	1	2019	4	2022
Sensor Assessment Cell (SAC) Capability Development: Subproj: Regional Dispatch/ SAC systems Integration	1	2019	4	2022

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy											Date: March 2019	
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0603739N *I Navy Logistic Productivity*							
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
Total Program Element	48.607	2.882	2.913	3.857	-	3.857	3.943	4.086	4.125	4.207	Continuing	Continuing
2955: *JEDMICS*	45.563	2.301	2.913	2.880	-	2.880	2.896	3.043	3.107	3.169	Continuing	Continuing
3223: *Logistics R&D*	3.044	0.581	0.000	0.977	-	0.977	1.047	1.043	1.018	1.038	Continuing	Continuing

A. Mission Description and Budget Item Justification

JUSTIFICATION FOR BUDGET ACTIVITY: This program is funded under ADVANCED COMPONENT DEVELOPMENT AND PROTOTYPES because it includes all efforts necessary to evaluate integrated technologies, representative models or prototype systems in a high fidelity and realistic operating environment.

Includes development and evaluation of incentive systems for improving the productivity of civilian and military personnel. Identifies barriers to increased productivity and evaluates the effect of removing them. Develops techniques for easing the introduction of new technology to the work place. Identifies and evaluates methods for improving the quality of work-life.

Excludes civilian and military manpower and their related costs and military construction costs which are included in appropriate Management and Support elements in this program.

B. Program Change Summary ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	2.995	4.059	4.018	-	4.018
Current President's Budget	2.882	2.913	3.857	-	3.857
Total Adjustments	-0.113	-1.146	-0.161	-	-0.161
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-1.146			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.113	0.000			
• Program Adjustments	0.000	0.000	-0.161	-	-0.161
• Rate/Misc Adjustments	0.000	0.000	0.000	-	0.000

Change Summary Explanation

The FY 2020 funding request was reduced by $.161 million to account for the availability of prior year execution balances. The increase from FY 2019 to FY 2020 is due to new supply chain optimization initiatives, Next Generation Radio Frequency Identification (RFID) technology, and to accommodate additional material studies and analysis.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603739N / *Navy Logistic Productivity*	Project (Number/Name) 2955 / *JEDMICS*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
2955: *JEDMICS*	45.563	2.301	2.913	2.880	-	2.880	2.896	3.043	3.107	3.169	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

In FY85 Congress directed the Services and Defense Logistics Agency to permanently capture, manage and control engineering data in digital format so it would be available to support competitive spares re-procurement. The Joint Engineering Data Management Information & Control System (JEDMICS) program manages and controls 100,000,000 engineering images and has 13,000 authorized users responsible for over 77,000 user sessions per month. Over 1.2 million digital images are retrieved each month. New data and new users are added each month as DoD re-engineers its business processes to take advantage of digital data that is managed and controlled for corporate reuse. The JEDMICS system is deployed at 5 interoperable sites that service user locations worldwide. Data stored in JEDMICS is used for Logistics Support, Spares re-procurement, Weapons Systems procurement, Engineering, Maintenance, Distribution, Manufacturing, Air National Guard and Deployed Engineering Technical Services organizations. JEDMICS facilitates work process re-design since it brings the electronic drawings to the desktop, shop floor or flight line in real time eliminating walk, wait and slack time to retrieve drawings. Additionally, Administrative Lead Time, Repair Turn Around Time, Engineering Change Proposal processing time, demilitarization time, and all cycle times dependent on engineering data have decreased with the real time availability of digital engineering data. JEDMICS also facilitates Electronic Commerce since it produces digital technical data packages that can be forwarded along with an electronic order. Funds are for Commercial Off The Shelf (COTS) test, evaluation and integration. JEDMICS development efforts are required to integrate and test COTS upgrades.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: JEDMICS Development	2.249	2.861	2.828	0.000	2.828
Articles:	-	-	-	-	-
Description: Conduct development efforts associated with JEDMICS software releases. Conduct COTS requirements definition, evaluation, integration and testing of annual baseline releases. Conduct technology insertion of the JEDMICS system that is required to protect the $21B digital data asset managed in JEDMICS. These annual releases are necessary to incorporate changes that are essential to keeping the system running within the Navy's Enterprise. They include Service mandated Information Technology changes, storage capability increases for emerging engineering data formats, changes to accommodate commercial hardware and software end-of-life product obsolescence, and defenses for newly recognized Information Assurance vulnerabilities affecting the systems various software applications.					
FY 2019 Plans:					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603739N / *Navy Logistic Productivity*	**Project (Number/Name)** 2955 / *JEDMICS*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Develop and integrate JEDMICS Software Release 3.0.20. ***FY 2020 Base Plans:*** Develop and integrate JEDMICS Software Release 3.0.21. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** The decrease from FY 2019 to FY 2020 is due to a reduction to system integration testing.					
Title: JEDMICS Test	0.026	0.026	0.026	0.000	0.026
Articles:	-	-	-	-	-
Description: Conduct test and readiness reviews and functional performance tests on JEDMICS system. ***FY 2019 Plans:*** Complete DT of JEDMICS Software Release 3.0.19. Initiate DT of JEDMICS Software Release 3.0.20. ***FY 2020 Base Plans:*** Complete DT of JEDMICS Software Release 3.0.20. Initiate DT of JEDMICS Software Release 3.0.21. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** There is no change from FY 2019 to FY 2020.					
Title: JEDMICS Evaluation & Review	0.026	0.026	0.026	0.000	0.026
Articles:	-	-	-	-	-
Description: Conduct technical evaluations and configuration control reviews of JEDMICS system. ***FY 2019 Plans:*** Conduct technical evaluations and reviews for JEDMICS Software Release 3.0.21. ***FY 2020 Base Plans:*** Conduct technical evaluations and review for JEDMICS Software Release 3.0.22. ***FY 2020 OCO Plans:***					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603739N / *Navy Logistic Productivity*	**Project (Number/Name)** 2955 / *JEDMICS*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** There is no change from FY 2019 to FY 2020.					
Accomplishments/Planned Programs Subtotals	2.301	2.913	2.880	0.000	2.880

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Competitively awarded requirements type contract for engineering, design, development and test efforts. Performance-based reviews conducted quarterly by the Project Management Office.

E. Performance Metrics

1. Complete testing, integration, & upgrade of three major embedded Commercial Off-the-Shelf products.
2. Test & integrate system Information Assurance Vulnerability Management software patch upgrades four times.
3. Complete development, testing, & integration of a minimum twenty corrected high-priority software problem reports.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603739N / *Navy Logistic Productivity*	Project (Number/Name) 2955 / *JEDMICS*	

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Development Support	C/IDIQ	Smartronix : Hollywood, MD	1.489	0.157	Oct 2017	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Development Support	C/IDIQ	KBR/Wyle : Lexington Park, MD	0.000	0.000		0.160	Oct 2018	0.000		-		0.000	0.000	0.160	0.160
Development Support	TBD	TBD : TBD	0.000	0.000		0.000		0.160	Oct 2019	-		0.160	0.000	0.160	-
Software Development	Various	Northrop Grumman Information : McLean, VA	39.610	2.092	Nov 2017	2.701	Nov 2018	2.668	Nov 2019	-		2.668	Continuing	Continuing	Continuing
Prior Year Support no Longer Funded in Budget Year or Out years	Various	Various : Various	0.216	0.000		0.000		0.000		-		0.000	0.000	0.216	-
		Subtotal	41.315	2.249		2.861		2.828		-		2.828	Continuing	Continuing	N/A

Remarks

Remarks: Funds are for development efforts associated with Commercial Off The Shelf (COTS) obsolescence on the fully deployed COTS Intensive Joint Engineering Data Management Infomation & Control System. Funds are for COTS evaulation, integration, and test and evaluation. The common baseline will be maintained and obsolete COTS software and hardware will be replaced. Baseline releases will protect joint interoperability, upgrade operating systems for security patches and supportable versions, support integration to replace obsolete COTS, and upgrade the Oracle database to supportable versions.

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Developmental Test & Evaluation	MIPR	WR-ALC/TILAB : Robins AFB, GA	2.572	0.026	Oct 2017	0.026	Oct 2018	0.026	Oct 2019	-		0.026	Continuing	Continuing	Continuing
		Subtotal	2.572	0.026		0.026		0.026		-		0.026	Continuing	Continuing	N/A

Remarks

Supports testing and evaluation of baseline releases in a user environment.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603739N / *Navy Logistic Productivity*	Project (Number/Name) 2955 / *JEDMICS*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management Support	WR	Naval Air Warfare Center : NAS Patuxent River, MD	0.305	0.015	Oct 2017	0.015	Oct 2018	0.015	Oct 2019	-		0.015	Continuing	Continuing	Continuing
Travel	Various	Various : Various	0.288	0.011	Jul 2018	0.011	Jul 2019	0.011	Jul 2020	-		0.011	Continuing	Continuing	Continuing
Prior Year Mgmt no Longer Funded in Budget Year or Out years	Various	Various : Various	1.083	0.000		0.000		0.000		-		0.000	0.000	1.083	-
		Subtotal	1.676	0.026		0.026		0.026		-		0.026	Continuing	Continuing	N/A

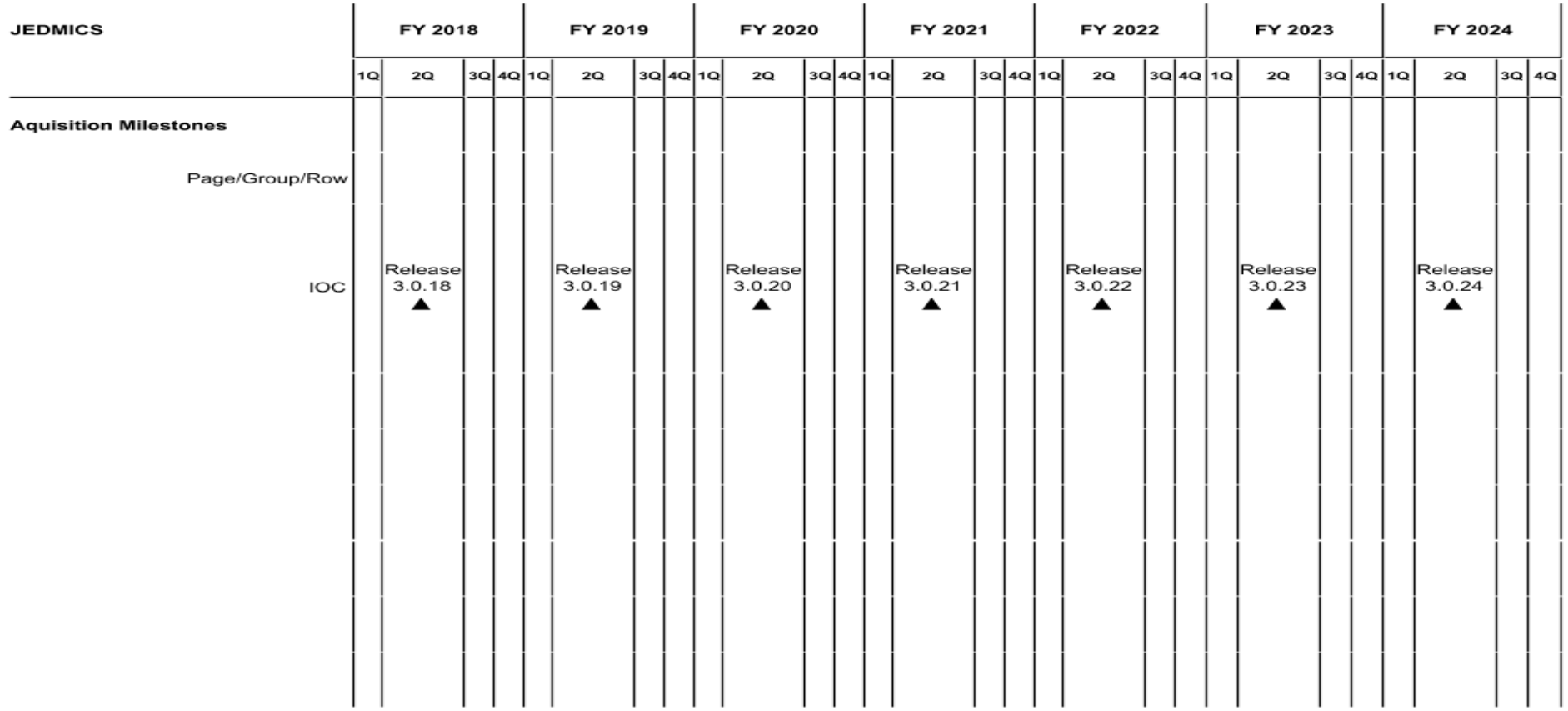
Remarks

Supports program compliance reviews and program related travel by government employees.

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	45.563	2.301		2.913		2.880		-		2.880	Continuing	Continuing	N/A

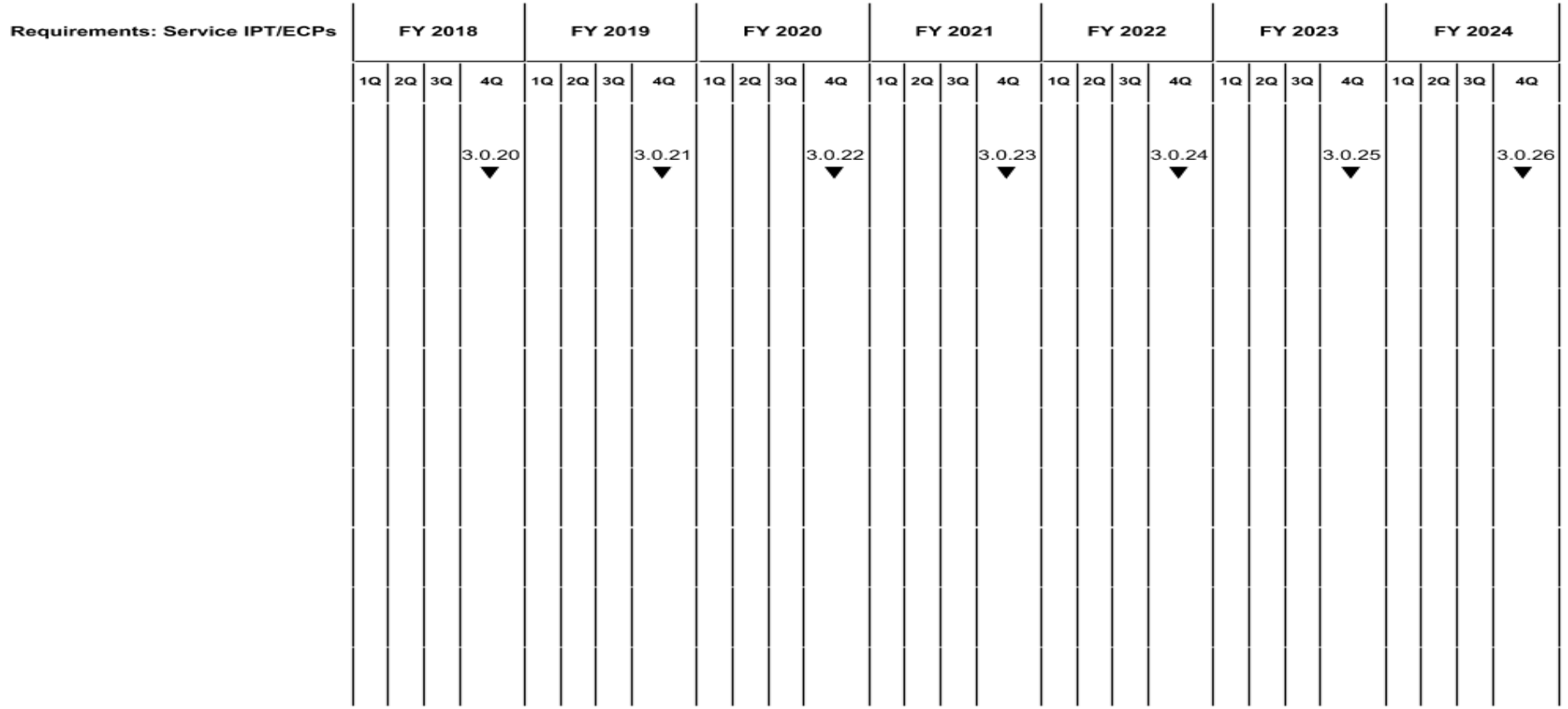
Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603739N / *Navy Logistic Productivity*	**Project (Number/Name)** 2955 / *JEDMICS*



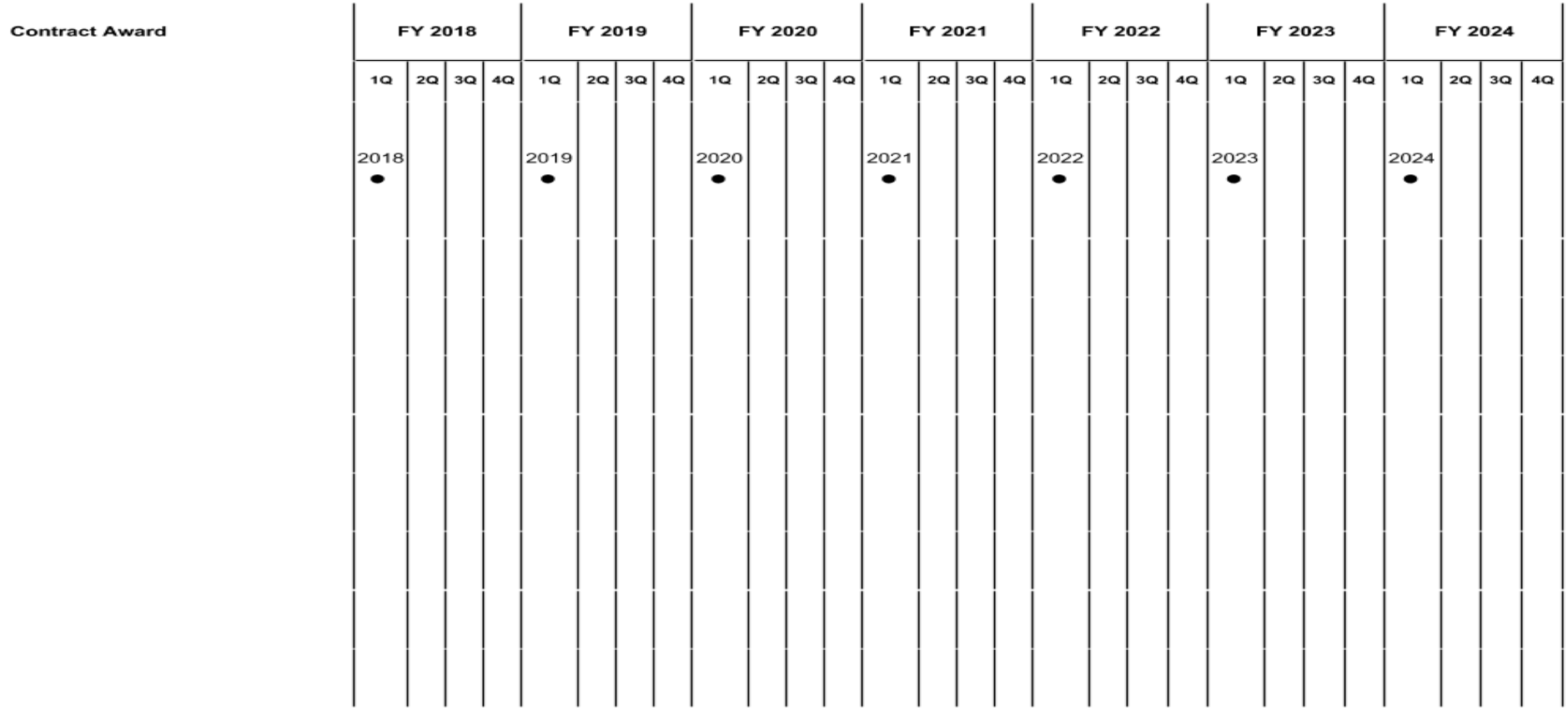
2020DON - 0603739N - 2955

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603739N / *Navy Logistic Productivity*	**Project (Number/Name)** 2955 / *JEDMICS*



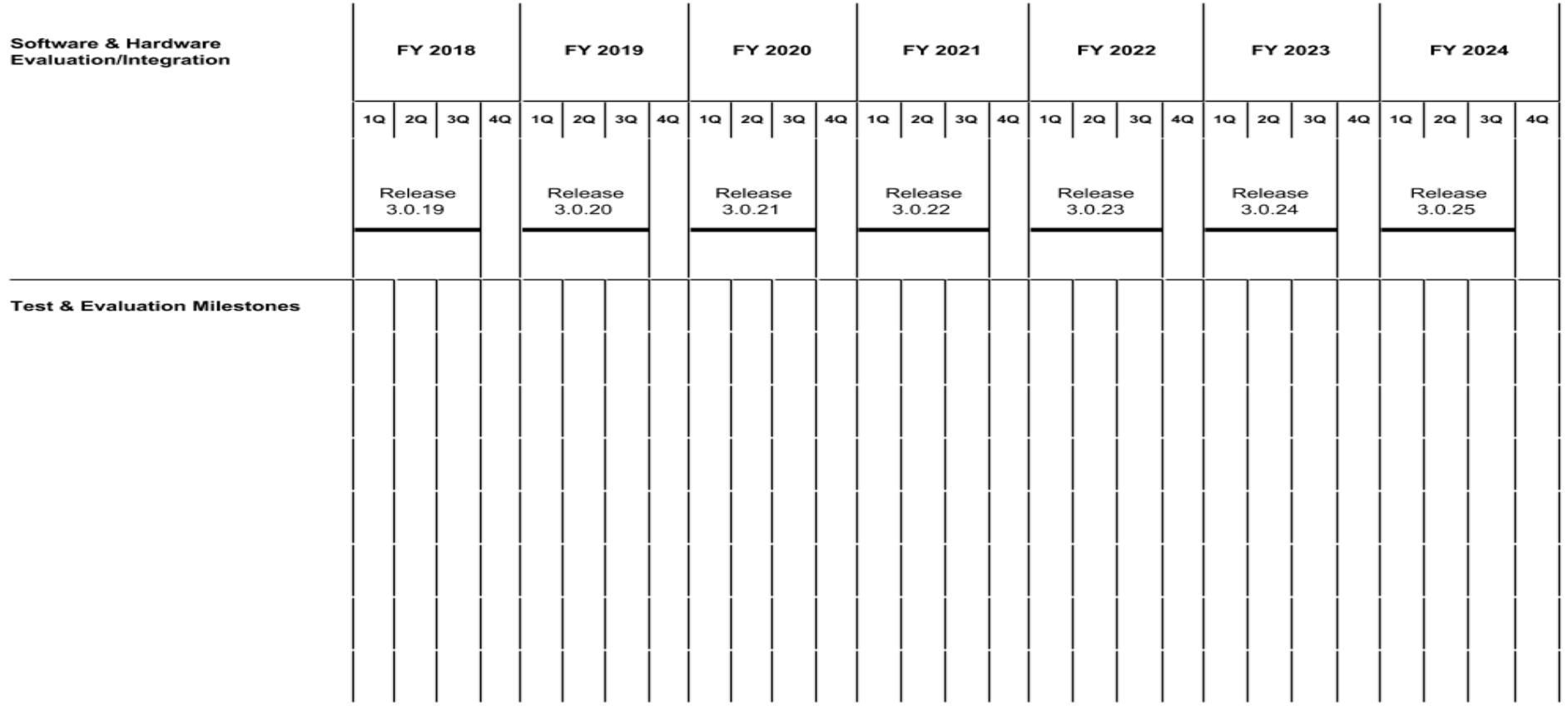
2020DON - 0603739N - 2955

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603739N / *Navy Logistic Productivity*	**Project (Number/Name)** 2955 / *JEDMICS*



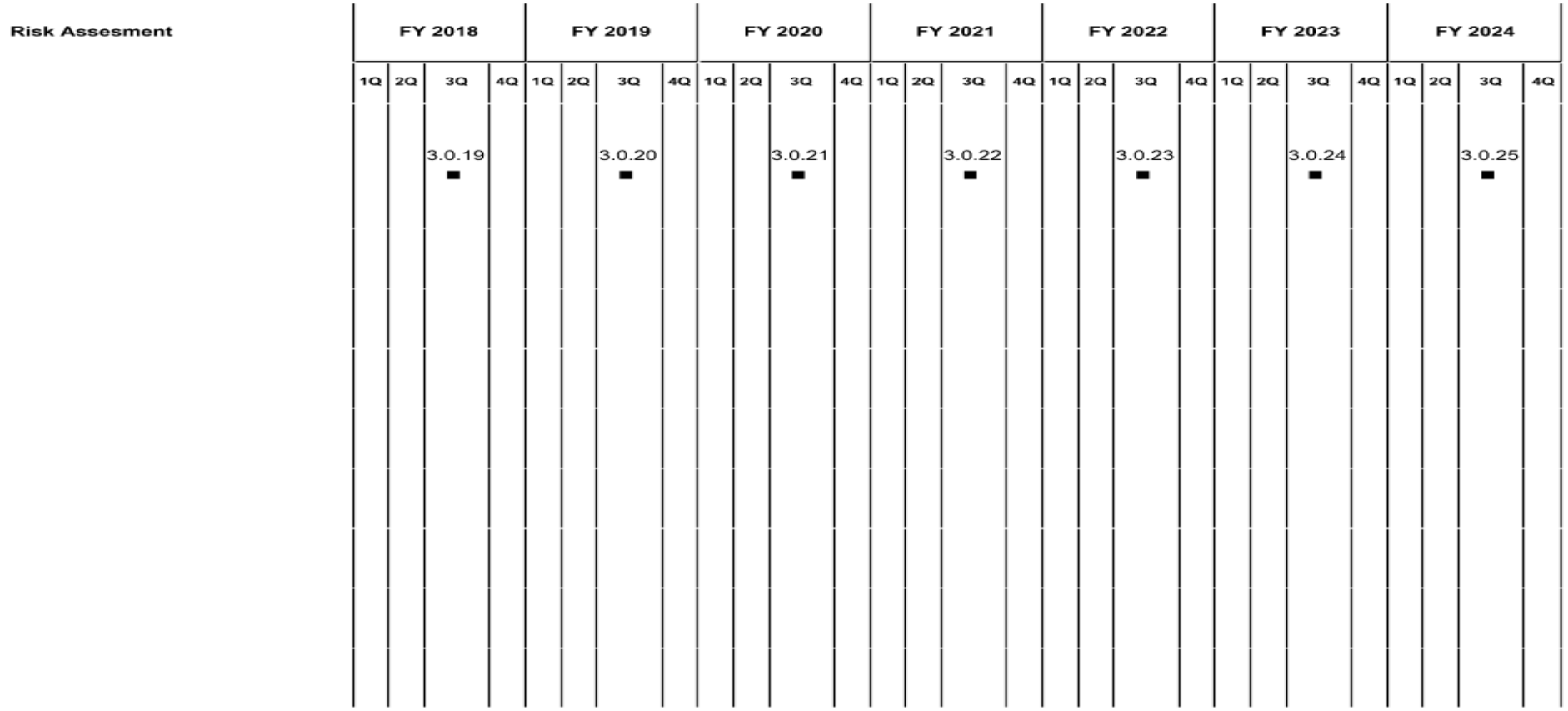
2020DON - 0603739N - 2955

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603739N / *Navy Logistic Productivity*	**Project (Number/Name)** 2955 / *JEDMICS*



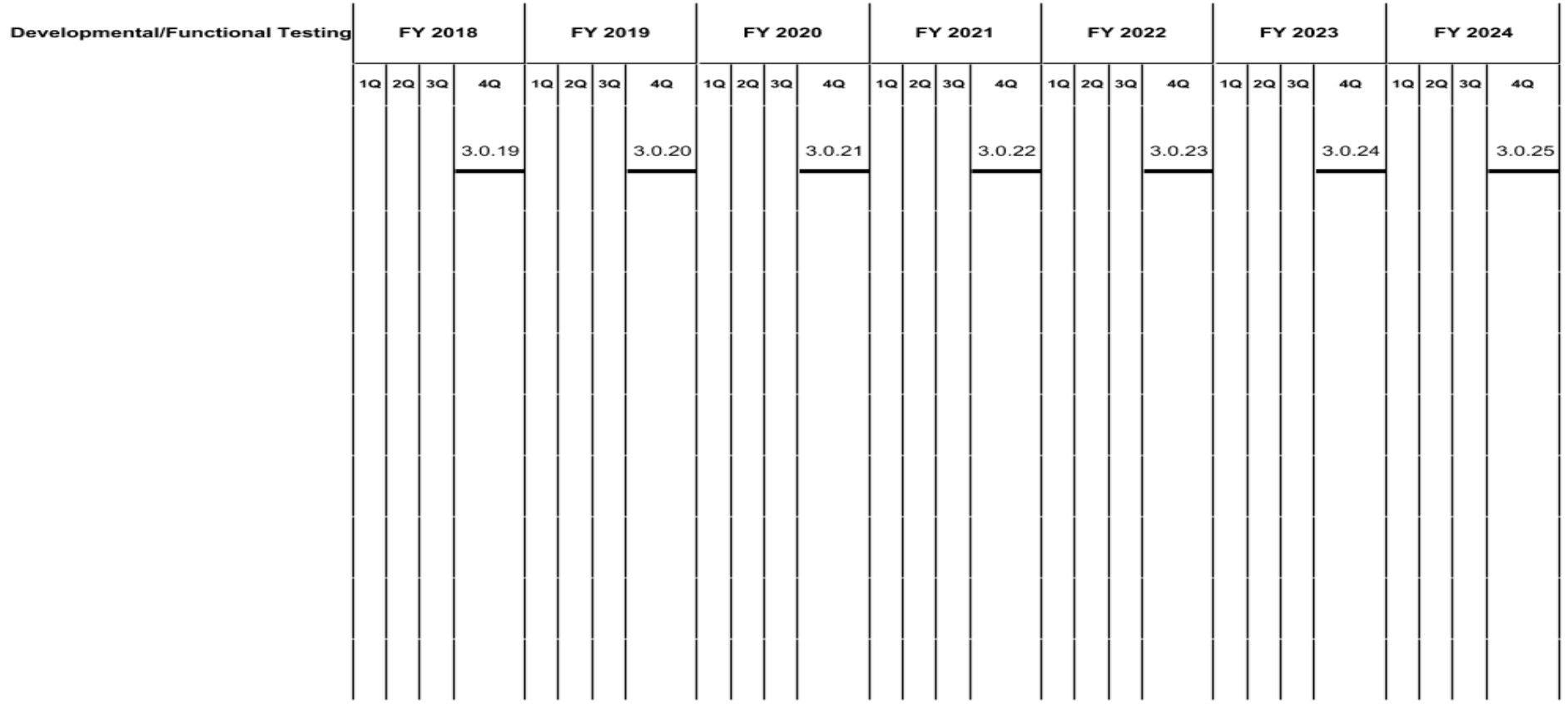
2020DON - 0603739N - 2955

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603739N / *Navy Logistic Productivity*	**Project (Number/Name)** 2955 / *JEDMICS*



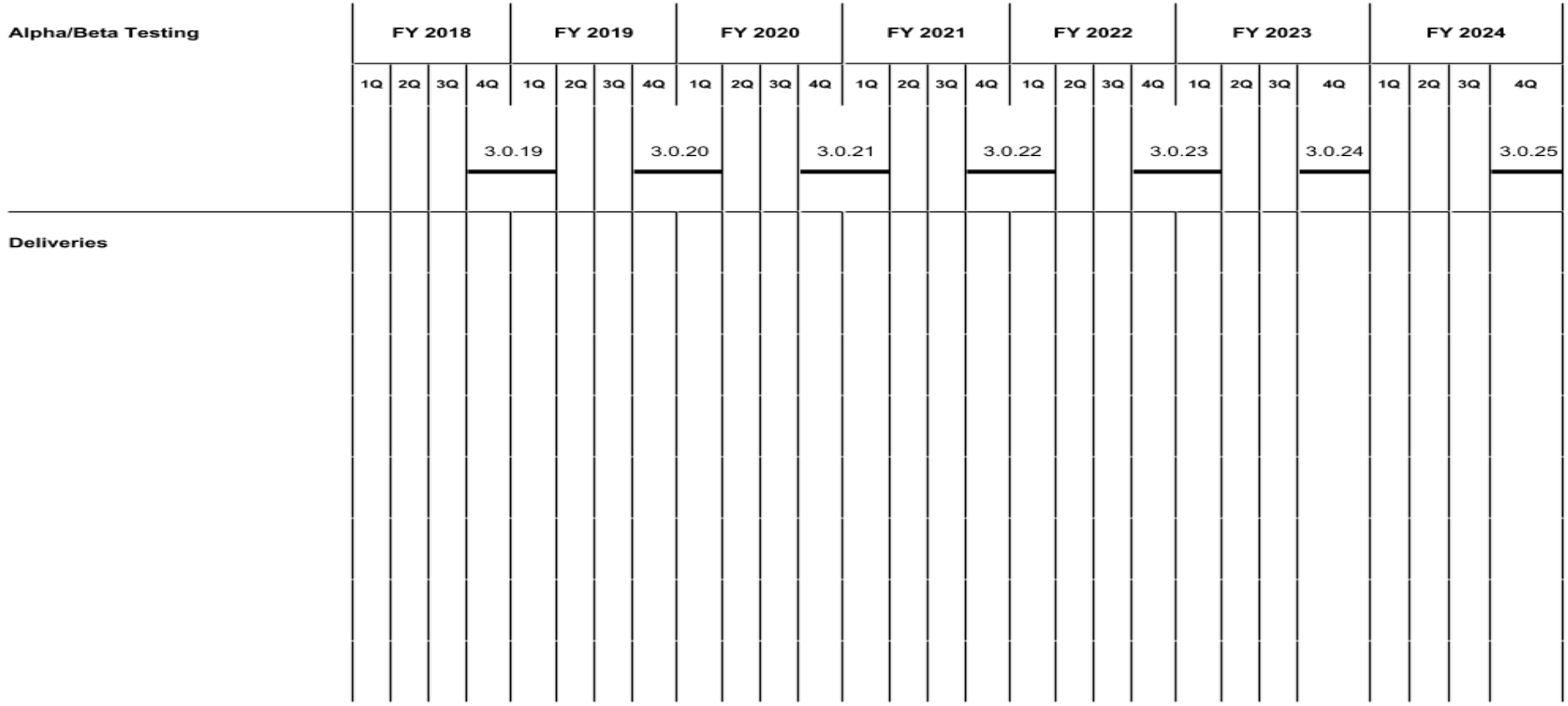
2020DON - 0603739N - 2955

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603739N / *Navy Logistic Productivity*	**Project (Number/Name)** 2955 / *JEDMICS*



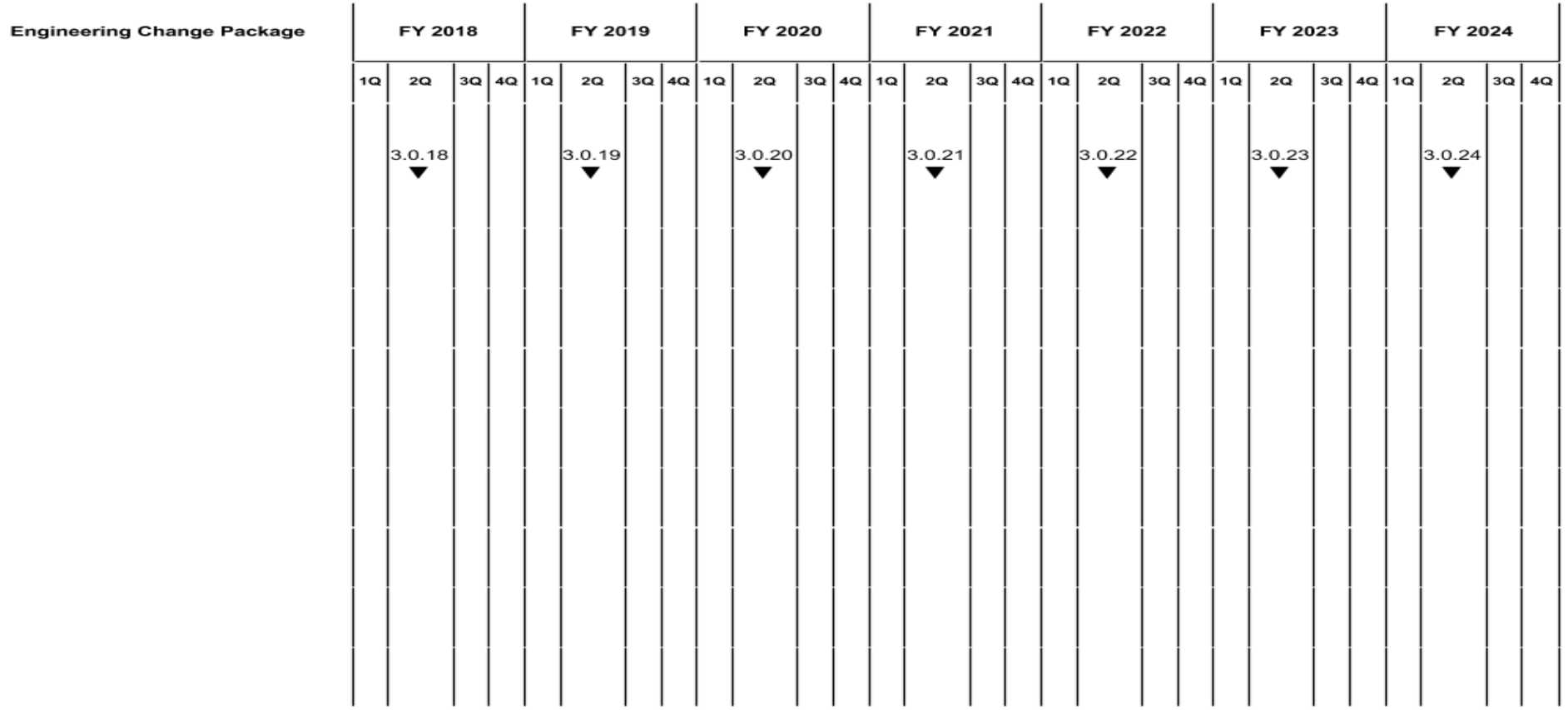
2020DON - 0603739N - 2955

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603739N / *Navy Logistic Productivity*	**Project (Number/Name)** 2955 / *JEDMICS*



2020DON - 0603739N - 2955

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603739N / *Navy Logistic Productivity*	**Project (Number/Name)** 2955 / *JEDMICS*



2020DON - 0603739N - 2955

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603739N / *Navy Logistic Productivity*	**Project (Number/Name)** 2955 / *JEDMICS*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
JEDMICS				
Aquisition Milestones: IOC: IOC Release 3.0.18	2	2018	2	2018
Aquisition Milestones: IOC: IOC Release 3.0.19	2	2019	2	2019
Aquisition Milestones: IOC: IOC Release 3.0.20	2	2020	2	2020
Aquisition Milestones: IOC: IOC Release 3.0.21	2	2021	2	2021
Aquisition Milestones: IOC: IOC Release 3.0.22	2	2022	2	2022
Aquisition Milestones: IOC: IOC Release 3.0.23	2	2023	2	2023
Aquisition Milestones: IOC: IOC Release 3.0.24	2	2024	2	2024
Aquisition Milestones: Requirements: Service IPT/ECPs: Service IPT/ECPs Release 3.0.20	4	2018	4	2018
Aquisition Milestones: Requirements: Service IPT/ECPs: Service IPT/ECPs Release 3.0.21	4	2019	4	2019
Aquisition Milestones: Requirements: Service IPT/ECPs: Service IPT/ECPs Release 3.0.22	4	2020	4	2020
Aquisition Milestones: Requirements: Service IPT/ECPs: Service IPT/ECPs Release 3.0.23	4	2021	4	2021
Aquisition Milestones: Requirements: Service IPT/ECPs: Service IPT/ECPs Release 3.0.24	4	2022	4	2022
Aquisition Milestones: Requirements: Service IPT/ECPs: Service IPT/ECPs Release 3.0.25	4	2023	4	2023
Aquisition Milestones: Requirements: Service IPT/ECPs: Service IPT/ECPs Release 3.0.26	4	2024	4	2024
Aquisition Milestones: Contract Award: 2018 Contract Award	1	2018	1	2018
Aquisition Milestones: Contract Award: 2019 Contract Award	1	2019	1	2019
Aquisition Milestones: Contract Award: 2020 Contract Award	1	2020	1	2020

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603739N / *Navy Logistic Productivity*	**Project (Number/Name)** 2955 / *JEDMICS*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Aquisition Milestones: Contract Award: 2021 Contract Award	1	2021	1	2021
Aquisition Milestones: Contract Award: 2022 Contract Award	1	2022	1	2022
Aquisition Milestones: Contract Award: 2023 Contract Award	1	2023	1	2023
Aquisition Milestones: Contract Award: 2024 Contract Award	1	2024	1	2024
Aquisition Milestones: Software & Hardware Evaluation/Integration: Software Hardware Evaluation/Integration Release 3.0.19	1	2018	3	2018
Aquisition Milestones: Software & Hardware Evaluation/Integration: Software Hardware Evaluation/Integration Release 3.0.20	1	2019	3	2019
Aquisition Milestones: Software & Hardware Evaluation/Integration: Software Hardware Evaluation/Integration Release 3.0.21	1	2020	3	2020
Aquisition Milestones: Software & Hardware Evaluation/Integration: Software Hardware Evaluation/Integration Release 3.0.22	1	2021	3	2021
Aquisition Milestones: Software & Hardware Evaluation/Integration: Software Hardware Evaluation/Integration Release 3.0.23	1	2022	3	2022
Aquisition Milestones: Software & Hardware Evaluation/Integration: Software Hardware Evaluation/Integration Release 3.0.24	1	2023	3	2023
Aquisition Milestones: Software & Hardware Evaluation/Integration: Software Hardware Evaluation/Integration Release 3.0.25	1	2024	3	2024
Test & Evaluation Milestones: Risk Assesment: Risk Assessment Release 3.0.19	3	2018	3	2018
Test & Evaluation Milestones: Risk Assesment: Risk Assessment Release 3.0.20	3	2019	3	2019
Test & Evaluation Milestones: Risk Assesment: Risk Assessment Release 3.0.21	3	2020	3	2020
Test & Evaluation Milestones: Risk Assesment: Risk Assessment Release 3.0.22	3	2021	3	2021
Test & Evaluation Milestones: Risk Assesment: Risk Assessment Release 3.0.23	3	2022	3	2022
Test & Evaluation Milestones: Risk Assesment: Risk Assessment Release 3.0.24	3	2023	3	2023
Test & Evaluation Milestones: Risk Assesment: Risk Assessment Release 3.0.25	3	2024	3	2024
Test & Evaluation Milestones: Developmental/Functional Testing: Developmental/ Functional Testing Release 3.0.19	4	2018	4	2018

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603739N / *Navy Logistic Productivity*	**Project (Number/Name)** 2955 / *JEDMICS*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Test & Evaluation Milestones: Developmental/Functional Testing: Developmental/ Functional Testing Release 3.0.20	4	2019	4	2019
Test & Evaluation Milestones: Developmental/Functional Testing: Developmental/ Functional Testing Release 3.0.21	4	2020	4	2020
Test & Evaluation Milestones: Developmental/Functional Testing: Developmental/ Functional Testing Release 3.0.22	4	2021	4	2021
Test & Evaluation Milestones: Developmental/Functional Testing: Developmental/ Functional Testing Release 3.0.23	4	2022	4	2022
Test & Evaluation Milestones: Developmental/Functional Testing: Developmental/ Functional Testing Release 3.0.24	4	2023	4	2023
Test & Evaluation Milestones: Developmental/Functional Testing: Developmental/ Functional Testing Release 3.0.25	4	2024	4	2024
Test & Evaluation Milestones: Alpha/Beta Testing: Alpha/Beta Testing Release 3.0.19	4	2018	1	2019
Test & Evaluation Milestones: Alpha/Beta Testing: Alpha/Beta Testing Release 3.0.20	4	2019	1	2020
Test & Evaluation Milestones: Alpha/Beta Testing: Alpha/Beta Testing Release 3.0.21	4	2020	1	2021
Test & Evaluation Milestones: Alpha/Beta Testing: Alpha/Beta Testing Release 3.0.22	4	2021	1	2022
Test & Evaluation Milestones: Alpha/Beta Testing: Alpha/Beta Testing Release 3.0.23	4	2022	1	2023
Test & Evaluation Milestones: Alpha/Beta Testing: Alpha/Beta Testing Release 3.0.24	4	2023	4	2023
Test & Evaluation Milestones: Alpha/Beta Testing: Alpha/Beta Testing Release 3.0.25	4	2024	4	2024
Deliveries: Engineering Change Package: Engineering Change Package Release 3.0.18	2	2018	2	2018
Deliveries: Engineering Change Package: Engineering Change Package Release 3.0.19	2	2019	2	2019
Deliveries: Engineering Change Package: Engineering Change Package Release 3.0.20	2	2020	2	2020
Deliveries: Engineering Change Package: Engineering Change Package Release 3.0.21	2	2021	2	2021
Deliveries: Engineering Change Package: Engineering Change Package Release 3.0.22	2	2022	2	2022

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603739N / *Navy Logistic Productivity*	**Project (Number/Name)** 2955 / *JEDMICS*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Deliveries: Engineering Change Package: Engineering Change Package Release 3.0.23	2	2023	2	2023
Deliveries: Engineering Change Package: Engineering Change Package Release 3.0.24	2	2024	2	2024

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy											Date: March 2019	
Appropriation/Budget Activity 1319 / 4					R-1 Program Element (Number/Name) PE 0603739N / *Navy Logistic Productivity*				Project (Number/Name) 3223 / *Logistics R&D*			
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
3223: *Logistics R&D*	3.044	0.581	0.000	0.977	-	0.977	1.047	1.043	1.018	1.038	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Stable annual funding is required to facilitate implementation and execution of a robust, flexible Logistics R&D program that will provide the means for Naval Supply Systems Command (NAVSUP) to effectively pursue solutions to mission-related capability and technology gaps. The NAVSUP Logistics R&D program has an established infrastructure and business process for ensuring that R&D funds are applied to projects that address high priority enterprise needs established in accordance with OPNAV goals and the NAVSUP Commander's Guidance.

From a process perspective, Logistics R&D investments are governed by a NAVSUP enterprise-wide Executive Steering Group (ESG) chaired by the NAVSUP Vice Commander, and comprised of SES and Command leadership representatives. The ESG ratifies capability and technology gaps identified by all activities within the enterprise, and then assesses and prioritizes all proposed Logistics R&D initiatives in accordance with their potential for filling the established gap and generating return on investment.

The established Logistics R&D business management process has currently identified capability/technology gaps in the following general areas: 1) the need to develop formalized food service management techniques that focus on increased efficiency of new and existing systems and facilities. 2) the need to modernize quality of life (QOL) services to improve overall services, offer additional desired features and reduce total ownership costs, 3) the need to assess clothing protection for the warfighter in areas of thermal/flame threats, protective footwear, and physical (hearing, vibration, etc.) clothing/accessories, 4) the need to develop logistics data access and information sharing through enhanced Graphical User Interfaces (GUI) and web-based data services, 5) the need to develop a capability that allows Integrated Logistics Support (ILS) repair and modernization tools, 6) the need to leverage breakthrough technologies to improve supply chain processing. This modest R&D investment will establish a NAVSUP Logistics R&D Program to explore additional technologies and significantly increase potential cost savings.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Supply Chain Optimization	0.000	0.000	0.355	0.000	0.355
Articles:	-	-	-	-	-
Description: Enable innovation in our supply chain processes in the areas of data sciences, logistics IT application development, and quality engineering through incorporation of Science, Technology, Engineering, and Math (STEM) projects performed by interns and academia. Peform market research on emerging supply chain technologies and methods that could be adopted to support the DoN/DoD material supply chain.					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603739N / *Navy Logistic Productivity*	**Project (Number/Name)** 3223 / *Logistics R&D*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Developed a new functionality (software supporting data structure and migration of current data) within Ordinance Information System (OIS) that provides visibility of serialized assets use and requirements. ***FY 2019 Plans:*** N/A ***FY 2020 Base Plans:*** Additive Manufacturing/3D Printing: Continue to drive towards SECNAV Additive Manufacturing (AM) goals and enable NAVSUP logistics innovation projects. Integrate AM as an order fulfillment strategy to increase readiness and improve maintenance and sustainment operations through reducing long-lead times and eliminating obsolescence-related issues. Furthermore, the technology enables improvements to current systems (e.g., weight reduction, part count reduction, increased system performance) through designs that are not possible by conventional manufacturing techniques. ($112K) Data Sciences and Logistics Engineering STEM Projects: Continued innovation in our supply chain processes in the areas of Data Sciences, Data Analytics, Logistics IT application development, and Quality Engineering through incorporation of Science, Technology, Engineering, and Math (STEM) projects performed by computer science interns and academia, which allows us to bridge the gaps in new methods of data utilization and industry trends. ($43K) Artificial Intelligence (AI) for custom code: Develop an AI solution to allow for business constraints to be dynamically adapted to current solutions, whether a Commercial Off the Shelf (COTS), Government Off the Shelf (GOTS) or a custom solution. DoD unique business rules exist while multiple systems implement business rules with differing logic. Given the DoD unique business rules that exist and multiple systems that implement business rules in many different ways, the AI can learn from all of those existing applications. The objective is for AI development that can automate learning to ensure the gaps that exist in out-of-the box solutions are identified and implemented before a product is released. ($100K) Artificial Intelligence for (AI) for Information Assurance (IA) vulnerabilities: Current IA processes require many highly qualified resources. IA and security processes require extensive hours to accomplish vital tasks that keep our Sailors' data safe and this dependency on humans introduces risk. Develop an AI automated learning solution to ensure future vulnerabilities that could be exploited to gain unauthorized system access to enterprise logistics systems are identified and corrected before the vulnerability is exploited. Specific areas to be addressed will include non-stop and true continuous monitoring of enterprise logistics IT systems. The AI					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603739N / *Navy Logistic Productivity*	**Project (Number/Name)** 3223 / *Logistics R&D*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
solution developed will provide consistent, secure, and scalable security measures to be implemented during all phases of the development cycle in a flexible, scalable and agile means. ($100K) ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** The increase from FY 2019 to FY 2020 is due to the new initiative for supply chain optimization.					
Title: Quality of Life Services Modernization & Cost Reduction (Initiative 2) ***Articles:*** ***Description:*** NAVSUP Quality of Life (QOL) services include subsistence in kind (SIK) food service, retail, postal, laundry, vending, barber shop, household goods and disbursing/Navy Cash, are in many cases inefficient, costly to operate, and lack easy access to the comprehensive information required to make informed management decisions impacting execution of routine supporting business processes. QOL services aims to leverage new technology which will improve support information systems, security, health, etc., and reduce total ownership costs. NAVSUP owns the Food Service Program for the Navy as part of logistics and quality of life programs and is responsible for managing the overall policy including training, food safety, and implementation of "Go for Green" program for the Navy. "Go for Green" is a DoD program that promotes healthful food and beverage choices in order to optimize the performance, readiness, and health of our service members. Future funding may include projects such as new platforms being developed to focus on human performance, physical training and nutrition applications that will be integrated with the "Go for Green" DoD effort. ***FY 2019 Plans:*** N/A ***FY 2020 Base Plans:*** N/A ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** N/A	0.252 -	0.000 -	0.000 -	0.000 -	0.000 -
Title: Readiness through Logistics Solutions ***Articles:***	0.128 -	0.000 -	0.361 -	0.000 -	0.361 -

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603739N / *Navy Logistic Productivity*	**Project (Number/Name)** 3223 / *Logistics R&D*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Description: Supply chain improvements are required to support logistics efficiency and Fleet readiness through logistics solutions technological improvements. Develop technological capabilities that improve Naval Logistics in part or in its record (from manufacture, storage, delivery, use, maintenance, and disposal). ***FY 2019 Plans:*** N/A ***FY 2020 Base Plans:*** RFID Interface: Perform case study assessment of Next Generation RFID technology and Real Time Location System (RTLS) graphical user interface scalability. FY 2019 prototype must be proofed via tangible real-world industrial environments. Case studies will demonstrate technology by monitoring logistics information such as forklift flow optimization and aviation aircraft engine monitoring at long term storage facilities. ($361K) ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** The increase from FY 2019 to FY 2020 is to support RFID technology and Real Time Location System (RTLS) research.					
Title: Clothing Protection for the Warfighter	0.201	0.000	0.261	0.000	0.261
Articles:	-	-	-	-	-
Description: Identify challenges to effectively manage durability and safety aspects of common work/combat uniforms for the warfighter. Eliminate risk of hazardous factors such as fire, weather, and general wear/tear to maximize readiness and strength in Fleet uniforms. Assist with specifications associated with permanent press finish related to the rollout of the Navy's Type III uniform. ***FY 2019 Plans:*** N/A ***FY 2020 Base Plans:*** "Green" Laundering Services: Validate new "green" shipboard laundering formulas for Navy uniforms subject to shipboard laundering. The new "green" formulation is a replacement of harsh chemicals with high acidity, with an enzymatic detergent that requires lower water temperatures and lower water consumption wash cycles, and a potential reduction of the wear and fading effects on uniforms, as well as a reduction of these chemical products stowed on-board in large quantities. Validation will allow NAVSUP to understand the effects of the chemicals on					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603739N / *Navy Logistic Productivity*	**Project (Number/Name)** 3223 / *Logistics R&D*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
appearance, color change, and special finishes on Navy uniforms. An updated shipboard formulation will further support OPNAV's Environmental Readiness Program. ($75K) Product Lifecycle Management (PLM) digital platform: Enhance efficiency in the management and standardization of materials documentations in support of uniform development of USN Uniforms and Materials. Over the years, the Navy Clothing and Textile Research Facility (NCTRF) has amassed extensive data on USN uniforms, fabrics and trims. With each garment and material update, multiple files must be created or amended manually and then stored in various server locations. As time goes on, employees transition and files multiply; the man hours to locate, research and review information on current uniforms and materials has increased. Incorporation of a PLM digital platform will streamline the garment creation process and reduce costs by effectively managing USN uniforms and materials with a product lifecycle management tool. Effort includes development, trial and inclusion of this tool into navy clothing and textile research efforts. ($61K) Navy Boot Enhancement: Develop, select and integrate Foreign Object Damage (FOD) and slip resistant outsole. An evaluation conducted in FY18 revealed that the outsole of the current boot was not FOD-resistant and has poor split resistance in flight deck environments. Determine the characteristics of an outsole (tread design and rubber compound) that meet the FOD-resistance and slip requirements of multiple Navy environments. The objective is to develop a common outsole that meets or exceeds safety boot requirements for all Navy communities and work environments. ($75K) E-yarn Development for embedded garment performance monitoring: Initiate a study related to the incorporation of e-yarns to support monitoring of personnel data to support safety goals. Technology changes driving new ship design will require a real-time connection between the ship and the sailor for delivery and receipt of information and data to and from the sailor. The challenge is connecting all the systems together with the sailor into intelligible human-system interfaces, so that, the ship of the future will be securely controlled by fewer sailors located anywhere on board. Study will research innovative multi-functional garment systems with embedded technologies to become the structure for robust human-systems interface. ($50K) ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** The increase from FY 2019 to FY 2020 is to accommodate additional material studies and analysis.					
Accomplishments/Planned Programs Subtotals	0.581	0.000	0.977	0.000	0.977

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603739N / *Navy Logistic Productivity*	**Project (Number/Name)** 3223 / *Logistics R&D*

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

NAVSUP R&D executed through firm fixed price negotiated contracts and NAVSUP support. Performance-based reviews conducted quarterly by the Project Management Office.

E. Performance Metrics

Development of capability and technology gaps initiatives are monitored quarterly by the NAVSUP R&D Program Management Office.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603739N / *Navy Logistic Productivity*	Project (Number/Name) 3223 / *Logistics R&D*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Effective Food Service Management	C/FFP	Various : Various	0.000	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Quality of Life Services Modernization & Cost Reduction (Initiative 1)	C/FFP	BSC : Mechanicsburg, PA	0.259	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Quality of Life Services Modernization & Cost Reduction (Initiative 2)	C/FFP	Various : Various	0.785	0.252	Jan 2018	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Readiness through Logistics Solutions	C/FFP	SSDM : Scott AFB, IL	1.075	0.128	Dec 2017	0.000		0.355	Dec 2019	-		0.355	Continuing	Continuing	Continuing
Clothing Protection for the Warfighter	C/FFP	NCTRF : Natick,MA	0.925	0.201	Dec 2017	0.000		0.361	Oct 2019	-		0.361	Continuing	Continuing	Continuing
Supply Chain Optimization	C/FFP	Varios : Varios	0.000	0.000		0.000		0.261	Dec 2019	-		0.261	Continuing	Continuing	Continuing
		Subtotal	3.044	0.581		0.000		0.977		-		0.977	Continuing	Continuing	N/A

Remarks

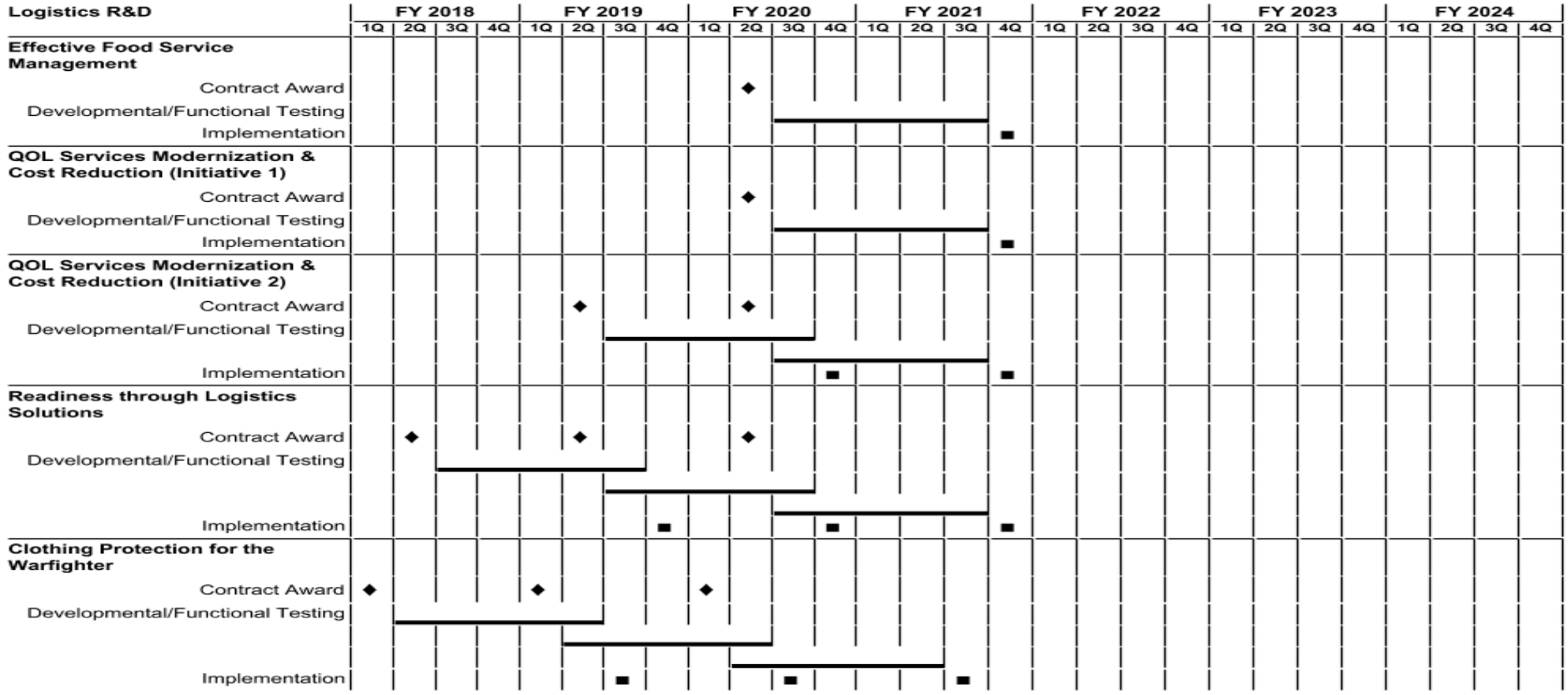
NLP funding of $581K was dispersed through the following projects: Sea Service Deployment Module (SSDM), Navy Type III Uniform, Augmented Reality Technology, and the Whissler Apparel Model. Sea Service Deployment Module will modernize a unit move information technology system to facilitate FY15 JROCM mandates, pending IA certification requirements as well as (Naval) forces required use of the force deployment planning and execution business procedures. These projects will conduct comprehensive research, testing, and evaluations to provide solid result of improvements needed to sustain the Fleet uniform initiatives.

	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	3.044	0.581		0.000		0.977		-		0.977	Continuing	Continuing	N/A

Remarks

In previous plans, NAVSUP forecast budget requirements based on projections rooted in the current year's capability gaps. As our priorities and Strategic Guidance evolves so does our budget requirements. Through leveraging new technologies, NAVSUP will enhance efforts for supply ashore and distant support. We will strengthen our supply chain information technology and management solutions for supply and financial requirements. We will collaborate with partners to improve the quality-of-life experiences and expand services to deployed forces. NAVSUP will continue to build an ethical and effective workforce dedicated to the mission by developing new technological programs that are advantageous to the warfighter. We will reduce risk and minimize vulnerabilities to protect against disruptions to supply chain and business systems. All of our actions will follow a culture of moral excellence to successfully execute the current and future missions of NAVSUP.

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603739N / *Navy Logistic Productivity*	**Project (Number/Name)** 3223 / *Logistics R&D*



2020DON - 0603739N - 3223

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603739N / *Navy Logistic Productivity*	**Project (Number/Name)** 3223 / *Logistics R&D*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Logistics R&D				
Supply Chain Optimization: Contract Award: FY 2020 Contract Award	2	2020	2	2020
Supply Chain Optimization: Developmental/Functional Testing: Developmental/ Functional Testing	3	2020	3	2021
Supply Chain Optimization: Implementation: Implementation	4	2021	4	2021
QOL Services Modernization & Cost Reduction (Initiative 1): Contract Award:	2	2020	2	2020
QOL Services Modernization & Cost Reduction (Initiative 1): Developmental/Functional Testing: Developmental/Functional Testing	3	2020	3	2021
QOL Services Modernization & Cost Reduction (Initiative 1): Implementation: Implementation	4	2021	4	2021
QOL Services Modernization & Cost Reduction (Initiative 2): Contract Award: FY 2020 Contract Award	2	2020	2	2020
QOL Services Modernization & Cost Reduction (Initiative 2): Contract Award: FY 2020Developmental/Functional Testing	3	2020	3	2021
Readiness through Logistics Solutions: Contract Award: FY 2018 Contract Award	2	2018	2	2018
Readiness through Logistics Solutions: Contract Award: FY 2020 Contract Award	2	2020	2	2020
Readiness through Logistics Solutions: Developmental/Functional Testing: FY 2018 Developmental/Functional Testing	3	2018	3	2019
Readiness through Logistics Solutions: Developmental/Functional Testing: FY 2020 Developmental/Functional Testing	3	2020	3	2021
Readiness through Logistics Solutions: Implementation: FY 2018 Implementation	4	2019	4	2019
Readiness through Logistics Solutions: Implementation: FY 2020 Implementation	4	2021	4	2021
Clothing Protection for the Warfighter: Contract Award: FY 2018 Contract Award	1	2018	1	2018
Clothing Protection for the Warfighter: Contract Award: FY 2020 Contract Award	1	2020	1	2020

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603739N / *Navy Logistic Productivity*	**Project (Number/Name)** 3223 / *Logistics R&D*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Clothing Protection for the Warfighter: Developmental/Functional Testing: FY 2018 Developmental/Functional Testing	2	2018	2	2019
Clothing Protection for the Warfighter: Developmental/Functional Testing: FY 2020 Developmental/Functional Testing	2	2020	2	2021
Clothing Protection for the Warfighter: Implementation: FY 2018 Implementation	3	2019	3	2019
Clothing Protection for the Warfighter: Implementation: FY 2020 Implementation	3	2021	3	2021

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0603790N *I NATO Research and Deve*

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	81.154	8.752	9.652	7.697	-	7.697	8.793	9.013	9.238	9.469	Continuing	Continuing
2293: *NATO Cooperative R & D*	81.154	8.752	9.652	7.697	-	7.697	8.793	9.013	9.238	9.469	Continuing	Continuing

A. Mission Description and Budget Item Justification

In accordance with Title 10 United States Code, Section 2350a, this Program Element (PE) provides funding for research and development (R&D) programs with approved allies under international agreements. These funds can only be applied to work efforts in the U.S.. The Under Secretary of Defense, Acquisition and Technology and Logistics (USD, AT&L) must approve each international agreement. The program provides funds for multiple projects under separately approved international agreements as well as funds that support the establishment of such agreements. Each international agreement is summarized in a separate Summary Statement of Intent (SSOI) that also states why the project serves to increase the defense capabilities of the U.S. The SSOI is used to obtain project approval by the Department of the Navy and the Office of the Secretary of Defense.

The North Atlantic Treaty Organization (NATO) R&D cooperative programs differ from other Research, Development, Test and Evaluation (RDT&E) programs because issuance of funding from this PE coincides with the signature of international agreements. These signatures occur throughout the fiscal year and often encounter unexpected delays during the staffing and negotiation phases of agreement processing prior to signature.

B. Program Change Summary ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	9.099	9.652	11.121	-	11.121
Current President's Budget	8.752	9.652	7.697	-	7.697
Total Adjustments	-0.347	0.000	-3.424	-	-3.424
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.347	0.000			
• Program Adjustments	0.000	0.000	-3.424	-	-3.424
• Rate/Misc Adjustments	0.000	0.000	0.000	-	0.000

Change Summary Explanation

The FY2020 funding request for project 2293 was reduced by $2.154 million to account for the availability of prior year execution balances.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603790N / *NATO Research and Deve*	Project (Number/Name) 2293 / *NATO Cooperative R & D*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
2293: *NATO Cooperative R & D*	81.154	8.752	9.652	7.697	-	7.697	8.793	9.013	9.238	9.469	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

In accordance with Title 10 United States Code, Section 2350a, this Program Element (PE) provides funding for research and development (R&D) programs with approved allies under international agreements. These funds can only be applied to work efforts in the U.S. The Under Secretary of Defense, Acquisition and Technology and Logistics (USD, AT&L) must approve each international agreement. The program provides funds for multiple projects under separately approved international agreements as well as funds that support the establishment of such agreements. Each international agreement is summarized in a separate Summary Statement of Intent (SSOI) that also states why the project serves to increase the defense capabilities of the U.S. The SSOI is used to obtain project approval by the Department of the Navy and the Office of the Secretary of Defense.

The North Atlantic Treaty Organization (NATO) R&D cooperative programs differ from other Research, Development, Test and Evaluation (RDT&E) programs because issuance of funding from this PE coincides with the signature of international agreements. These signatures occur throughout the fiscal year and often encounter unexpected delays during the staffing and negotiation phases of agreement processing prior to signature.
This NATO Research and Development funding provides funding for U.S. efforts under established International agreements (IAs) intended to address CNO priorities and identified interoperability gaps, as well as activities to support the identification and implementation of those agreements.

- Projects depend on commitment of U.S. and Ally, and are subject to imprecise staffing timelines (funding typically provided when international agreement is signed, often later in the FY)
- Funds must be identified/committed early (1-2 years prior) to indicate support during processing (in Summary Statement of Intent)
- These funds only constitute a portion of U.S. project funding

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: NATO Cooperative R & D	8.752	9.652	7.697	0.000	7.697
Articles:	-	-	-	-	-
FY 2019 Plans: -Continue to support approved Cooperative projects signed in prior fiscal years. -Plan and support approved FY2019 Cooperative projects. Potential Projects include, but are not limited to: -Advanced Structural Monitoring Techniques (ASMT) U.S. and Australia -Advanced Surveillance Technology (AST) U.S. and Australia					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603790N / *NATO Research and Deve*	**Project (Number/Name)** 2293 / *NATO Cooperative R & D*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
-Allied Munitions Detection-Underwater Initiative (ALMOND-U) U.S. and Germany -Arctic Hydrodynamics U.S. and Finland -Autonomous Maritime Asset Protection Systems (AMAPS) U.S. and United Kingdom -Biomimetic Threat Detection System (BTDS) U.S. and United Kingdom -Coalition Underwater Mine and IED Defeat (CUMID) U.S., Canada, and Norway -Collaborative Situational Awareness Development (CSA DEV) U.S. and Italy -Dynamic System Mechanics Advanced Simulation-Shallow Confined Waters (DYSMAS-SCW) U.S. and Germany -Electromagnetic Silencing U.S. and United Kingdom -Helo Seat Damper U.S. and Canada -Hull Treatments U.S. and United Kingdom -International Programs Opportunities Engagement Tool (iPoet) -Japan U.S. Amphibious Vehicle Technology Cooperation (JUSAV) U.S. and Japan -Optical Materials Amendment 1 U.S. and Israel -Submarine Superiority U.S. and Australia -Superconducting Quantum Small Electromagnetic Sensor System Research and Development (Super QSES) U.S. and Australia -Ultra Heavy Lift Amphibious Connector (UHAC) U.S. and Singapore -Undersea Surveillance and Communications (USC) U.S. and Sweden					
FY 2020 Base Plans: FY 2020 Base Plans: -Continue to support approved Cooperative projects from FY18/FY19. -Plan and support approved FY20 Cooperative projects. Projects include, but are not limited to: -Advanced Material Propeller U.S. and Australia -Advanced Surveillance Technology U.S. and Australia -Allied Munitions Detection-Underwater Initiative (ALMOND-U) U.S. and Germany - Amphibious Vehicle Technology Cooperation U.S. and Japan -Arctic Hydrodynamics U.S. and Finland -Autonomous Maritime Asset Protection Systems (AMAPS) U.S. and United Kingdom -Biomimetic Threat Detection System (BTDS) U.S. and United Kingdom -Coalition Underwater Mine and IED Defeat U.S., Canada, and Norway					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603790N / *NATO Research and Deve*	**Project (Number/Name)** 2293 / *NATO Cooperative R & D*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
-Collaborative Situational Awareness Development (CSA DEV) U.S. and Italy -Dynamic System Mechanics Advanced Simulation-Shallow Confined Waters (DYSMAS-SCW) U.S. and Germany -Electromagnetic Silencing U.S. and United Kingdom -Helo Seat Damper U.S. and Canada -Hull Treatments U.S. and United Kingdom -Optical Materials Amendment 1 U.S. and Israel -Submarine Superiority U.S. and Australia -Superconducting Quantum Small Electromagnetic Sensor System Research and Development (Super QSES) U.S. and Australia -Ultra Heavy Lift Amphibious Connector (UHAC) U.S. and Singapore -Undersea Surveillance and Communications (USC) U.S. and Sweden -Advanced Structural Monitoring Techniques (ASMT)U.S. and Australia -Japan U.S. Amphibious Vehicle Technology Cooperation (JUSAV) U.S. and Japan -Background Nuclear Radiation Measurement (BANRAM) U.S. and Finland -Coalition Open System Diagnostic Environment (CODE) -Buried IED ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** The FY 2020 funding request was reduced by $2.154 million to account for the availability of prior year execution balances.					
Accomplishments/Planned Programs Subtotals	8.752	9.652	7.697	0.000	7.697

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603790N / *NATO Research and Deve*	**Project (Number/Name)** 2293 / *NATO Cooperative R & D*

E. Performance Metrics

The intent of the North Atlantic Treaty Organization (NATO) cooperative R&D program is to provide initial funds for projects seeking allied contributions into cooperative research and development projects with the U.S. The primary metric used in the program is foreign contributions into projects supported by the program. The performance goal is met if total foreign contributions into projects exceed total NATO cooperative R&D program funds by over 100%.

This program historically does not meet established execution benchmarks. The North Atlantic Treaty Organization (NATO) R&D cooperative programs differ from other Research, Development, Test and Evaluation (RDT&E) programs because issuance of funding from this PE coincides with the signature of international agreements. These signatures occur throughout the fiscal year and often encounter unexpected delays during the staffing and negotiation phases of agreement processing prior to signature.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603790N / *NATO Research and Deve*	Project (Number/Name) 2293 / *NATO Cooperative R & D*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Developmental Test and Evaluation	C/FP	NAVSEA : Washington Navy Yard, DC	26.626	0.250	Apr 2018	0.669	Dec 2018	0.668	Dec 2019	-		0.668	Continuing	Continuing	Continuing
Developmental Test and Evaluation	C/FP	NSWC : West Bethesda, MD	13.621	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Developmental Test and Evaluation	C/FP	NUWC : Newport, RI	2.352	0.409	Dec 2017	0.300	Dec 2018	0.300	Dec 2019	-		0.300	Continuing	Continuing	Continuing
Developmental Test and Evaluation	C/FP	SPAWAR : San Diego, CA	5.353	0.818	Apr 2018	1.000	Jan 2019	0.850	Jan 2020	-		0.850	Continuing	Continuing	Continuing
Developmental Test and Evaluation	C/FP	NAVAIR : Patuxent River, MD	2.136	1.893	Dec 2017	0.353	Dec 2018	0.349	Dec 2019	-		0.349	Continuing	Continuing	Continuing
Developmental Test and Evaluation	C/FP	NRL : Washington, DC	2.484	1.392	Oct 2017	1.830	Nov 2018	1.180	Nov 2019	-		1.180	Continuing	Continuing	Continuing
Developmental Test and Evaluation	C/FP	NAWC : Point Mugu, CA	7.100	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Developmental Test and Evaluation	C/FP	Miscellaneous : Washington Navy Yard	15.723	1.170	Mar 2018	1.500	Apr 2019	1.300	May 2020	-		1.300	Continuing	Continuing	Continuing
Deveiopmental Test and Evaulation	C/FP	MARCOR : Washington.DC	1.200	0.000		0.000		0.000		-		0.000	0.000	1.200	-
Developmental Test and Evaulation	C/FP	NSWCCD : Carderock, MD	2.035	0.900	May 2018	0.625	Apr 2019	0.625	Apr 2020	-		0.625	0.000	4.185	-
Developmental Test and Evaulation	C/FP	ONR : Arlington, VA	2.475	0.000		0.775	Mar 2019	0.725	Mar 2020	-		0.725	0.000	3.975	-
Developmental Test and Evaluation	C/FP	USMC : Qunatic VA	0.000	0.000		0.500	May 2019	0.550	May 2020	-		0.550	0.000	1.050	-
Developmental Test and Evaulation	C/FP	NSWC : Indian Head, MD	0.000	0.250	Jan 2018	0.000		0.000		-		0.000	0.000	0.250	-
Developmental Test and Evaulation	C/FP	NSWC : Panama City , FL	0.000	0.250	Dec 2017	0.200	Oct 2018	0.200	Oct 2019	-		0.200	0.000	0.650	-
Developmental Test and Evaulation	C/FP	GSA : Washington, DC	0.000	0.400	Feb 2018	0.400	Mar 2019	0.200	Mar 2020	-		0.200	0.000	1.000	-
Developmental Test and Evaulation	C/FP	DISA : Ft Meade MD	0.000	0.000		1.500	Dec 2018	0.750	Dec 2019	-		0.750	0.000	2.250	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603790N / *NATO Research and Deve*	Project (Number/Name) 2293 / *NATO Cooperative R & D*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Developmental Test and Evaulation	C/FP	CDSA : Dam Neck, VA	0.000	1.020	Mar 2018	0.000		0.000		-		0.000	0.000	1.020	-
		Subtotal	81.105	8.752		9.652		7.697		-		7.697	Continuing	Continuing	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
ACQ Workforce Fund	Various	Various : Various	0.049	0.000		0.000		0.000		-		0.000	0.000	0.049	-
		Subtotal	0.049	0.000		0.000		0.000		-		0.000	0.000	0.049	N/A

	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	81.154	8.752		9.652		7.697		-		7.697	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603790N / *NATO Research and Deve*	**Project (Number/Name)** 2293 / *NATO Cooperative R & D*

	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Proj 2293																												
International Agreements	[redacted]																											

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603790N / *NATO Research and Deve*	**Project (Number/Name)** 2293 / *NATO Cooperative R & D*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 2293				
International Agreements	1	2018	4	2020

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy											Date: March 2019	
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0603795N *I Land Attack Tech*							
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
Total Program Element	16.179	16.684	7.100	9.086	1.428	10.514	12.552	10.097	5.852	5.575	Continuing	Continuing
2020: *Advanced Gun System Projectile*	0.000	2.884	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	2.884
2038: *ADVANCED MINOR CALIBER GUN*	16.179	2.018	1.400	4.500	1.428	5.928	5.857	4.186	1.815	1.546	Continuing	Continuing
3401: *Guided Projectile*	0.000	11.782	0.700	4.586	-	4.586	6.695	5.911	4.037	4.029	Continuing	Continuing
9999: *Congressional Adds*	0.000	0.000	5.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	5.000

A. Mission Description and Budget Item Justification

Project 2020: The Advanced Gun System (AGS) projectile will provide affordable Naval Surface Fires Support for DDG 1000 class destroyers from the MK 51 Gun Weapon System (commonly referred to as AGS). Initiation of a demonstration and development planning for an affordable round was directed by Assistant Secretary of the Navy, Research, Development, and Acquisition to address the unaffordability of the Long Range Land Attack Projectile. The effort focuses on integration of an affordable 155mm guided projectile in the MK 51 GWS. Several options were assessed in FY17 and determined to be unaffordable; additional studies are planned to assess longer term options or options not previously considered to identify potential candidates for projectile replacement. The program was funded under PE 0204202N DDG 1000 in FY 2017.

Project 2038 Base & OCO: The MK 38 MOD 3 Machine Gun System (MGS) provides Anti-Surface Warfare (ASUW) and Anti-terrorism and Force Protection (AT/FP) capability as a simple, stabilized, low cost solution to outfit near-term deployers to counter small boat threats. Over 300 systems are installed on U.S. Navy AS, CG, CVN, DDG, LCC, LHA, LHD, LSD, OSV, PC class ships and MK VI Patrol Boats. In order to respond to the Joint Urgent Operational Need (JUONS CC-0558) Counter Unmanned Aerial Systems (C-UAS), the MK 38 MOD 3 MGS' electro-optical/infra-red sensor, hardware, and software is being upgraded to counter emerging unmanned aerial threats. Fielding of initial capability will start in fourth quarter of FY19. Incremental improvements will be made in the out years to further improve on accuracy, effective range, and lethality. Starting in FY20, further development will improve the MK 38 MGS' accuracy, lethality, and effective range to counter unmanned air (C-UAS) and unmanned surface (C-USV) threats with integration to highly accurate fire control system, 30mm gun, and targeting sensor.

Projects 3401 & C452: The Gun Launched Guided Projectile provides initial operational capability for Cruise Missile Defense (CMD) with potential future Surface Warfare and Naval Surface Fire Support capability. This project implements a materiel design decision, conducts integration enabling technology maturation, and prepares for Engineering and Manufacturing Development (E&MD) development in FY21. The Gun Launched Guided Projectile project was previously funded under the PE 0603925N / Directed Energy and Electronic Weapon Systems (Proj: 3370 Railgun) and 0603795N / Land Attack Tech (Proj: 3370 Railgun).

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0603795N *I Land Attack Tech*

B. Program Change Summary ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	33.568	15.529	0.000	-	0.000
Current President's Budget	16.684	7.100	9.086	1.428	10.514
Total Adjustments	-16.884	-8.429	9.086	1.428	10.514
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-14.829			
• Congressional Rescissions	-	-			
• Congressional Adds	-	5.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-3.400	0.000			
• SBIR/STTR Transfer	-0.584	0.000			
• Program Adjustments	2.100	1.400	11.312	-	11.312
• Rate/Misc Adjustments	0.000	0.000	-2.226	1.428	-0.798
• Congressional Directed Reductions Adjustments	-15.000	-	-	-	-

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2018	FY 2019
Project: 9999: *Congressional Adds*		
Congressional Add: *Guided Projectile*	0.000	5.000
Congressional Add Subtotals for Project: 9999	0.000	5.000
Congressional Add Totals for all Projects	0.000	5.000

Change Summary Explanation

Land Attack Tech: FY19 -$8.429M net adjustment due to: Project 3401 lack of program funding: -$14.829M; Program Increase - Guided projectile C452: + $5.000M; and other program adjustments: +$1.400M.

PU 3401:
FY20-FY24 increase of +$25.258M continues development of GLGP Block 0, which otherwise ends in FY19. GLGP Block 0 provides multi-mission capabilities for SuW, NSFS , and limited AW aboard DDG/CG platforms equipped with MK45 MOD 4 Guns. Funds also provided in out years to enable request for proposal (RFP).

PU 2038: FY20-FY24 increase of +$19.332M continues to support Counter Unmanned Aerial Systems (CUAS) JUON.

The FY 2020 funding request was reduced by $4.616 million to account for the availability of prior year execution balances.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603795N / *Land Attack Tech*	Project (Number/Name) 2020 / *Advanced Gun System Projectile*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
2020: *Advanced Gun System Projectile*	0.000	2.884	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	2.884
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Advanced Gun System (AGS) projectile will provide affordable Naval Surface Fires Support for DDG 1000 class destroyers from the MK 51 Gun Weapon System (commonly referred to as AGS). Initiation of a demonstration and development planning for an affordable round was directed by Assistant Secretary of the Navy, Research, Development, and Acquisition to address the unaffordability of the Long Range Land Attack Projectile. The effort focuses on integration of an affordable 155mm guided projectile in the MK 51 GWS. Several options were assessed in FY17 and determined to be unaffordable; additional studies are planned to assess longer term options or options not previously considered to identify potential candidates for projectile replacement. The program was funded under PE 0204202N DDG 1000 in FY 2017.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Systems Engineering and Design Verification	2.884	0.000	0.000	0.000	0.000
Articles:	-	-	-	-	-
FY 2019 Plans: N/A					
FY 2020 Base Plans: N/A					
FY 2020 OCO Plans: N/A					
Accomplishments/Planned Programs Subtotals	2.884	0.000	0.000	0.000	0.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603795N / *Land Attack Tech*	**Project (Number/Name)** 2020 / *Advanced Gun System Projectile*

E. Performance Metrics

Completion of studies; close-out of start-up efforts prior to decision to not purchase a projectile.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603795N / *Land Attack Tech*	Project (Number/Name) 2020 / *Advanced Gun System Projectile*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
155mm Cartridge Case Facility Equipment Installation	MIPR	DOTC : Picatinny, NJ	0.000	0.413	Mar 2018	0.000		0.000		-		0.000	0.000	0.413	-
		Subtotal	0.000	0.413		0.000		0.000		-		0.000	0.000	0.413	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Alternative Projectile Studies	WR	NSWC Dahlgren : Dahlgren, VA	0.000	0.782	Oct 2017	0.000		0.000		-		0.000	0.000	0.782	-
Alternative Projectile Studies	WR	NSWC IHEOTD : Indian Head MD	0.000	0.428	Oct 2017	0.000		0.000		-		0.000	0.000	0.428	-
Alternative Projectile Studies	WR	NSWC IHEOTD : Picatinny, NJ	0.000	0.118	Oct 2017	0.000		0.000		-		0.000	0.000	0.118	-
Alternative Projectile Studies	WR	NAWC,CL : China Lake, CA	0.000	0.390	Jul 2018	0.000		0.000		-		0.000	0.000	0.390	-
Alternative Projectile Studies	MIPR	ARDEC : Picatinny, NJ	0.000	0.219	Jan 2019	0.000		0.000		-		0.000	0.000	0.219	-
Contractor Support Services	C/CPFF	Various : Various	0.000	0.328	Jan 2019	0.000		0.000		-		0.000	0.000	0.328	-
		Subtotal	0.000	2.265		0.000		0.000		-		0.000	0.000	2.265	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Range Services for Alternative Projectile Studies	WR	NSWC DD : Dahlren, VA	0.000	0.128	Jul 2018	0.000		0.000		-		0.000	0.000	0.128	-
		Subtotal	0.000	0.128		0.000		0.000		-		0.000	0.000	0.128	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603795N / *Land Attack Tech*	Project (Number/Name) 2020 / *Advanced Gun System Projectile*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Government Support Service	Allot	NAVSEA : Washington, DC	0.000	0.078	Jul 2018	0.000		0.000		-		0.000	0.000	0.078	-
		Subtotal	0.000	0.078		0.000		0.000		-		0.000	0.000	0.078	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	2.884		0.000		0.000		-		0.000	0.000	2.884	N/A

Remarks

Planned integration of a projectile with the MK 51 GWS was cancelled due to cost to develop, integrate, procure, and install. Efforts were replanned to close out alternative projectile study efforts from FY17 and continue studies in FY19.

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603795N / *Land Attack Tech*	**Project (Number/Name)** 2020 / *Advanced Gun System Projectile*

	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Proj 2020																												
AGS Projectile Replacement Studies: Schedule Detail	[redacted]																											

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603795N / *Land Attack Tech*	**Project (Number/Name)** 2020 / *Advanced Gun System Projectile*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 2020				
AGS Projectile Replacement Studies: Schedule Detail	1	2018	4	2019

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603795N / *Land Attack Tech*	Project (Number/Name) 2038 / *ADVANCED MINOR CALIBER GUN*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
2038: *ADVANCED MINOR CALIBER GUN*	16.179	2.018	1.400	4.500	1.428	5.928	5.857	4.186	1.815	1.546	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The MK 38 MOD 3 Machine Gun System (MGS) provides Anti-Surface Warfare (ASUW) and Anti-terrorism and Force Protection (AT/FP) capability as a simple, stabilized, low cost solution to outfit near-term deployers to counter small boat threats. Over 300 systems are installed on U.S. Navy AS, CG, CVN, DDG, LCC, LHA, LHD, LSD, OSV, PC class ships and MK VI Patrol Boats. In order to respond to the Joint Urgent Operational Need (JUONS CC-0558) Counter Unmanned Aerial Systems (C-UAS), the MK 38 MOD 3 MGS' electro-optical/infra-red sensor, hardware, and software is being upgraded to counter emerging unmanned aerial threats. Fielding of initial capability will start in fourth quarter of FY19. Incremental improvements will be made in the out years to further improve on accuracy, effective range, and lethality. Starting in FY20, further development will improve the MK 38 MGS' accuracy, lethality, and effective range to counter unmanned air (C-UAS) and unmanned surface (C-USV) threats with integration to highly accurate fire control system, 30mm gun, and targeting sensor.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Systems Engineering and Testing	2.018	1.400	4.500	1.428	5.928
Articles:	-	-	-	-	-
FY 2019 Plans: OCO: - Deliver final Counter-UAS capability software release - Complete land-based and at-sea qualification testing - Obtain WSESRB concurrence for deployment - Obtain element certification of new MK 38 HW/W baseline - Field engineering design model for Initial Operational Capability					
FY 2020 Base Plans: - System requirements development for integration with 30mm gun and high accuracy gun fire control system - Develop gun, fire control, and ship combat system interfaces - Procure test hardware					
FY 2020 OCO Plans: - Train Fleet and collect feedback on operation of initial C-UAS upgrade - Analyze Fleet feedback and identify required bug fixes					
FY 2019 to FY 2020 Increase/Decrease Statement:					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603795N / *Land Attack Tech*	**Project (Number/Name)** 2038 / *ADVANCED MINOR CALIBER GUN*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Increase of funding in the amount of $4.528M from FY 2019 to FY 2020 to continue support of Counter Unmanned Aerial Systems (CUAS).					
Accomplishments/Planned Programs Subtotals	2.018	1.400	4.500	1.428	5.928

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Hardware improvement based on engineering changes was integrated into FY 2017 and follow-on production orders.

E. Performance Metrics

Quarterly program reviews and semi-annual product certification panel reviews.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603795N / *Land Attack Tech*	Project (Number/Name) 2038 / *ADVANCED MINOR CALIBER GUN*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Counter-UAS (JUONS CC-0558) Primary Product Integration	SS/BOA	BAE Systems : Minneapolis MN	12.725	1.718	Feb 2018	0.550	Mar 2019	0.000		1.200	Mar 2020	1.200	Continuing	Continuing	Continuing
MK38 Counter UAS/USV Improvement Primary Product Integration	C/CPFF	TBD : Not Specified	0.000	0.000		0.000		3.000	Mar 2020	-		3.000	0.000	3.000	-
		Subtotal	12.725	1.718		0.550		3.000		1.200		4.200	Continuing	Continuing	N/A

Remarks

Counter UAS capability upgrades to MK 38 Machine Gun System

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Government Engineering Services	WR	NSWC, DD : Dahlgren, VA	2.749	0.150	Jul 2018	0.750	Mar 2019	1.300	Nov 2019	0.098	Nov 2019	1.398	0.000	5.047	-
Government Engineering Services	WR	NSWC, IHD : Picatinny, NJ	0.640	0.050	Jul 2018	0.050	Mar 2019	0.100	Nov 2019	0.100	Nov 2019	0.200	0.000	0.940	-
Government Engineering Services	WR	NSWC, CR : Crane, IN	0.065	0.100	Jul 2018	0.050	Mar 2019	0.100	Nov 2019	0.030	Nov 2019	0.130	0.000	0.345	-
		Subtotal	3.454	0.300		0.850		1.500		0.228		1.728	0.000	6.332	N/A

Remarks

Configuration Management (CM), qualification testing, certification

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	16.179	2.018		1.400		4.500		1.428		5.928	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603795N / *Land Attack Tech*	**Project (Number/Name)** 2038 / *ADVANCED MINOR CALIBER GUN*

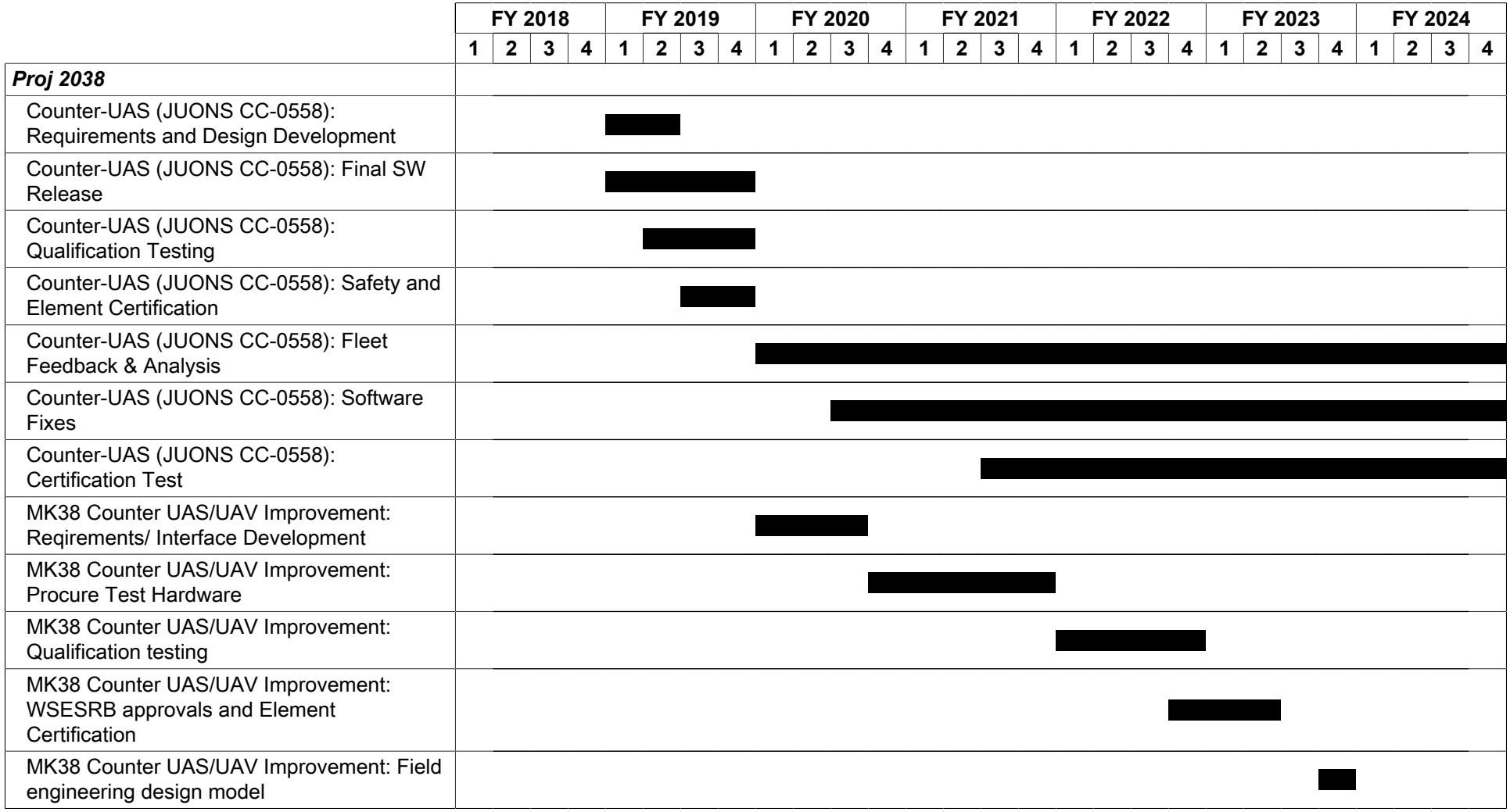


Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603795N / *Land Attack Tech*	**Project (Number/Name)** 2038 / *ADVANCED MINOR CALIBER GUN*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 2038				
Counter-UAS (JUONS CC-0558): Requirements and Design Development	1	2019	2	2019
Counter-UAS (JUONS CC-0558): Final SW Release	1	2019	4	2019
Counter-UAS (JUONS CC-0558): Qualification Testing	2	2019	4	2019
Counter-UAS (JUONS CC-0558): Safety and Element Certification	3	2019	4	2019
Counter-UAS (JUONS CC-0558): Fleet Feedback & Analysis	1	2020	4	2024
Counter-UAS (JUONS CC-0558): Software Fixes	3	2020	4	2024
Counter-UAS (JUONS CC-0558): Certification Test	3	2021	4	2024
MK38 Counter UAS/UAV Improvement: Reqirements/ Interface Development	1	2020	3	2020
MK38 Counter UAS/UAV Improvement: Procure Test Hardware	4	2020	4	2021
MK38 Counter UAS/UAV Improvement: Qualification testing	1	2022	4	2022
MK38 Counter UAS/UAV Improvement: WSESRB approvals and Element Certification	4	2022	2	2023
MK38 Counter UAS/UAV Improvement: Field engineering design model	4	2023	4	2023

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603795N / *Land Attack Tech*	Project (Number/Name) 3401 / *Guided Projectile*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
3401: *Guided Projectile*	0.000	11.782	0.700	4.586	-	4.586	6.695	5.911	4.037	4.029	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Gun Launched Guided Projectile provides initial operational capability for Cruise Missile Defense (CMD) with potential future Surface Warfare and Naval Surface Fire Support capability. This project implements a materiel design decision, conducts integration enabling technology maturation, and prepares for Engineering and Manufacturing Development (E&MD) development in FY21. The Gun Launched Guided Projectile project was previously funded under the PE 0603925N / Directed Energy and Electronic Weapon Systems (Proj: 3370 Railgun) and 0603795N / Land Attack Tech (Proj: 3370 Railgun).

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Systems Engineering and Testing	11.782	0.700	4.586	0.000	4.586
Articles:	-	-	-	-	-
FY 2019 Plans: - Develop acquisition strategy - Perform cost/trade studies for system integration					
FY 2020 Base Plans: - Documentation prep for Milestone B - Continue common interface definition documentation					
FY 2020 OCO Plans: N/A					
FY 2019 to FY 2020 Increase/Decrease Statement: FY20 increase due to FY19 Congressional adjustment of -$14.829M that restores acquisition accountability. Funding continues development of GLGP Block 0, which otherwise ends in FY19.					
Accomplishments/Planned Programs Subtotals	11.782	0.700	4.586	0.000	4.586

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603795N / *Land Attack Tech*	**Project (Number/Name)** 3401 / *Guided Projectile*

D. Acquisition Strategy

Leverage the ONR sponsored Future Naval Capabilities project, Strategic Capabilities Office (SCO) Hypervelocity Projectile (HVP) demonstrations, and Gov't developed Interface Control Drawings and specification to establish a competitive solicitation for Engineering & Manufacturing Development (E&MD) Phase.

E. Performance Metrics

- Program execution review

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603795N / *Land Attack Tech*	Project (Number/Name) 3401 / *Guided Projectile*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
5 Inch Cartridge Case Process Modification	C/CPFF	Rock Island : Rock Island, IN	0.000	0.684	Jun 2018	0.000		0.000		-		0.000	0.000	0.684	16.000
Interface Development	WR	NSWC Dahlgren : Dahlgren, VA	0.000	1.085	Jun 2018	0.000		0.000		-		0.000	0.000	1.085	-
Tech Maturation	FFRDC	MIT : Boston, MA	0.000	0.350	Jul 2018	0.000		0.000		-		0.000	0.000	0.350	-
Tech Maturation	WR	NSWC IH : Indian Head, MD	0.000	4.452	Jun 2018	0.000		0.000		-		0.000	0.000	4.452	-
Tech Maturation	FFRDC	APL : Laurel, MD	0.000	0.312	Apr 2018	0.000		0.000		-		0.000	0.000	0.312	-
		Subtotal	0.000	6.883		0.000		0.000		-		0.000	0.000	6.883	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Combat System and Terminal Guidance Analyses	C/CPFF	APL : Laurel, MD	0.000	0.500	Jul 2018	0.000		0.175	Nov 2019	-		0.175	0.000	0.675	-
Systems Engineering, Cyber, T&E, Software Guidance, and Electronic Engineering	WR	NSWC DD : Dahlgren, VA	0.000	2.000	Oct 2017	0.670	Nov 2018	2.220	Nov 2019	-		2.220	0.000	4.890	-
Program Office Contractor Services	C/CPFF	Various : Arlington, VA	0.000	1.415	Oct 2017	0.030	Nov 2018	0.659	Nov 2019	-		0.659	Continuing	Continuing	Continuing
Program Support Services	FFRDC	MITRE : McLean, VA	0.000	0.089	Nov 2017	0.000		0.000		-		0.000	0.000	0.089	-
Program Support Services	WR	NPS : Monterey, CA	0.000	0.090	Nov 2017	0.000		0.000		-		0.000	0.000	0.090	-
Fuzing, Warhead, Propellant Charge	WR	NSWC IH : Indian Head, MD	0.000	0.150	Oct 2017	0.000		0.744	Nov 2019	-		0.744	0.000	0.894	-
CM/Data Management, Acquisition Support, Logistics	WR	NSWC IH : Picatinny, NJ	0.000	0.630	Oct 2017	0.000		0.788	Nov 2019	-		0.788	0.000	1.418	-
		Subtotal	0.000	4.874		0.700		4.586		-		4.586	Continuing	Continuing	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603795N / *Land Attack Tech*	Project (Number/Name) 3401 / *Guided Projectile*	

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
T&E Support	WR	NSWC Dahlgren : Dahlgren, VA	0.000	0.025	May 2018	0.000		0.000		-		0.000	0.000	0.025	-
		Subtotal	0.000	0.025		0.000		0.000		-		0.000	0.000	0.025	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	11.782		0.700		4.586		-		4.586	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603795N / *Land Attack Tech*	**Project (Number/Name)** 3401 / *Guided Projectile*

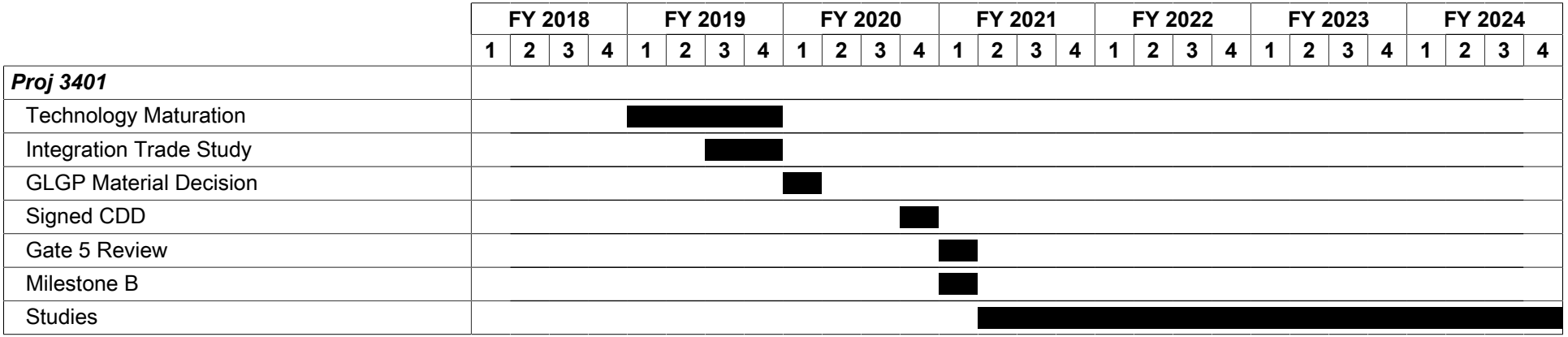


Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603795N / *Land Attack Tech*	**Project (Number/Name)** 3401 / *Guided Projectile*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 3401				
Technology Maturation	1	2019	4	2019
Integration Trade Study	3	2019	4	2019
GLGP Material Decision	1	2020	1	2020
Signed CDD	4	2020	4	2020
Gate 5 Review	1	2021	1	2021
Milestone B	1	2021	1	2021
Studies	2	2021	4	2024

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603795N / *Land Attack Tech*	Project (Number/Name) 9999 / *Congressional Adds*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
9999: *Congressional Adds*	0.000	0.000	5.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	5.000
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Gun Launched Guided Projectile provides initial operational capability for Cruise Missile Defense (CMD) with potential future Surface Warfare and Naval Surface Fire Support capability. This project implements a materiel design decision, conducts integration enabling technology maturation, and prepares for Engineering and Manufacturing Development (E&MD) development in FY21.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019
Congressional Add: Guided Projectile	0.000	5.000
FY 2018 Accomplishments: N/A		
FY 2019 Plans: - Continuation of trade studies - Continue development of interface design documentation - Continue subcomponent technology maturation for critical integration enabling technologies including propelling charge, terminal guidance technologies, and datalink. - Initiate combat system architecture and design		
Congressional Adds Subtotals	0.000	5.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Execute efforts with government labs, FFRDCs and UARCs to preserve competitive posture for a subsequent development program.

E. Performance Metrics

- Drafted common interface definition documentation
- Initiated system architecture design
- Initiated demonstration of subset integration enabling technologies
- Program execution review

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603795N / *Land Attack Tech*	Project (Number/Name) 9999 / *Congressional Adds*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Testing and Interface Development	WR	NSWC DD : Dahlgren, VA	0.000	0.000		1.333	Jan 2019	0.000		-		0.000	0.000	1.333	-
Tech Maturation	FFRDC	JHU APL : Laurel, MD	0.000	0.000		0.593	Dec 2018	0.000		-		0.000	0.000	0.593	-
Tech Maturation	FFRDC	MIT LL : Arlington, VA	0.000	0.000		0.350	Dec 2018	0.000		-		0.000	0.000	0.350	-
Tech Maturation	WR	NSWC Carderock : Bethesda, MD	0.000	0.000		0.120	Feb 2019	0.000		-		0.000	0.000	0.120	-
Fuzing, Warhead, propelling Charge	WR	NSWC IH : indian Head, MD	0.000	0.000		0.253	Jan 2019	0.000		-		0.000	0.000	0.253	-
		Subtotal	0.000	0.000		2.649		0.000		-		0.000	0.000	2.649	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Sys. Eng.,Cyber, T&E	WR	NSWC DD : Dahlgren, VA	0.000	0.000		1.234	Jan 2019	0.000		-		0.000	0.000	1.234	-
CDIM, Acq. Support, ILS	WR	NSWC - IH PIC Det. : Picatinny, NJ	0.000	0.000		0.810	Jan 2019	0.000		-		0.000	0.000	0.810	-
Program Eng Support	C/CPFF	Various : Various	0.000	0.000		0.307	Dec 2018	0.000		-		0.000	0.000	0.307	-
		Subtotal	0.000	0.000		2.351		0.000		-		0.000	0.000	2.351	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Need Item Text	C/BA	Not Specified : Not Specified	0.000	0.000		0.000		0.000		-		0.000	0.000	0.000	-
		Subtotal	0.000	0.000		0.000		0.000		-		0.000	0.000	0.000	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603795N / *Land Attack Tech*	Project (Number/Name) 9999 / *Congressional Adds*	

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	0.000		5.000		0.000		-		0.000	0.000	5.000	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603795N / *Land Attack Tech*	**Project (Number/Name)** 9999 / *Congressional Adds*

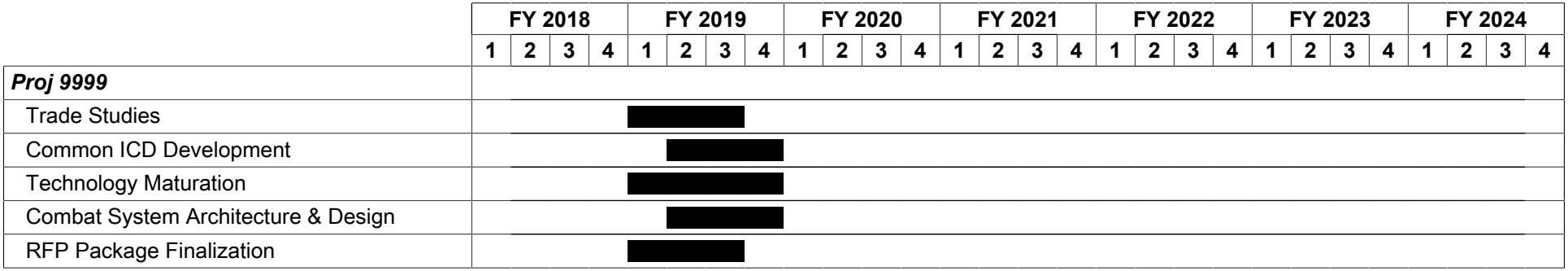


Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603795N / *Land Attack Tech*	**Project (Number/Name)** 9999 / *Congressional Adds*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 9999				
Trade Studies	1	2019	3	2019
Common ICD Development	2	2019	4	2019
Technology Maturation	1	2019	4	2019
Combat System Architecture & Design	2	2019	4	2019
RFP Package Finalization	1	2019	3	2019

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy											Date: March 2019	
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0603851M *I Joint Non-Lethal Weapons Testing*							
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
Total Program Element	547.856	23.934	27.581	28.466	-	28.466	28.079	29.705	30.282	30.908	Continuing	Continuing
2319: *Non-Lethal Weapons*	547.856	23.934	27.581	28.466	-	28.466	28.079	29.705	30.282	30.908	Continuing	Continuing

A. Mission Description and Budget Item Justification

The DoD Non-Lethal Weapons Program was established by the FY96 National Defense Authorization Act. The Office of the Secretary of Defense designated the Commandant of the Marine Corps (CMC) as the DoD NLW Executive Agent (EA). The EA exercises centralized responsibility for joint research and development of non-lethal weapons and technology through the Joint Non-Lethal Weapons Program (JNLWP). The Office of the Under Secretary of Defense for Acquisition and Sustainment serves as the OSD Principal Staff Assistant and oversees, in consultation with the Under Secretary of Defense for Policy, the DoD NLW Executive Agent.

The efforts described in this Program Element (PE) reflect Joint Service research and development (R&D) investment decisions by the Joint Non-Lethal Weapons Integrated Product Team, a multi-service flag level corporate board that provides executive oversight and management of the JNLWP for the EA. Research conducted is based on the requirements and capabilities sought by the Services and the Coast Guard, as identified in JROC-approved Joint Non-Lethal Effects Initial Capabilities Documents. This coordinated joint Research and Development approach addresses mutual capability gaps and assures the most relevant non-lethal technologies, capabilities and equipment are provided to the operating forces while eliminating duplicative Service investment. Advanced Component Development and Prototypes non-lethal weapons initiatives provide non-lethal capabilities in direct support of the National Defense Strategy (NDS) objective of strategic competition by providing options to the joint force in pursuit of national objectives in legal or policy constrained scenarios, as well as complementing the use of lethal effects in complex combat scenarios, for example, in urban environments with large civilian populations. Ongoing NLW studies, analyses and exercise efforts with NATO and Allies also support NDS objectives to strengthen alliances and partnerships. Resulting capabilities facilitate a fully integrated non-lethal competency as a complement to lethal firepower, providing force application options for below lethal threshold engagements.

This PE funds Joint Service research, development, test, and evaluation of non-lethal weapons, devices, munitions and technologies which provide a non-lethal capability to minimize significant injuries as well as undesired damage to property and the environment. Counter-personnel and counter-materiel capability investment areas include directed energy (lasers, millimeter wave and high power microwave), multi-sensory suppression/incapacitation initiatives (acoustics, optical, electro-muscular incapacitation), and other emergent technologies transitioning from coordinated JNLWP Science and Technology PE initiatives. Investments also focus on Joint and allied experimentation, exercise, demonstration and assessment of advanced component and prototype initiatives in order to assist transition of suitable and effective capabilities to both joint and allied operational applications.

The Joint Non-Lethal Weapons Directorate is designated as a R&D organization and was established by the EA to manage the day to day research and development activities of the DoD's JNLWP. Each Service is responsible for their procurement and operating support costs.

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy					Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*			R-1 Program Element (Number/Name) PE 0603851M *I Joint Non-Lethal Weapons Testing*		
B. Program Change Summary ($ in Millions)	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**
Previous President's Budget	29.873	27.581	28.611	-	28.611
Current President's Budget	23.934	27.581	28.466	-	28.466
Total Adjustments	-5.939	0.000	-0.145	-	-0.145
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.271	0.000			
• Rate/Misc Adjustments	0.000	0.000	-0.145	-	-0.145
• Congressional Directed Reductions Adjustments	-5.668	-	-	-	-

Change Summary Explanation

The increase between FY19 and FY20 is due to a combination of inflation and a greater demand for experimentation, demonstration and assessment of NL capabilities.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy											Date: March 2019	
Appropriation/Budget Activity 1319 / 4					R-1 Program Element (Number/Name) PE 0603851M / *Joint Non-Lethal Weapons Testing*				Project (Number/Name) 2319 / *Non-Lethal Weapons*			
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
2319: *Non-Lethal Weapons*	547.856	23.934	27.581	28.466	-	28.466	28.079	29.705	30.282	30.908	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This project develops non-lethal weapon (NLW) capabilities that minimize fatal or permanent injuries and undesired damage to property and the environment. These capabilities are designed to incapacitate or hinder movement of individuals, crowds or equipment. The availability of NLW allows commanders less lethal options across the range of military operations, particularly in urban warfare and military operations other than war, i.e. peacekeeping, humanitarian assistance and disaster relief, as well as special operations.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Counter-Personnel Advanced Component Development and Prototypes	11.762	11.324	11.646	0.000	11.646
Articles:	-	-	-	-	-
FY 2019 Plans: - Continue maturation of CP directed energy technologies to increase system efficiencies and reduce system size, weight and cost in preparation for transition to joint acquisition programs of record. - Continue the advanced development of CP emerging technologies to support Service capability gaps and priorities as they support the Combatant Commanders. - Continue technology maturation and risk reduction of competing approaches to inform decisions for Service capability development. Specifically complete multi-sensory applications supporting Global Strike for USAF. - Continue prototype development and assessment of advanced payloads for technological capabilities relevant to emerging counter-personnel capability gaps. - Continue coordination and requirements development for Service counter-personnel (CP) prototyping initiatives within the JNLWP. This includes SOCOM and USCG. - Continue development and assessment of Service-led CP NL prototype initiatives. - Continue prototype development and demonstration for the most promising technologies employing multisensory stimuli. - Continue program management support for CP efforts. - Continue munitions testing and acquisition documentation of NL capability to deny, move and suppress individuals at long ranges from currently fielded weapons systems.					
FY 2020 Base Plans:					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603851M / *Joint Non-Lethal Weapons Testing*	**Project (Number/Name)** 2319 / *Non-Lethal Weapons*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
- Continue maturation of CP directed energy technologies to increase system efficiencies and reduce system size, weight and cost in preparation for transition to joint acquisition programs of record. - Continue the advanced development of CP emerging technologies to support Service capability gaps and priorities as they support the Combatant Commanders. - Continue technology maturation and risk reduction of competing approaches to inform decisions for Service capability development. - Continue prototype development and assessment of advanced payloads for technological capabilities relevant to emerging counter-personnel capability gaps. - Continue coordination and requirements development for Service counter-personnel (CP) prototyping initiatives within the JNLWP. This includes SOCOM and USCG. - Continue development and assessment of Service-led CP NL prototype initiatives. - Continue prototype development and demonstration for the most promising technologies employing multisensory stimuli. - Continue program management support for CP efforts. - Complete munitions testing and acquisition documentation of NL capability to deny, move and suppress individuals at long ranges from currently fielded weapons systems. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increase of $0.322M from FY19 to FY20 is a result of inflation rate assumptions.					
Title: Counter-Materiel Advanced Component Development and Prototypes	5.668	10.574	10.801	0.000	10.801
Articles:	-	-	-	-	-
FY 2019 Plans: - Initiate advanced component development and prototyping support to the U.S. Navy's candidate Maritime Vessel Stopping capability. - Continue development of the conceptual design of non-lethal Directed Energy (DE) vessel-stopping capability, including electro-magnetic and engagement modeling, platform feasibility and integration studies, and target characterization and validation. - Continue maturation of CM directed energy technologies to increase system efficiencies and reduce system size, weight and cost in preparation for transition to joint acquisition programs of record.					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603851M / *Joint Non-Lethal Weapons Testing*	**Project (Number/Name)** 2319 / *Non-Lethal Weapons*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
- Continue coordination and requirements development for Service counter-material (CM) prototyping initiatives within the JNLWP. This includes SOCOM and USCG. - Continue development and assessment of Service-led CM NL prototype initiatives. - Continue the advanced development of Counter-Materiel emerging technologies to support Service capability gaps and priorities as they support the Combatant Commanders. Specifically complete advanced development of Maritime System Attack and WASP SEWMOD technologies for USSOCOM. - Continue technology maturation and risk reduction of competing approaches to inform decisions for Service capability development. - Continue prototype development and assessment of advanced payloads for technological capabilities relevant to emerging counter-materiel capability gaps. - Continue program management support for CM efforts. - Continue Critical Design Review for counter material: Radio Frequency vehicle stopper prototype capability. - Continue production qualification testing of a Service-endorsed pre-emplaced, counter-materiel, counter vehicle stopping capability.					
FY 2020 Base Plans: - Continue advanced component development and prototyping support to the U.S. Navy's candidate Maritime Vessel Stopping capability. - Continue development of the conceptual design of non-lethal Directed Energy (DE) vessel-stopping capability, including electro-magnetic and engagement modeling, platform feasibility and integration studies, and target characterization and validation. - Continue maturation of CM directed energy technologies to increase system efficiencies and reduce system size, weight and cost in preparation for transition to joint acquisition programs of record. - Continue coordination and requirements development for Service counter-material (CM) prototyping initiatives within the JNLWP. This includes SOCOM and USCG. - Continue development and assessment of Service-led CM NL prototype initiatives. - Continue the advanced development of Counter-Materiel emerging technologies to support Service capability gaps and priorities as they support the Combatant Commanders. Specifically, complete advanced development of 40mm non-lethal counter material round for USSOCOM. - Continue technology maturation and risk reduction of competing approaches to inform decisions for Service capability development. - Continue prototype development and assessment of advanced payloads for technological capabilities relevant to emerging counter-materiel capability gaps.					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603851M / *Joint Non-Lethal Weapons Testing*	**Project (Number/Name)** 2319 / *Non-Lethal Weapons*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
- Continue program management support for CM efforts. - Complete Critical Design Review for counter material: Radio Frequency vehicle stopper prototype capability. - Complete production qualification testing of a Service-endorsed pre-emplaced, counter-materiel, counter vehicle stopping capability. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increase of $0.227M from FY19 to FY20 is a result of inflation rate assumptions.					
Title: Joint and Allied Exercise, Experimentation, Demonstration and Assessment	6.504	5.683	6.019	0.000	6.019
Articles:	-	-	-	-	-
FY 2019 Plans: - Continue support of two CCMDs by demonstrating and assessing NLW capabilities for vessel interdiction and counter-migration exercises. Specifically, complete support to USAFRICOM in exercise African Lion 2019 and continue support to USEUCOM/USAFRICOM through engagement with NATO's Maritime Interdiction Operations Training Center (MIOTC). - Continue modeling and simulation (M&S) of NLWs in warfighter training/gaming models and performance effects data collection/population to demonstrate/analyze NL effects and support optimization of training. - Continue evaluation of NLWs by Service warfighting laboratories and Joint Staff, J7, Joint and Coalition Warfighting for direct user feedback of various non-lethal (NL) technologies and munitions to include policy and strategy and strategic communication. - Continue engagement with NATO on cooperative security efforts, to include providing input for Systems Analysis and Studies (SAS) Panels and NATO assessment of NLW in appropriate allied scenarios and exercises. - Continue interaction with Combatant Commander staffs to evaluate emerging NLW capabilities and their utility in theater operations and Defense of the Homeland missions. - Continue effort to assess the utility, effect, and effectiveness of technologies for incapacitating personnel, clearing facilities, stopping vehicles and vessels, and denying enemy access to protected areas. Specifically, continue vehicle stopping pilot programs for USAF and USMC. - Continue to identify, test, and evaluate newly developed commercial products that may meet Joint service requirements for specific non-lethal capability set common items.					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603851M / *Joint Non-Lethal Weapons Testing*	**Project (Number/Name)** 2319 / *Non-Lethal Weapons*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
- Continue program management support for Joint and Allied Exercise, Experimentation, Demonstration and Assessment efforts. - Continue support of Combatant Commanders (CCMD) by demonstrating and assessing NLW capabilities for multiple priority mission areas, such as port opening operations; Humanitarian Assistance and Disaster Relief (HA/DR) and Counter-Transnational Organized Crime (CTOC) operations; and harbor and in-transit security operations. - Continue leadership of the NATO Special Area Study 133 (SAS-133) panel addressing challenges in fielding NL capabilities. - Complete the 2018 NATO Non-Lethal Technology Exercise-Counter Unmanned Aerial Systems (NNTEX-18C).					
FY 2020 Base Plans: - Continue support of two CCMDs by demonstrating and assessing NLW capabilities for vessel interdiction and counter-migration exercises. - Continue modeling and simulation (M&S) of NLWs in warfighter training/gaming models and performance effects data collection/population to demonstrate/analyze NL effects and support optimization of training. - Continue evaluation of NLWs by Service warfighting laboratories and Joint Staff, J7, Joint and Coalition Warfighting for direct user feedback of various non-lethal (NL) technologies and munitions to include policy and strategy and strategic communication. - Continue engagement with NATO on cooperative security efforts, to include providing input for Systems Analysis and Studies (SAS) Panels and NATO assessment of NLW in appropriate allied scenarios and exercises. - Continue interaction with Combatant Commander staffs to evaluate emerging NLW capabilities and their utility in theater operations and Defense of the Homeland missions. - Continue effort to assess the utility, effect, and effectiveness of technologies for incapacitating personnel, clearing facilities, stopping vehicles and vessels, and denying enemy access to protected areas. Specifically, complete vehicle stopping pilot programs for USAF and USMC. - Continue to identify, test, and evaluate newly developed commercial products that may meet Joint service requirements for specific non-lethal capability set common items. - Continue program management support for Joint and Allied Exercise, Experimentation, Demonstration and Assessment efforts. - Continue support of Combatant Commanders (CCMD) by demonstrating and assessing NLW capabilities for multiple priority mission areas, such as port opening operations; Humanitarian Assistance and Disaster Relief					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603851M / *Joint Non-Lethal Weapons Testing*	**Project (Number/Name)** 2319 / *Non-Lethal Weapons*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
(HA/DR) and Counter-Transnational Organized Crime (CTOC) operations; and harbor and in-transit security operations. - Complete leadership of the NATO Special Area Study 133 (SAS-133) panel addressing challenges in fielding NL capabilities. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increase of $0.336M from FY19 to FY20 is a result of the greater demand for experimentation, demonstration and assessment of NL capabilities.					
Accomplishments/Planned Programs Subtotals	23.934	27.581	28.466	0.000	28.466

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• RDTEN/0602651M/0000: *Joint Non-Lethal Weapons Applied Research*	6.229	6.349	6.346	-	6.346	6.343	6.468	6.600	6.732	Continuing	Continuing
• RDTEN/0603651M/3022: *Joint Non-Lethal Weapons Advanced Technology Development*	13.090	13.313	13.307	-	13.307	13.301	13.564	13.840	14.116	Continuing	Continuing

Remarks

D. Acquisition Strategy

The JNLW Program strategy is to pursue the fielding of NLW systems through modifying Commercial-Off-The-Shelf (COTS) products for near term capabilities and the development of new technology NLW systems in various stages of acquisition. These are balanced with efforts in state-of-the-art technology investment, experimentation, and modeling and simulation. The acquisition strategy for each weapon system is largely Lead Service dependent. The JNLWP provides RDT&E funding while the Services are responsible for procurement and operations and maintenance funding. For complex development programs, such as directed energy research, JNLWP RDT&E funds will support each Service's RDT&E joint application efforts.

E. Performance Metrics

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603851M / *Joint Non-Lethal Weapons Testing*	**Project (Number/Name)** 2319 / *Non-Lethal Weapons*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
NLW Product Development	MIPR	ARDEC : Picatinny, NJ	55.742	1.129	Oct 2017	3.192	Oct 2018	2.757	Oct 2019	-		2.757	Continuing	Continuing	Continuing
NLW Product Development	MIPR	SOCOM : McDill AFB, FL	26.340	0.000		0.289	Oct 2018	0.000		-		0.000	Continuing	Continuing	Continuing
NLW Product Development	Various	NSWC : Various	46.952	3.841	Oct 2017	6.175	Oct 2018	6.297	Oct 2019	-		6.297	Continuing	Continuing	Continuing
NLW Product Development	MIPR	USAF : Ft. Sam Houston AFB, TX	58.886	0.690	Oct 2017	0.525	Oct 2018	0.515	Oct 2019	-		0.515	Continuing	Continuing	Continuing
NLW Product Development	Various	MCSC : Quantico, VA	33.719	1.475	Oct 2017	0.475	Oct 2018	0.395	Oct 2019	-		0.395	Continuing	Continuing	Continuing
NLW Product Development	Various	Uniformed Services : Various	177.416	7.774	Oct 2017	7.718	Oct 2018	9.629	Oct 2019	-		9.629	Continuing	Continuing	Continuing
Prior Year NLW Product Development	Various	Various : Various	65.401	0.000		0.000		0.000		-		0.000	0.000	65.401	-
		Subtotal	464.456	14.909		18.374		19.593		-		19.593	Continuing	Continuing	N/A

Remarks

Joint Program funds are prioritized and provided to the USA, USAF, USN, USMC, SOCOM, and USCG in support of NLW research and development efforts. Each Cost Category Item does not correlate to an individual project/effort. They fund multiple non-lethal projects/efforts that are incrementally funded throughout the fiscal year as each service identifies the project/effort requiring funding. October award dates reflect the start of incremental funding and does not indicate that the full amount will be awarded in October.

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
NLW Support Cost	WR	NSWC : Dahlgren, VA	17.374	0.618	Oct 2017	0.632	Oct 2018	0.737	Oct 2019	-		0.737	Continuing	Continuing	Continuing
		Subtotal	17.374	0.618		0.632		0.737		-		0.737	Continuing	Continuing	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603851M / *Joint Non-Lethal Weapons Testing*	**Project (Number/Name)** 2319 / *Non-Lethal Weapons*

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
JNLW Management Support	Various	MCSC : Quantico, VA	25.305	8.407	Oct 2017	8.575	Oct 2018	8.136	Oct 2019	-		8.136	Continuing	Continuing	Continuing
Prior Year Management Services	Various	Various : Various	40.721	0.000		0.000		0.000		-		0.000	0.000	40.721	-
		Subtotal	66.026	8.407		8.575		8.136		-		8.136	Continuing	Continuing	N/A

Remarks

The JNLW Management Support was previously incorporated into the various cost categories instead of being displayed in the corresponding section of the R-3. The Management Services section of the R-3 now reflects the amounts for civilian salaries and contractor program management. The funding fluctuates across the R-2A categories based on the demand signals of the Services, USSOCOM, and the USCG.

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	547.856	23.934		27.581		28.466		-		28.466	Continuing	Continuing	N/A

Remarks

Joint Program funds are prioritized and provided to the USA, USAF, USN, USMC, SOCOM, and USCG in support of NLW research and development efforts. Each Cost Category Item does not correlate to an individual project/effort. They fund multiple non-lethal projects/efforts that are incrementally funded throughout the fiscal year as each service identifies the project/effort requiring funding. October award dates reflect the start of incremental funding and does not indicate that the full amount will be awarded in October.

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603851M / *Joint Non-Lethal Weapons Testing*	**Project (Number/Name)** 2319 / *Non-Lethal Weapons*

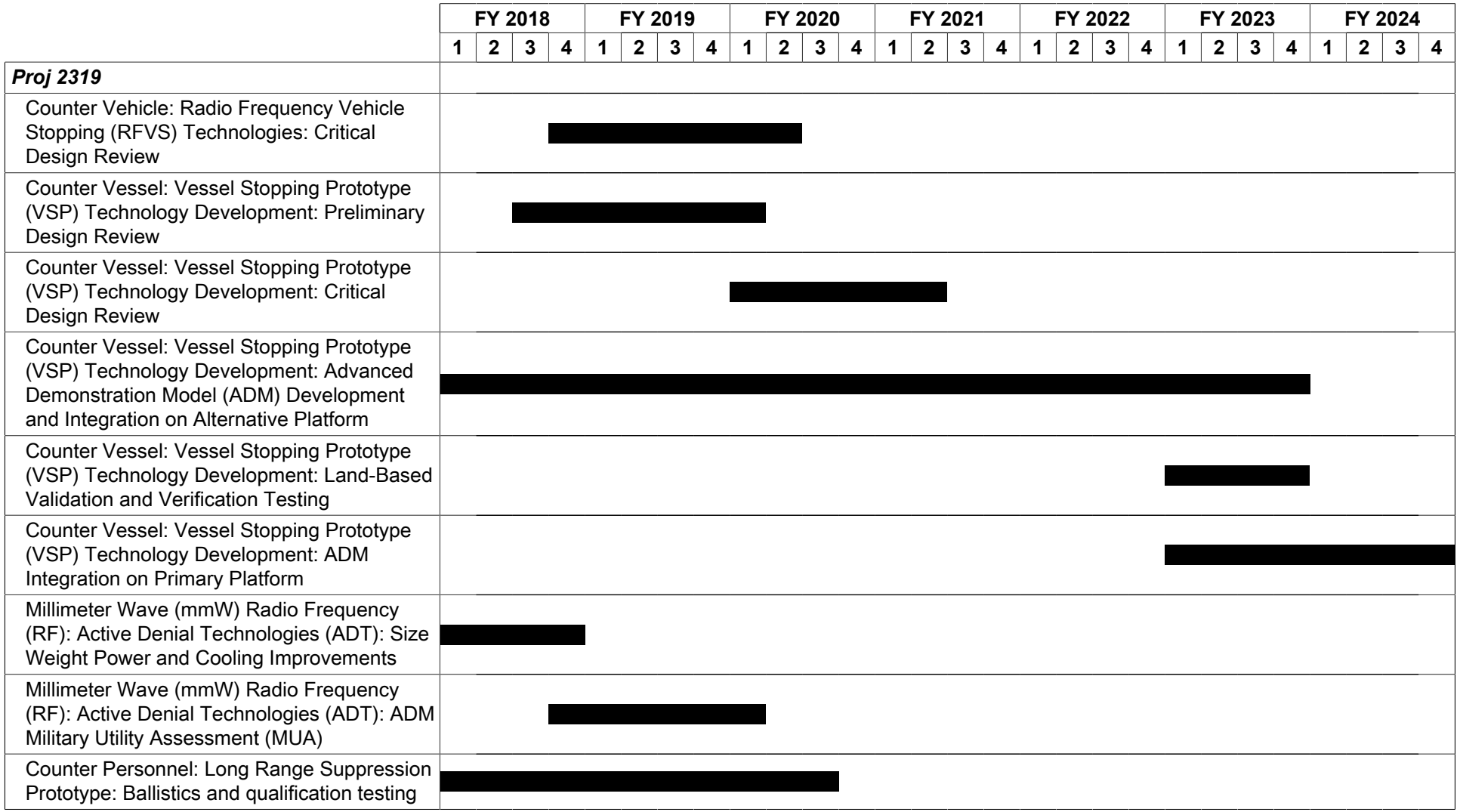


Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603851M / *Joint Non-Lethal Weapons Testing*	**Project (Number/Name)** 2319 / *Non-Lethal Weapons*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 2319				
Counter Vehicle: Radio Frequency Vehicle Stopping (RFVS) Technologies: Critical Design Review	4	2018	2	2020
Counter Vessel: Vessel Stopping Prototype (VSP) Technology Development: Preliminary Design Review	3	2018	1	2020
Counter Vessel: Vessel Stopping Prototype (VSP) Technology Development: Critical Design Review	1	2020	2	2021
Counter Vessel: Vessel Stopping Prototype (VSP) Technology Development: Advanced Demonstration Model (ADM) Development and Integration on Alternative Platform	1	2018	4	2023
Counter Vessel: Vessel Stopping Prototype (VSP) Technology Development: Land-Based Validation and Verification Testing	1	2023	4	2023
Counter Vessel: Vessel Stopping Prototype (VSP) Technology Development: ADM Integration on Primary Platform	1	2023	4	2024
Millimeter Wave (mmW) Radio Frequency (RF): Active Denial Technologies (ADT): Size Weight Power and Cooling Improvements	1	2018	4	2018
Millimeter Wave (mmW) Radio Frequency (RF): Active Denial Technologies (ADT): ADM Military Utility Assessment (MUA)	4	2018	1	2020
Counter Personnel: Long Range Suppression Prototype: Ballistics and qualification testing	1	2018	3	2020

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy											Date: March 2019	
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0603860N *I JT Precision Approach & Ldg Sys*							
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
Total Program Element	1,128.971	103.984	101.566	51.341	-	51.341	32.871	28.910	17.435	11.545	Continuing	Continuing
2329: *JPALS*	1,128.971	103.984	101.566	51.341	-	51.341	32.871	28.910	17.435	11.545	Continuing	Continuing
Program MDAP/MAIS Code: **Project MDAP/MAIS Code(s):** 238												

A. Mission Description and Budget Item Justification

A. Mission Description and Budget Item Justification

The Joint Precision Approach and Landing System (JPALS) is the primary precision approach and landing system for CVN and LHA/D ships to support aircraft without SPN-46 ACLS capability including F-35B, F-35C, MQ-25A and future platforms. JPALS ship systems are required to provide CVN and LHA/D ships a primary precision approach capability during night and instrument flight conditions, including coupled approach capability to a hover transition point for LHA/D ships, and coupled approach to the deck (auto-land) capability aboard CVN ships. JPALS also provides the over-the-air inertial alignment capability for CVN and LHA/D ships to support aircraft platforms without Link-4A capability, including
F-35, MQ-25A and future platforms. JPALS Early Operational Capability is required to support initial F-35 operational deployments in FY18. JPALS efforts include addressing broadened CyberSecurity requirements to remain compliant with software CyberSecurity directives and Information Assurance mandates.

JUSTIFICATION FOR BUDGET ACTIVITY: This program is funded under ADVANCED COMPONENT DEVELOPMENT AND PROTOTYPES because it includes all efforts necessary to evaluate integrated technologies, representative models or prototype systems in high fidelity and realistic operating environments.

B. Program Change Summary ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	106.391	101.566	52.553	-	52.553
Current President's Budget	103.984	101.566	51.341	-	51.341
Total Adjustments	-2.407	0.000	-1.212	-	-1.212
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-2.407	0.000			
• Program Adjustments	0.000	0.000	-1.232	-	-1.232
• Rate/Misc Adjustments	0.000	0.000	0.020	-	0.020

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0603860N *I JT Precision Approach & Ldg Sys*

Change Summary Explanation

Technical: N/A

Schedule: N/A

Financial: FY 2020 decrease of $1.212M is due the realignment of funds in preparation for MS C in 2nd quarter FY 2019.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603860N / *JT Precision Approach & Ldg Sys*	Project (Number/Name) 2329 / *JPALS*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
2329: *JPALS*	1,128.971	103.984	101.566	51.341	-	51.341	32.871	28.910	17.435	11.545	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Project MDAP/MAIS Code: 238

A. Mission Description and Budget Item Justification

The restructured Joint Precision Approach and Landing System (JPALS) program (post Nunn-McCurdy certification) completed a successful MS B and entry into the Engineering and Manufacturing Development (EMD) phase in June 2016. This budget reflects the Department of Defense certified Component Cost Position of the restructured JPALS program that funds the developmental, testing, and integration activities to implement and field JPALS ship systems that deliver the primary precision approach, landing, on-deck inertial alignment, surveillance, and auto-land capability for current and future low observable manned and unmanned platforms onboard all CVN and LHA/D ships. JPALS Early Operational Capability (EOC) is required to support initial F-35 operational deployments. JPALS provides for development, integration, installation, and test of JPALS on CVN and LHA/D ships in accordance with the Joint Requirements Oversight Council (JROC) March 2016 approved JPALS Capability Development Document (CDD). JPALS Engineering Development Model (EDM) articles have been delivered to support JPALS EMD activities. JPALS EDMs will be installed at shore based test facilities and (temporarily) on CVN and LHA/D ships to support F-35B/C developmental and operational testing and MQ-25A concept refinement, system requirements identification, allocation, surrogate risk reduction, and test. Two JPALS EDMs were procured to support testing and F-35 shipboard operational deployments. JPALS will continue to invest in software development in direct support of precision approach and auto-land capabilities for the F-35B/C, MQ-25A, and future air platforms. JPALS effort includes addressing broadened CyberSecurity requirements to remain compliant with software CyberSecurity directives and Information Assurance mandates.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: JPALS Ship Systems and Test	98.548	95.980	45.540	0.000	45.540
Articles:	-	-	-	-	-
Description: JPALS provides for development, integration, installation, and test of Sea-Based JPALS on CVN and LHA/D ships.					
FY 2019 Plans: Attain MS C in 2nd quarter. Perform System Verification Review (SVR) and Integrated Logistics Assessment (ILA) in 1st quarter and Production Readiness Review (PRR) in 2nd quarter. Award LRIP contract in 3rd quarter. Support F-35 operational deployments.					
FY 2020 Base Plans:					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603860N / *JT Precision Approach & Ldg Sys*	**Project (Number/Name)** 2329 / *JPALS*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Begin Operational Test (OT). Continue to support F-35 operational deployments. Conduct Interactive Electronic Technical Manuals (IETM) Validation and Verification, complete Maintenance Demonstration. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Decrease of $50.440M from FY 2019 to FY 2020 is due to EMD phase ramping down.					
Title: Joint Strike Fighter (JSF) F-35B Marine Corp STOVL and F-35C Navy Carrier Variant Support	3.999	4.020	4.101	0.000	4.101
Articles:	-	-	-	-	-
Description: Provide technical development, shore based, and ship based support for F-35B and F-35C JPALS Integration and Developmental Test (DT) and Operational Test (OT) events. Provide JPALS system certification and documentation to certify shipboard all weather precision approach capability for F-35 operational test and deployments. ***FY 2019 Plans:*** Continue support of F-35 operational deployments of JPALS UDB capable F-35 aircraft including delivery, installation, and ship rider support of the JPALS Early Operational Capability (EOC) units onto ships. Begin planning of JPALS two-way, autoland, and M-code implementation into F-35 aircraft. ***FY 2020 Base Plans:*** Continue support of operational deployments of JPALS UDB capable F-35 aircraft including delivery, installation, and ship rider technical support of the JPALS Early Operational Capability (EOC) units onto ships. Continue planning of JPALS two-way, autoland, and M-code implementation into F-35 aircraft. Begin development of JPALS two-way and autoland implementation into F-35 aircraft. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increase of $.081M from FY 2019 to FY 2020 is due to engineering efforts for development of JPALS two-way and autoland implementation into F-35 aircraft.					
Title: MQ-25 Support	1.437	1.566	1.700	0.000	1.700
Articles:	-	-	-	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603860N / *JT Precision Approach & Ldg Sys*	**Project (Number/Name)** 2329 / *JPALS*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Description: Provide technical support, lab support, requirements identification, allocation and test activities for MQ-25. Support MQ-25 concept refinement, requirements development, integration specifications, and risk reduction activities for JPALS integration. Support MQ-25 concept refinement and JPALS integration and developmental activities. ***FY 2019 Plans:*** Provide support to MQ-25 to include JPALS algorithm integration support to Aircraft OEM, validation and verification activities supporting the aircraft software development, support M-code implementation of JPALS, support development of the Patuxent River MQ-25 Systems Integration Lab, and preparation for future testing. ***FY 2020 Base Plans:*** Continue JPALS algorithm integration support and testing. Prepare JPALS system integration lab at Patuxent River for MQ-25 shore testing. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increase in $.134M from FY 2019 to FY 2020 is due to engineering efforts required for JPALS system integration lab support.					
Accomplishments/Planned Programs Subtotals	103.984	101.566	51.341	0.000	51.341

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• OPN/2867: *JPALS*	0.000	38.094	92.695	-	92.695	100.243	46.728	12.193	5.575	5.808	301.336

Remarks

D. Acquisition Strategy

Technology Development phase was conducted jointly by NAVAIRSYSCOM (PMA-213), USAF Electronic Systems Command (Global Air) and multiple industry partners. This effort provided the concept of operations, performance specifications and technology readiness levels necessary to provide the foundation from which to launch the Increment 1 System Development and Demonstration (SDD) phase development. Joint Precision Approach and Landing System (JPALS) reached MS-B on 14 July 2008 and the SDD phase development contract was awarded on 17 July 2008. Tasking consisted of sea-based JPALS, related ship and airborne reference systems, end-to-end software algorithms, necessary ship installation hardware, test equipment, system simulation software, and other RDT&E deliverable products. The

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603860N / *JT Precision Approach & Ldg Sys*	**Project (Number/Name)** 2329 / *JPALS*

SDD contract was decided after full and open competition. JPALS is being developed by the Navy with an open system architecture in order to facilitate the compatible integration of many different aircraft and avionics architectures. JPALS provides for development, integration, installation, and test of Sea-Based JPALS to meet Initial Operation Capability of CVN and LHA/D ships in accordance with the JPALS Capability Development Document (CDD). Additionally, this requirement provides critical enabling technology for Joint Strike Fighter (JSF) F-35B Marine Corps Short Take-Off and Vertical Landing (STOVL) and F-35C Navy Carrier Variant, ship-based MQ-25A, and future Navy and Marine Corps air platforms.

As a result of the DON Resource and Requirements Review Board approved PALC Roadmap, the JPALS production phase was deferred to include design improvements to provide manned and unmanned aircraft with autoland capabilities. The current Engineering and Manufacturing Development (EMD) contract was modified in FY14 to add detailed requirements and design trade studies to identify specific system design improvements. An extension for pre-Milestone B efforts was awarded in fourth quarter FY15.

A Development RFP Release Decision Point (DRRDP) Defense Acquisition Board (DAB) was completed and the RFP for JPALS EMD 16 was released on 24 November 2015. A Milestone B (MS B) DAB was completed 02 June 2016. The MS B Acquisition Decision Memorandum (ADM) was approved 27 June 2016, which granted entry into the EMD phase for the restructured JPALS program and officially completed all actions required to exit Nunn-McCurdy. JPALS now has an approved Acquisition Program Baseline (APB) and has been designated an Acquisition Category (ACAT) 1C program. Sole Source contract was awarded to Raytheon in fourth quarter FY16.

E. Performance Metrics

Milestone C scheduled for second quarter FY19.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603860N / *JT Precision Approach & Ldg Sys*	Project (Number/Name) 2329 / *JPALS*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Ship Integration	WR	NAWCAD : Pax River, MD	55.390	12.482	Nov 2017	12.296	Nov 2018	7.725	Nov 2019	-		7.725	Continuing	Continuing	Continuing
Primary Hardware Development - EMD Phase I	C/CPIF	Raytheon : Fullerton, CA	410.181	0.000		0.000		0.000		-		0.000	0.000	410.181	410.181
Primary Hardware Development - New EMD Contract	C/CPIF	Raytheon : Fullerton, CA	68.190	60.693	Nov 2017	60.860	Nov 2018	30.073	Nov 2019	-		30.073	40.100	259.916	259.916
JPALS Modifications for ARC-210	C/CPFF	RCI : Cedar Rapids, IA	5.104	0.000		1.849	Nov 2018	2.650	Nov 2019	-		2.650	0.700	10.303	10.303
Risk Reduction for Auto-land - FFRDC Support	FFRDC	JHU : Laurel, MD	0.493	0.000		0.000		0.000		-		0.000	0.000	0.493	-
Prior Year Prod Dev no longer funded in the FYDP	TBD	Various : Various	249.870	0.000		0.000		0.000		-		0.000	0.000	249.870	-
		Subtotal	789.228	73.175		75.005		40.448		-		40.448	Continuing	Continuing	N/A

Remarks

The Primary Hardware Development contract with Raytheon is a CPIF contract. The increase to JPALS Modifications from FY 2019 to FY 2020 is due to ramping up efforts for ARC-210 modifications required to support JPALS.

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Systems Engineering Support	WR	NAWCAD : Pax River, MD	175.381	16.822	Nov 2017	16.375	Nov 2018	1.963	Nov 2019	-		1.963	Continuing	Continuing	Continuing
Integrated Logistics Support	WR	NAWCAD : Pax River, MD	27.883	2.659	Nov 2017	2.682	Nov 2018	0.725	Nov 2019	-		0.725	Continuing	Continuing	Continuing
Prior Year Support Costs non longer funded in FYDP	Various	Various : Various	21.514	0.000		0.000		0.000		-		0.000	0.000	21.514	-
		Subtotal	224.778	19.481		19.057		2.688		-		2.688	Continuing	Continuing	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603860N / *JT Precision Approach & Ldg Sys*	Project (Number/Name) 2329 / *JPALS*	

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract

Remarks

Decrease in Systems Engineering support between FY 2019 and FY 2020 is due to EMD phase ramping down.

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Developmental Test & Evaluation	WR	NAWCAD : Pax River, MD	69.646	6.637	Nov 2017	2.772	Nov 2018	0.000		-		0.000	Continuing	Continuing	Continuing
Operational Test & Evaluation	WR	COMOPTEVFOR : Norfolk, VA	4.308	0.637	Nov 2017	0.638	Nov 2018	0.726	Nov 2019	-		0.726	Continuing	Continuing	Continuing
Operational Test & Evaluation	WR	NAWCAD : Pax River, MD	0.000	0.000		0.000		6.387	Nov 2019	-		6.387	0.000	6.387	-
		Subtotal	73.954	7.274		3.410		7.113		-		7.113	Continuing	Continuing	N/A

Remarks

The increase in Operational Test & Evaluation between FY 2019 and FY 2020 is in support of FY 2020 scheduled test events to include TRR, OTRR-2, Techeval-IOT&E Phase 2, and M-DEMO OT.

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management Support	WR	NAWCAD : Pax River, MD	22.717	3.035	Nov 2017	3.050	Nov 2018	0.917	Nov 2019	-		0.917	Continuing	Continuing	Continuing
PM Support-MSS	C/CPFF	Amelex : Pax River, MD	14.036	0.808	Nov 2017	0.829	Nov 2018	0.133	Nov 2019	-		0.133	1.069	16.875	16.875
PM Support-MSS	C/CPFF	Avian : Pax River, MD	1.592	0.000		0.000		0.000		-		0.000	0.000	1.592	1.592
PM Support-MSS	C/CPFF	SAIC : Pax River, MD	2.346	0.141	Nov 2017	0.142	Nov 2018	0.000		-		0.000	0.000	2.629	2.629

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603860N / *JT Precision Approach & Ldg Sys*	Project (Number/Name) 2329 / *JPALS*	

Management Services ($ in Millions)

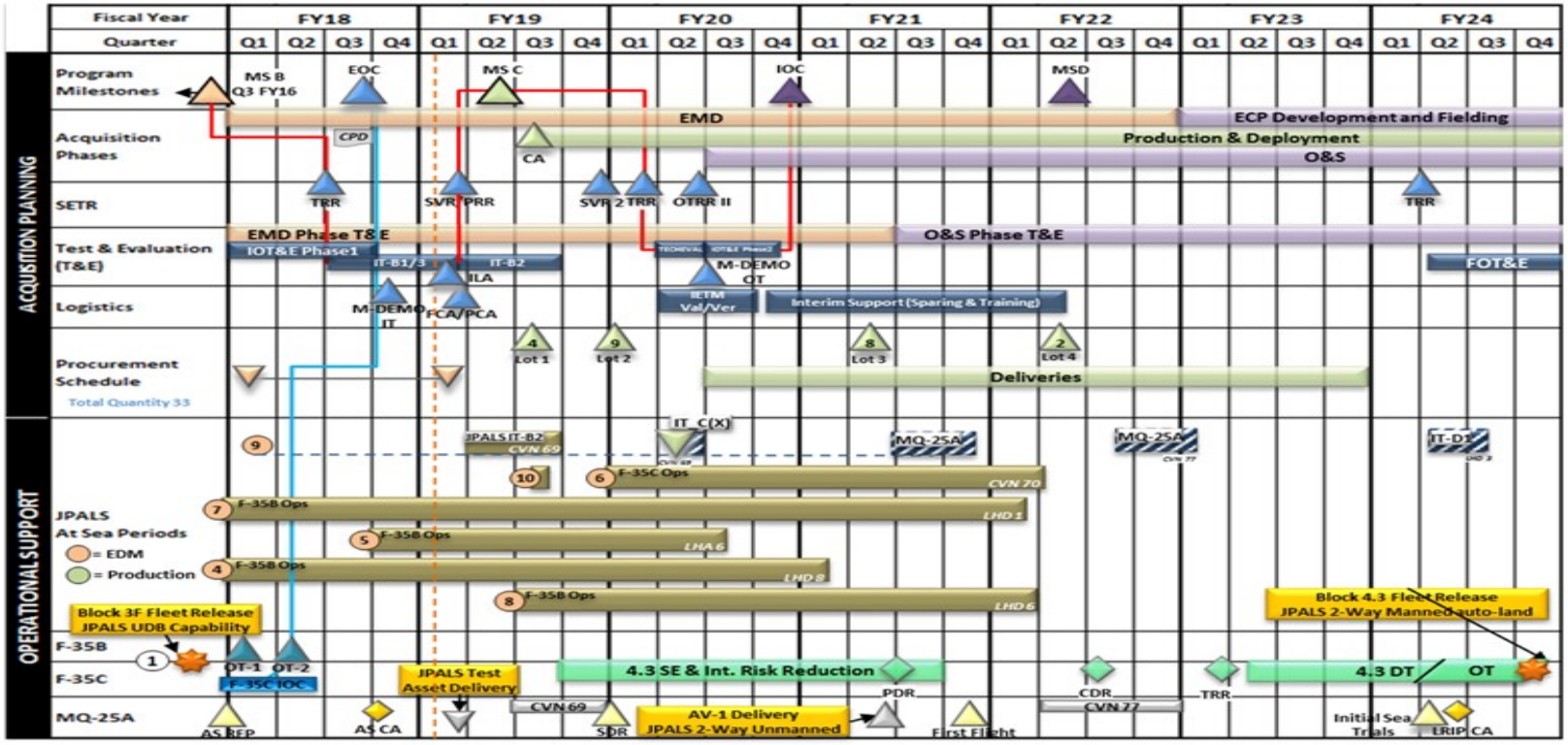
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Travel	WR	NAVAIR : Pax River, MD	0.320	0.070	Nov 2017	0.073	Nov 2018	0.042	Nov 2019	-		0.042	Continuing	Continuing	Continuing
		Subtotal	41.011	4.054		4.094		1.092		-		1.092	Continuing	Continuing	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	1,128.971	103.984		101.566		51.341		-		51.341	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603860N / *JT Precision Approach & Ldg Sys*	**Project (Number/Name)** 2329 / *JPALS*

JPALS Program
MS C Schedule



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Notes:
1. F-35B/C Block 3F Software includes JPALS one-way capability (UHF Data Broadcast (UDB))

Legend:
- Critical Path to JPALS IOC
- Critical Path to F-35 JPALS EOC
- =Objective, =Threshold
- EDM Procurement
- Lot Buys
- Projected Test/Cert Production Unit

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603860N / *JT Precision Approach & Ldg Sys*	**Project (Number/Name)** 2329 / *JPALS*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
JPALS				
Acquisition Milestones: MS C	2	2019	2	2019
Acquisition Milestones: Early Operating Capability (EOC)	3	2018	3	2018
Systems Development: Engineering and Manufacturing Development	1	2018	4	2022
Systems Development: Reviews: System Verification Review (SVR)	1	2019	1	2019
Systems Development: Reviews: System Verification Review (SVR) 2	4	2019	4	2019
Systems Development: Reviews: Integrated Logistics Assessment (ILA)	1	2019	1	2019
Systems Development: Contract Awards: LRIP Contract Award	3	2019	3	2019
Test & Evaluation: Operational Test and Evaluation (IOT&E) Phase 1	1	2018	3	2018
Test & Evaluation: JPALS Operational Test Readiness Review (OTRR)	2	2018	2	2018
Production Milestones: Production Readiness Review (PRR)	2	2019	2	2019

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy												Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0603925N *I Directed Energy and Electric Weapon System*							
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
Total Program Element	14.379	92.856	142.814	118.169	-	118.169	80.903	70.639	38.359	34.472	Continuing	Continuing
2731: *High Energy Laser Counter ASCM Project (HELCAP)*	0.000	0.000	0.000	9.000	-	9.000	19.000	17.000	3.000	0.000	0.000	48.000
3402: *Surface Navy Laser Weapon System (SNLWS)*	0.000	47.441	83.807	89.234	-	89.234	56.282	47.250	29.451	30.032	Continuing	Continuing
9823: *Lasers for Navy applicat*	14.379	39.625	33.107	19.935	-	19.935	5.621	6.389	5.908	4.440	Continuing	Continuing
9999: *Congressional Adds*	0.000	5.790	25.900	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	31.690

A. Mission Description and Budget Item Justification

This program element will transition Directed Energy and Electric Weapon Systems (DE&EWS) technology from Science and Technology (S&T) research to the Technology Maturation and Risk Reduction phase, ultimately leading to acquisition initiation for the Surface/Subsurface Navy.

DE&EWS consist of multiple breakthrough technologies including: laser weapons that provide for speed-of-light engagements at tactically significant ranges resulting in savings realized by minimizing the use of defensive missiles and projectiles; electromagnetic launch of projectiles that will significantly increase firing ranges imposing greater cost to adversaries of ballistic and air defense missile engagements; enhance the land attack mission; and fielding of high power radio frequency systems for non-kinetic electronic attack and active denial technology, allowing for non-lethal determination of threat intent beyond small arms fire ranges.

Development of DE&EWS includes: Weapons Grade High Energy Lasers, Electromagnetic Railgun (EMRG) Weapon Systems, High Power Radio Frequency Weapon/ Sensor Systems, and other systems/capabilities.

Project 2731 - High Energy Laser Counter ASCM Project (HELCAP): Defeating Anti-Ship Cruise Missiles (ASCMs) with a laser weapon system presents several technical challenges (e.g. high atmospheric turbulence, target acquisition and identification, target tracking, aim point maintenance, automatic aim point placement, jitter control). The High Energy Laser Counter ASCM Project (HELCAP) will assess, develop, experiment, and demonstrate the various laser weapon system technologies and methods of implementation (e.g. laser sources, mission analysis, lethality, advanced beam control with atmospheric mitigation, target and tracking sensors, control systems) required to defeat ASCMs in a crossing engagement.

FY 2020 funding will provide for automated laser weapon control activities and initiate planning and establish test assets and test site preparations to enable FY 2022-2023 counter ASCM detect to defeat demonstrations.

Project 3402 - The Surface Navy Laser Weapon System (SNLWS) was initiated under the authority granted by the Middle-Tier Acquisition legislation (Section 804 of the FY16 NDAA) in accordance with CNO's direction. The SNLWS program supports the National Defense Strategy of building a more lethal force by leveraging

mature technology to deliver proven laser weapon capability to the Fleet. HELIOS provides a capability to address Anti-Surface Warfare and Counter-Intelligence, Surveillance and Reconnaissance (C-ISR) gaps with the ability to dazzle and destroy Unmanned Aerial Systems (UAS) and defeat Fast Inshore Attack Craft (FIAC). SNLWS provides for industry-developed and government integrated capability to the Fleet in as short a timeframe as possible, thereby addressing the National Defense Strategy direction to foster a culture of affordability. SNLWS includes the development of an advanced prototype laser weapon system in the 60 kW or higher class. Competition is utilized for system development and prototype production efforts. SNLWS leverages mature technology to deliver a proven laser weapon capability to the Fleet integrated with the Combat System. SNLWS development leverages the Office of Naval Research (ONR) efforts on the Solid State Laser (SSL) Quick Reaction Capability (QRC) and Solid State Laser (SSL) Technology Maturation (TM) efforts.

The FY 2020 funding supports completion of the system build, review and delivery of the Technical Data Package, preparation for conduct of Factory Qualification Testing (FQT), and Packaging, Handling, Storage and Transportation (PHS&T) of one system.

Project 9823 - Lasers for Navy Applications: Low Power Module (LPM) development will provide near-term, directed energy, shipboard Counter-Intelligence, Surveillance, and Reconnaissance (C-ISR) capabilities to dazzle Unmanned Aerial Systems (UASs) and other platforms that will address urgent operational needs of the Fleet. FY 2018 was the first year of funding and supported the design, development and procurement of eight standalone units over the FYDP, for deployment on DDG 51 surface combatants. The program supports the non-recurring engineering, development, procurement of long lead material, assembly and checkout, system certification, and platform integration/installation for these eight standalone units.

The FY 2020 funding supports assembly and checkout of the final increment of ODIN systems to be installed shipboard in FY 2021, as well as sustainment of installed Units 1 and 2 is initiated in FY 2020.

Project 9999 (PU C407) - Congressional Add - High Energy Storage Modules: Advanced energy storage systems are the foundation of the electric weapons kill chain, and their applications and demands are increasing in defense and naval applications. These applications require innovative battery technologies that provide high power and energy density, and provide increased rates of discharge, while ensuring safety and optimal thermal management. High Energy Storage Modules research will involve development, assembly and initial Naval certification testing of a 1000 volt high-rate, high-power-density Lithium-ion battery pack in order to increase Naval operational capabilities. The 1000-volt battery pack will combine newly developed and patented battery cooling technologies with an established Lithium-ion battery chemistry, produced by a domestic manufacturer. High Energy Storage Modules with higher discharge rates will decrease the amount of batteries needed to meet peak shipboard power loads. This effort will substantially progress the state of the art for high-rate water-cooled battery packs, to help bolster Naval operational capabilities.

Project 9999 (PU C453) - Congressional Add - Surface Navy Laser Weapon System (SNLWS) Program Re-phasing: Congress added funding in FY 2019 for re-phasing of the SNLWS development and fielding effort. This funding supports procurement of HELIOS long lead materials in FY 2019 related to early award of the contract to Lockheed Martin Aculight.

Project 9999 (PU C440) - Congressional Add - Electromagnetic Railgun Program: Congress added funding in FY 2019 for ship-based program/technical development and ship integration related risk reduction. Electromagnetic railgun provides increased capability for the following mission sets: Naval Surface Fire Support (NSFS), Integrated Air and Missile Defense (IAMD), Fast Attack Craft and Fast Inshore Attack Craft (FAC/FIAC), and future potential for Anti-Surface Warfare (ASuW). This

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0603925N *I Directed Energy and Electric Weapon System*

funding supports the testing and refinement of pulse current transfer, mount, and hypervelocity projectile component development. In addition, this project supports the continuing effort to define and evolve requirements related to mount and platform interface management and maturations of specifications for tactical railgun weapon system.

B. Program Change Summary ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	107.310	223.344	107.886	-	107.886
Current President's Budget	92.856	142.814	118.169	-	118.169
Total Adjustments	-14.454	-80.530	10.283	-	10.283
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-106.430			
• Congressional Rescissions	-	-			
• Congressional Adds	-	25.900			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.960	0.000			
• Program Adjustments	0.000	0.000	11.338	-	11.338
• Rate/Misc Adjustments	-0.001	0.000	-1.055	-	-1.055
• Congressional Directed Reductions Adjustments	-19.493	-	-	-	-
• Congressional Add Adjustments	6.000	-	-	-	-

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2018	FY 2019
Project: 9999: *Congressional Adds*		
Congressional Add: *High Energy Storage Modules*	5.790	0.000
Congressional Add: *Electromagnetic Railgun*	0.000	10.000
Congressional Add: *SNLWS Program Rephasing*	0.000	15.900
Congressional Add Subtotals for Project: 9999	5.790	25.900
Congressional Add Totals for all Projects	5.790	25.900

Change Summary Explanation

The FY 2019 net funding decrease in the amount of $80.530 million consists of the following: A $106.430 million decrease to the SNLWS Program PU 3402; a $15.9 million Congressional add for the SNLWS rephrasing and a $10 million Congressional add for the Electromagnetic Railgun Program.

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0603925N *I Directed Energy and Electric Weapon System*

The funding increase from PB19 to PB20 for FY 2020 includes $2.3 million to support Optical Dazzling Interdictor, Navy (ODIN) Sustainment; and $9.0 million for the High Energy Laser Counter ASCM Project (HELCAP) to address laser technology for ACSM threats.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603925N / *Directed Energy and Electric Weapon System*	Project (Number/Name) 2731 / *High Energy Laser Counter ASCM Project (HELCAP)*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
2731: *High Energy Laser Counter ASCM Project (HELCAP)*	0.000	0.000	0.000	9.000	-	9.000	19.000	17.000	3.000	0.000	0.000	48.000
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Note

This project is not a new start in FY20 as efforts associated with RHEL PH II now titled HELCAP were ongoing in PE 0603801N. Due to technology maturation, a portion of HELCAP program efforts now fall into BA04.

A. Mission Description and Budget Item Justification

The High Energy Laser Counter ASCM Project (HELCAP) will expedite the development, experimentation, integration and demonstration of critical technologies to defeat crossing Anti-Ship Cruise Missiles (ASCM) by addressing the remaining technical challenges, e.g.: atmospheric turbulence, automatic target identification and aim point selection, precision target tracking with low jitter in high clutter conditions, advanced beam control, and higher power HEL development. HELCAP will assess, develop, experiment, and demonstrate the various laser weapon system technologies and methods of implementation required to defeat ASCMs in a crossing engagement.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: High Energy Laser Counter ASCM Project (HELCAP)	0.000	0.000	9.000	0.000	9.000
Articles:	-	-	-	-	-
Description: The High Energy Laser Counter ASCM Project (HELCAP) will expedite the development, experimentation, integration and demonstration of critical technologies to defeat crossing Anti-Ship Cruise Missiles (ASCM) by addressing the remaining technical challenges, e.g.: atmospheric turbulence, automatic target identification and aim point selection, precision target tracking with low jitter in high clutter conditions, advanced beam control, and higher power HEL development. HELCAP will assess, develop, experiment, and demonstrate the various laser weapon system technologies and methods of implementation required to defeat ASCMs in a crossing engagement. HELCAP will leverage the knowledge gained in the Navy Laser Family of Systems (NLFoS) efforts: - Alternative Laser Sources for higher powers, also known as the Ruggedized High Energy Laser (RHEL) activities;					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603925N / *Directed Energy and Electric Weapon System*	**Project (Number/Name)** 2731 / *High Energy Laser Counter ASCM Project (HELCAP)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
- Solid State Laser Tech Maturation activities that provides initial key enabling technical solutions in high power lasers and beam control, and will provide opportunities for single ship operational and sustainment learning; - Surface Navy Laser Weapon System Increment 1 (SNLWS Inc. 1) project that provides the initial combat system integration and installation knowledge for Aegis platforms, and multi-ship battle force operations knowledge; - Optical Dazzling Interdictor Navy (ODIN) that provides Counter-ISR technical and fleet operational knowledge. This leveraged knowledge and new HELCAP technical solutions to the C-ASCM problem will enable a fully informed decision to rapidly field an integrated, fleet ready, HEL Weapon. HELCAP activities include assessment, development, and experimentation associated with lethality, advanced beam control, and laser sources being conducted with advanced technology development (BA 03) funds under PE 0603801N Innovative Naval Prototypes (INP) Advanced Technology Development, as well as technology integration to support automated laser weapon control in "integrated detect to defeat demonstrations" conducted within this program element (PE). ***FY 2019 Plans:*** N/A. ***FY 2020 Base Plans:*** The FY 2020 funding supports automated laser weapon control activities, as well as the initiation of planning and establishment of test assets and test site preparations to enable FY 2022-2023 counter ASCM detect to defeat demonstrations. FY 2020 tasks include: - Perform Systems Engineering activities to ensure that the advanced technology development (BA 03) HELCAP products being produced under PE 0603801N appropriately interface with automated laser weapon control and planned counter ASCM detect to defeat demonstrations. - Perform additional mission analysis to ensure counter ASCM detect to defeat demos are representative of future concepts of operations. - Perform automated laser weapon control system design and fabricate tasks including laser weapon control, laser weapon console, and target acquisition handover. Activities may include requirements flow-down, design reviews, interface documents, and identification of long lead procurements,					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603925N / *Directed Energy and Electric Weapon System*	**Project (Number/Name)** 2731 / *High Energy Laser Counter ASCM Project (HELCAP)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
- Initiate planning to enable FY 2022-2023 counter ASCM detect to defeat demonstrations. This may include requirements development, draft integrated test plans, confirm test site selection and initial approvals, and identification of long lead test articles. - Initiate establishment of test asset procurements and site preparation to enable FY 2022-2023 counter ASCM detect to defeat demonstrations. ***FY 2020 OCO Plans:*** N/A. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** The funding increase from FY 2019 to FY 2020 reflects the initial year of Advanced Component Development & Prototypes (BA 04) investment for HELCAP.					
Accomplishments/Planned Programs Subtotals	0.000	0.000	9.000	0.000	9.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

The HELCAP is an initiative that provides for an industry-developed testbed for government test and evaluation and demonstration of a high energy laser system capable of defeating an anti-ship cruise missile. Competition was utilized to select the industry provider of the beam control testbed. The testbed is being designed to accept technology insertion from other industry providers. These activities are being performed under PE 0603801N. The government is then integrating additional auxiliary systems and performing FY 2022-2023 counter ASCM detect to defeat demonstrations at government test sites.

E. Performance Metrics

- Conduct Laser Weapon Control Design Reviews
- Procure Laser Weapon Control Hardware
- Conduct Test and Evaluation of Laser Weapon Control
- Document HELCAP ASCM Mission Analysis
- Conduct ASCM detect to defeat experimentation
- Procure ASCM detect to defeat test hardware
- Conduct ASCM detect to defeat test site preparations
- ASCM detect to defeat demonstration test execution
- ASCM detect to defeat demonstration post-test documentation

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603925N / *Directed Energy and Electric Weapon System*	Project (Number/Name) 2731 / *High Energy Laser Counter ASCM Project (HELCAP)*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Laser Weapon Control Design and Fabricate	WR	NSWC Dahlgren : Dahlgren VA	0.000	0.000		0.000		2.500	Oct 2019	-		2.500	0.000	2.500	-
Laser Weapon Control Design and Fabricate	C/CPFF	TBD : Not Specified	0.000	0.000		0.000		1.750	Dec 2019	-		1.750	0.000	1.750	-
HELCAP Mission Analysis	WR	NSWC Dahlgren : Dahlgren VA	0.000	0.000		0.000		1.000	Oct 2019	-		1.000	0.000	1.000	-
		Subtotal	0.000	0.000		0.000		5.250		-		5.250	0.000	5.250	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
HELCAP Systems Engineering, Program Management	WR	NSWC Dahlgren : Dahlgren VA	0.000	0.000		0.000		1.250	Oct 2019	-		1.250	0.000	1.250	-
		Subtotal	0.000	0.000		0.000		1.250		-		1.250	0.000	1.250	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
ASCM detect to defeat demonstration planning	WR	NSWC Dahlgren : Dahlgren VA	0.000	0.000		0.000		0.750	Oct 2019	-		0.750	0.000	0.750	-
ASCM detect to defeat demonstration test site long lead assets and preparations	C/CPFF	NSWC Port Hueneme : Hueneme, CA	0.000	0.000		0.000		1.500	Oct 2019	-		1.500	0.000	1.500	-
		Subtotal	0.000	0.000		0.000		2.250		-		2.250	0.000	2.250	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603925N / *Directed Energy and Electric Weapon System*	**Project (Number/Name)** 2731 / *High Energy Laser Counter ASCM Project (HELCAP)*

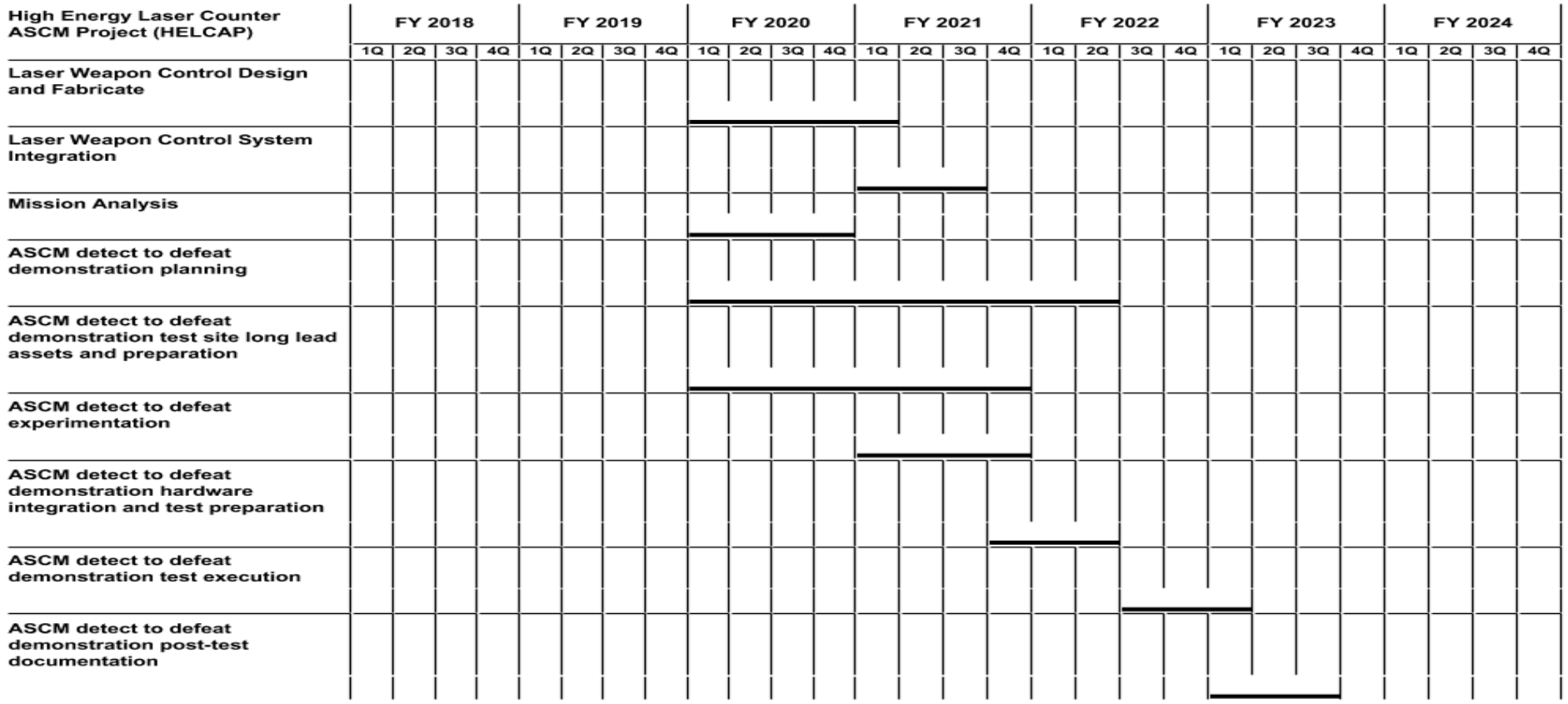
Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
HELCAP Program Management /Engineering Support	C/CPFF	TBD : TBD	0.000	0.000		0.000		0.250	Oct 2019	-		0.250	0.000	0.250	-
		Subtotal	0.000	0.000		0.000		0.250		-		0.250	0.000	0.250	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	0.000		0.000		9.000		-		9.000	0.000	9.000	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603925N / *Directed Energy and Electric Weapon System*	**Project (Number/Name)** 2731 / *High Energy Laser Counter ASCM Project (HELCAP)*



2020OSD - 0603925N - 2731

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603925N / *Directed Energy and Electric Weapon System*	**Project (Number/Name)** 2731 / *High Energy Laser Counter ASCM Project (HELCAP)*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
High Energy Laser Counter ASCM Project (HELCAP)				
Laser Weapon Control Design and Fabricate: HELCAP: Laser Weapon Control Design and Fabricate	1	2020	1	2021
Laser Weapon Control System Integration: HELCAP: Laser Weapon Control System Integration	1	2021	3	2021
Mission Analysis: HELCAP: Mission Analysis	1	2020	4	2020
ASCM detect to defeat demonstration planning: HELCAP: ASCM detect to defeat demonstration planning	1	2020	2	2022
ASCM detect to defeat demonstration test site long lead assets and preparation: HELCAP: ASCM detect to defeat demonstration test site	1	2020	4	2021
ASCM detect to defeat experimentation: HELCAP: ASCM detect to defeat experimentation	1	2021	4	2021
ASCM detect to defeat demonstration hardware integration and test preparation: HELCAP: ASCM detect to defeat demonstration hardware integration and test	4	2021	2	2022
ASCM detect to defeat demonstration test execution: HELCAP: ASCM detect to defeat demonstration test execution	3	2022	1	2023
ASCM detect to defeat demonstration post-test documentation: HELCAP: ASCM detect to defeat demonstration post-test documentation	1	2023	3	2023

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603925N / *Directed Energy and Electric Weapon System*	Project (Number/Name) 3402 / *Surface Navy Laser Weapon System (SNLWS)*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
3402: *Surface Navy Laser Weapon System (SNLWS)*	0.000	47.441	83.807	89.234	-	89.234	56.282	47.250	29.451	30.032	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Project 3402 - The Surface Navy Laser Weapon System (SNLWS) was initiated under the authority granted by the Middle-Tier Acquisition legislation (Section 804 of the FY16 NDAA) in accordance with CNO's direction. The SNLWS program supports the National Defense Strategy of building a more lethal force by leveraging mature technology to deliver proven laser weapon capability to the Fleet. HELIOS provides a capability to address Anti-Surface Warfare and Counter-Intelligence, Surveillance and Reconnaissance (C-ISR) gaps with the ability to dazzle and destroy Unmanned Aerial Systems (UAS) and defeat Fast Inshore Attack Craft (FIAC). SNLWS provides for industry-developed and government integrated capability to the Fleet in as short a timeframe as possible, thereby addressing the National Defense Strategy direction to foster a culture of affordability. SNLWS includes the development of an advanced prototype laser weapon system in the 60 kW or higher class. Competition is utilized for system development and prototype production efforts. SNLWS leverages mature technology to deliver a proven laser weapon capability to the Fleet integrated with the Combat System. SNLWS development leverages the Office of Naval Research (ONR) efforts on the Solid State Laser (SSL) Quick Reaction Capability (QRC) and Solid State Laser (SSL) Technology Maturation (TM) efforts.

The FY20 funding supports completion of the system build, review and delivery of the Technical Data Package, preparation for conduct of Factory Qualification Testing (FQT), and Packaging, Handling, Storage and Transportation (PHS&T) of one system.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: SNLWS Development	32.000	55.410	57.199	0.000	57.199
Articles:	-	-	-	-	-
FY 2019 Plans: - Continue SNLWS development. This includes creating an A-Specification which meets the requirements in the System Scope Document (SSD); conducting systems engineering efforts for laser, mount, beam transport, power and cooling, and systems/ship integration; continuing system design that meets the A-Specification and Government furnished external (Mechanical, Electrical, and Logical) interface requirements and ship integration study requirements; initiating functional decomposition of the system level documentation into sub-system level requirements for the laser, weapon mount, beams control architecture and transport system, power and cooling sub system and ship interface requirements. - Develop Interface Functional Descriptions (IFDs) for the combat system baseline. - Develop system level control and combat system interface software.					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603925N / *Directed Energy and Electric Weapon System*	**Project (Number/Name)** 3402 / *Surface Navy Laser Weapon System (SNLWS)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
- Continue development of Preliminary Design/Technical Data Package consisting of: design documentation; non-recurring system/sub-system/component engineering and management; and component/sub-system procurement, assembly, and testing. - Conduct SNLWS Technical Interchange Meetings (TIMs) with PEO IWS and designated field activities. - Provide programmatic and engineering support to SNLWS Integrated Product Teams (IPTs) and Working Groups (WGs). - Conduct Preliminary Design Review (PDR) to provide a technical assessment of the system architecture and preliminary system design and establish the allocated baseline. - Continue procurement of materials to include: Mount, Computer Systems, Cables/Connectors, Cameras/ Illuminators, Laser Structure/Foundation, Power/Cooling Mod Kits, and Platform Mod Kits. - Receive and integrate government furnished Laser Weapon Control System (LWCS), Weapons Domain Laser Controller (WDLC) and Deconfliction Safety Software (DSS) GFE into final system design. - Prepare for conduct of system Factory Qualification Test (FQT) by verifying test procedures are complete and are in compliance with approved test plans. - Continue fabrication of first system consisting of a High Energy Laser Weapon System combined with a C-ISR capability for countering UAS-mounted sensors. - Develop and deliver required contract deliverables/documentation.					
FY 2020 Base Plans: - Conduct Critical Design Review (CDR) to assess the system detailed design prior to fabrication of hardware and coding of software. - Complete integration of sub-systems to include High Energy Laser Weapon System combined with a C-ISR capability for countering UAS-mounted sensors. - Preparation for and initiation of test events associated with contractor testing and verification of system for delivery. - Develop and deliver required contract deliverables/documentation, including life cycle support and training documentation. - Conduct SNLWS Technical Interchange Meetings (TIMs) with PEO IWS and designated field activities. - Provide programmatic and engineering support to SNLWS Integrated Product Teams (IPTs) and Working Groups (WGs).					
FY 2020 OCO Plans:					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
N/A. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** The funding increase for LM/Aculight from FY 2019 to FY 2020 is required to support the SNLWS development efforts, such as the Critical Design Review (CDR), as a result of the re-phasing.					
Title: SNLWS Government and Support Engineering Services	15.441	28.397	32.035	0.000	32.035
Articles:	-	-	-	-	-
FY 2019 Plans: - Support all management/technical efforts required in support of Preliminary Design Review (PDR) efforts leading up to and conducting the formal PDR. - Support all management/technical efforts required in support of Critical Design Review (CDR) efforts leading up to conduct of the formal CDR in FY 2020. - Continue review of all contractor provided engineering, design, production readiness, and test documentation. - Conduct Technical Interchange Meetings (TIMs) with contractor and government personnel. - Provide programmatic and engineering support to government-led Integrated Product Teams (IPTs) and Working Groups (WGs). - Complete hardware/software build of Laser Weapon Control System (LWCS), Weapons Domain Laser Controller (WLDC) and Deconfliction Safety Software (DSS) and provide to contractor as GFE. - Continue AEGIS Combat System software engineering, development, and integration; conduct Levels 1-5 integration and testing. - Continue DDG 51 Flight IIA Ship Integration and Installation engineering ship data package development, review, and approval. - Finalize test plans, procedures, and schedules that ensure traceability to system requirements as part of required contractor testing. - Review/comment/approve deliverables provided by the contractor. - Develop and deliver programmatic and technical documentation to support all requisite cost, schedule, and performance reporting requirements.					
FY 2020 Base Plans: - Continue review of all contractor provided engineering, design, production readiness, and test documentation. - Conduct Technical Interchange Meetings (TIMs) with contractor and government personnel. - Provide programmatic and engineering support to government-led Integrated Product Teams (IPTs) and Working Groups (WGs).					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
- Continue AEGIS Combat System software engineering, development, and integration; conduct Levels 1-5 integration and testing. - Execute DDG 51 Flight IIA Ship Integration and Installation in FY 2021. - Execute planned test events and conduct analysis of test results. - Support efforts leading up to the Factory Qualification Test (FQT)in FY 2021 for contractor developed components/ subsystems/systems. - Review/comment/approve deliverables provided by the contractor. - Update and implement programmatic and technical documentation developed to support all requisite cost, schedule, and performance reporting requirements. - Prepare drawings, support ship checks and preparation for system Shipboard Installation. ***FY 2020 OCO Plans:*** N/A. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** The funding increase for SNLWS Government and Engineering Services from FY 2019 to FY 2020 supports the increased government requirements for preparation for and initiation of shipboard integration, checkout and testing.					
Accomplishments/Planned Programs Subtotals	47.441	83.807	89.234	0.000	89.234

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

The Surface Navy Laser Weapon System (SNLWS) was initiated under the authority granted by the Middle-Tier Acquisition legislation (Section 804 of the FY 2016 NDAA) in accordance with CNO's direction. The SNLWS program supports the National Defense Strategy of building a more lethal force by leveraging mature technology to deliver proven laser weapon capability to the Fleet. HELIOS provides a capability to address Anti-Surface Warfare and Counter-Intelligence, Surveillance and Reconnaissance (C-ISR) gaps with the ability to dazzle and destroy Unmanned Aerial Systems (UAS) and defeat Fast Inshore Attack Craft (FIAC). SNLWS provides for industry-developed and government integrated capability to the Fleet in as short a timeframe as possible, thereby addressing the National Defense Strategy direction to foster a culture of affordability. SNLWS includes the development of an advanced prototype laser weapon system in the 60 kW or higher class. Competition is utilized for system development and prototype production efforts. The acquisition strategy permits accelerated fielding of laser weapon systems in the Fleet. The acquisition strategy consists of a baseline development and production of a single test unit followed by options for fixed price production units.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
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E. Performance Metrics

- Conduct SNLWS Source Selection.
- Award SNLWS contract.
- Conduct System Requirements Review.
- Conduct System Functional Review.
- Develop/deliver Laser Weapon Control System (LWCS) as GFE.
- Conduct Preliminary Design Review.
- Conduct Final Design Review.
- Develop/deliver Deconflication Safety Software (DSS) as GFE.
- Develop/deliver Weapons Domain Laser Controller (WDLC) as GFE.
- Conduct Factory Qualification Test (FQT).
- Conduct T&E review for Contractor Test.
- Deliver Test System.
- Install, Develop, Test & Operate delivered system.
- Sustain delivered system.
- Initiate Combat System Integration & DDG 51 Flight IIA Integration/Installation Engineering.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
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Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
SNLWS Development	C/CPIF	Lockheed Martin Aculight : Bothell, WA	0.000	32.000	Jan 2018	55.410	Oct 2018	57.199	Oct 2019	-		57.199	Continuing	Continuing	Continuing
		Subtotal	0.000	32.000		55.410		57.199		-		57.199	Continuing	Continuing	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
SNLWS Systems Engineering, Program Management, GFE/GFI	WR	NSWC Dahlgren : Dahlgren, VA	0.000	9.066	Nov 2017	13.323	Nov 2018	18.121	Nov 2019	-		18.121	Continuing	Continuing	Continuing
SNLWS Ship Installation, Integration & Documentation	C/CPAF	BIW : Bath, ME	0.000	0.103	Feb 2018	2.974	Jan 2019	4.850	Jan 2020	-		4.850	Continuing	Continuing	Continuing
SNLWS Combat System Integration/Licenses	C/CPFF	Lockheed Martin : Moorestown, NJ	0.000	1.433	Oct 2017	6.067	Jan 2019	2.500	Jan 2020	-		2.500	Continuing	Continuing	Continuing
SNLWS Systems Engineering	WR	NSWC Crane : Crane, IN	0.000	0.270	Nov 2017	0.162	Nov 2018	0.162	Nov 2019	-		0.162	Continuing	Continuing	Continuing
SNLWS Systems Engineering	WR	NSWC PHD : Port Hueneme, CA	0.000	0.477	Nov 2017	0.280	Nov 2018	0.250	Nov 2019	-		0.250	Continuing	Continuing	Continuing
SNLWS Systems Engineering	WR	SSC PAC : San Diego, CA	0.000	0.146	Nov 2017	0.199	Nov 2018	0.250	Nov 2019	-		0.250	Continuing	Continuing	Continuing
SNLWS Systems Engineering	WR	NPS : Monterey, CA	0.000	0.150	Nov 2017	0.100	Dec 2018	0.100	Nov 2019	-		0.100	Continuing	Continuing	Continuing
SNLWS Systems Engineering	MIPR	MIT LL : Lexington, MA	0.000	0.005	Jan 2018	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
SNLWS Systems Engineering	C/CPFF	PSU EOC : Freeport, PA	0.000	0.500	Feb 2018	0.300	Dec 2018	0.300	Dec 2019	-		0.300	Continuing	Continuing	Continuing
SNLWS Technical Director	WR	NSWC Crane : Crane, IN	0.000	0.280	Nov 2017	0.324	Nov 2018	0.325	Nov 2019	-		0.325	Continuing	Continuing	Continuing

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
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Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
SNLWS Product Support	WR	NSWC PHD : Port Hueneme, CA	0.000	0.182	Nov 2017	0.902	Nov 2018	0.600	Nov 2019	-		0.600	Continuing	Continuing	Continuing
Installation APM	WR	NSWC Dam Neck : Dam Neck, VA	0.000	0.168	Nov 2018	0.150	Nov 2019	0.150	Sep 2020	-		0.150	Continuing	Continuing	Continuing
		Subtotal	0.000	12.780		24.781		27.608		-		27.608	Continuing	Continuing	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
SNLWS Test & Evaluation	WR	SSC PAC : San Diego, CA	0.000	0.122	Nov 2017	0.000		0.250	Nov 2019	-		0.250	Continuing	Continuing	Continuing
SNLWS Test & Evaluation	WR	NSWC PHD : Port Hueneme, CA	0.000	0.133	Nov 2017	0.818	Nov 2018	1.200	Nov 2019	-		1.200	Continuing	Continuing	Continuing
SNLWS Test & Evaluation	WR	NSWC Crane : Crane, IN	0.000	0.000		0.250	Nov 2018	0.100	Nov 2019	-		0.100	Continuing	Continuing	Continuing
SNLWS Test & Evaluation	WR	NSWC Dahlgren : Dahlgren, VA	0.000	0.707	Nov 2017	0.573	Nov 2018	0.900	Nov 2019	-		0.900	Continuing	Continuing	Continuing
		Subtotal	0.000	0.962		1.641		2.450		-		2.450	Continuing	Continuing	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
SNLWS Program Management/Engineering Support	C/CPFF	GRYPHON Technologies : Washington, D.C.	0.000	0.265	Jun 2018	0.500	Feb 2019	0.000		-		0.000	Continuing	Continuing	Continuing
SNLWS Program Management/Engineering Support	C/CPIF	SPA : Washington, D.C.	0.000	0.950	Feb 2018	1.011	Dec 2018	1.012	Dec 2019	-		1.012	Continuing	Continuing	Continuing
SNLWS Travel	Various	NAVSEA : Washington, D.C.	0.000	0.125	Feb 2018	0.150	Feb 2019	0.150	Feb 2020	-		0.150	Continuing	Continuing	Continuing

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
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Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
SNLWS Program Management	C/CPFF	TMB : Washington, D.C.	0.000	0.162	Jun 2018	0.170	Dec 2018	0.000		-		0.000	Continuing	Continuing	Continuing
SNLWS Program Management	TBD	TBD : TBD	0.000	0.000		0.000		0.670	Dec 2019	-		0.670	Continuing	Continuing	Continuing
SNLWS Program Management	C/CPFF	Strategic Insight : Washington, D.C.	0.000	0.197	Jun 2018	0.144	Dec 2018	0.145	Dec 2019	-		0.145	Continuing	Continuing	Continuing
		Subtotal	0.000	1.699		1.975		1.977		-		1.977	Continuing	Continuing	N/A

Remarks

SNLWS Program Management award is TBD due to the planned competitive award of follow-on contract.

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	47.441		83.807		89.234		-		89.234	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
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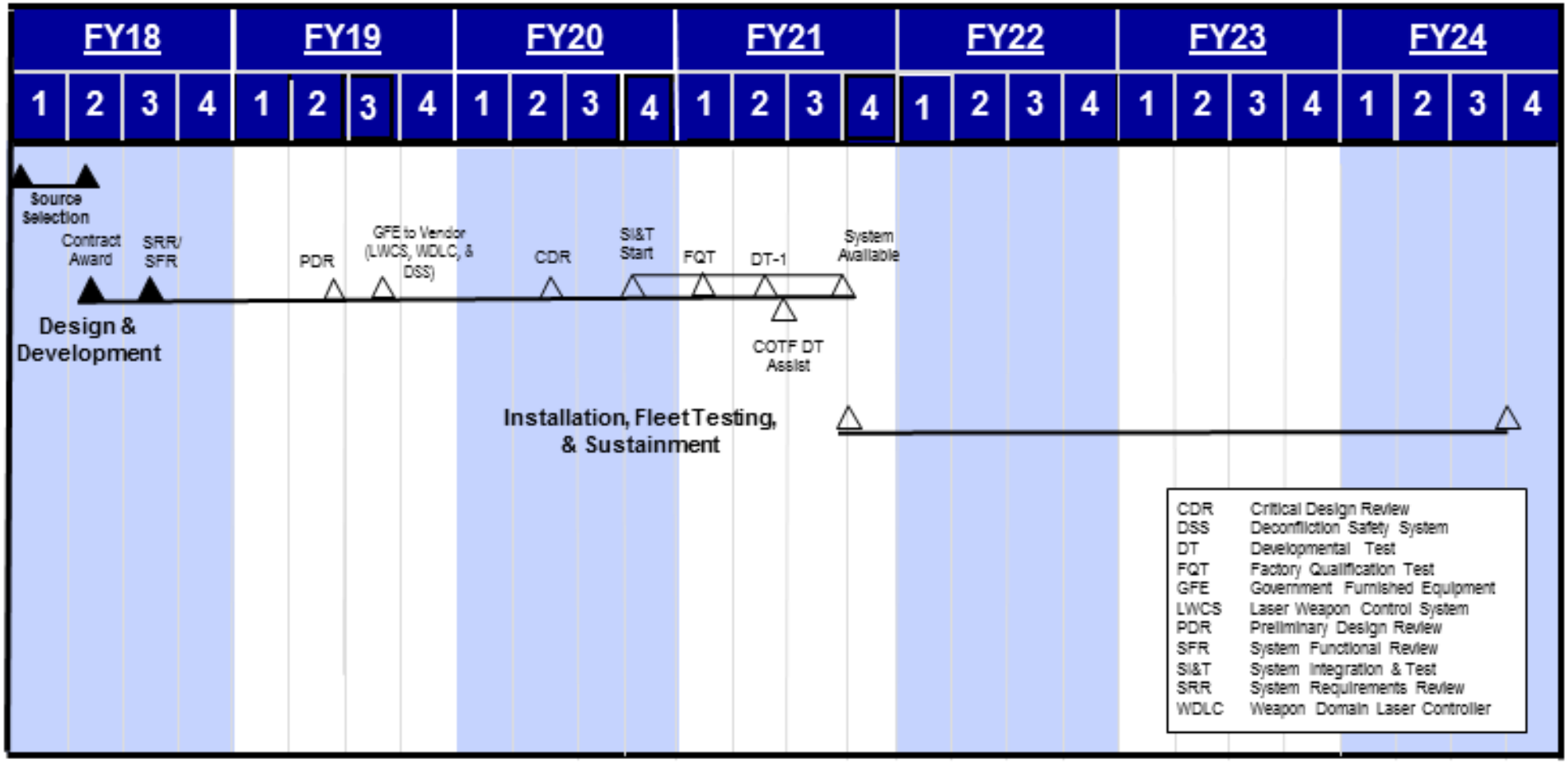


Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603925N / *Directed Energy and Electric Weapon System*	**Project (Number/Name)** 3402 / *Surface Navy Laser Weapon System (SNLWS)*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 3402				
SNLWS: Conduct SNLWS Source Selection	1	2018	2	2018
SNLWS: Contract Award	2	2018	2	2018
SNLWS: Conduct System Requirements Review/System Functional Review	3	2018	3	2018
SNLWS: Initial Baseline Review (IBR)	2	2019	2	2019
SNLWS: Preliminary Design Review	2	2019	2	2019
SNLWS: Laser Weapon Control System (LWCS) GFE to Vendor	3	2019	3	2019
SNLWS: Deconflication Safety Software (DSS) GFE to Vendor	3	2019	3	2019
SNLWS: Weapons Domain Laser Controller (WDLC) GFE to Vendor	3	2019	3	2019
SNLWS: Critical Design Review	2	2020	2	2020
SNLWS: Factory Qualification Test (FQT)	1	2021	1	2021
SNLWS: Deliver to Pier	4	2021	4	2021
SNLWS: Installation, Fleet Testing and Sustainment	4	2021	4	2024

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603925N / *Directed Energy and Electric Weapon System*	Project (Number/Name) 9823 / *Lasers for Navy applicat*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
9823: *Lasers for Navy applicat*	14.379	39.625	33.107	19.935	-	19.935	5.621	6.389	5.908	4.440	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Project 9823 - Lasers for Navy Applications: Low Power Module (LPM) development will provide near-term, directed energy, shipboard Counter-Intelligence, Surveillance, and Reconnaissance (C-ISR) capabilities to dazzle Unmanned Aerial Systems (UASs) and other platforms that will address urgent operational needs of the Fleet. FY 2018 was the first year of funding and supported the design, development and procurement of eight standalone units over the FYDP, for deployment on DDG 51 surface combatants. The program supports the non-recurring engineering, development, procurement of long lead material, assembly and checkout, system certification, and platform integration/installation and sustainment for these eight standalone units.

The FY 2020 funding supports assembly and checkout of the final increment of ODIN systems to be installed shipboard in FY 2021. Additionally, sustainment of installed Units 1 and 2 begins in FY 2020 as well as installation of units 3, 4, and 5 onboard designated DDG 51 class ships.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Low Power Module (LPM) Development	39.625	33.107	19.935	0.000	19.935
Articles:	-	-	-	-	-
Description: Beginning in FY 2018, Low Power Module (LPM) development efforts are being renamed Optical Dazzling Interdictor, Navy (ODIN).					
FY 2019 Plans: - Complete system integration, test and certifications, including electromagnetic interference, system operability, and safety. - Complete shipboard documentation development - deliver to ship, and conduct training for ship's crew. - Deliver Units 1 and 2 onboard designated DDG 51 class ships, conduct system turnover, and support shipboard operations. - Complete procurement and build of Units 3, 4, and 5. - Perform Assembly and Checkout, and integration of Units 3, 4, and 5. Each unit consists of: Beam Director (Telescope, Optics, Fast Steering Mirrors); Lower Power Lasers (2); Sensors (Coarse Track, Fine Track, ISR Imaging); Computer Rack, Network Switches; and an Operator Laptop. - Procure and initiate build of Units 6, 7, and 8.					
FY 2020 Base Plans:					

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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
- Install Units 3, 4, and 5 onboard designated DDG 51 class ships and initiate shipboard test and checkout. - Conduct system integration, test and certifications, including electromagnetic interference, system operability, and safety for Units 6, 7, and 8. - Initiate shipboard documentation and training development for Units 6, 7, and 8. - Complete shipboard test and checkout, conduct system turnover, and support shipboard operations of units 3, 4, and 5. - Complete procurement and build of Units 6, 7, and 8. - Perform Assembly and Checkout, and integration of Units 6, 7, and 8. Each unit consists of: Beam Director (Telescope, Optics, Fast Steering Mirrors); Lower Power Lasers (2); Sensors (Coarse Track, Fine Track, ISR Imaging); Computer Rack, Network Switches; and an Operator Laptop. - Initiate sustainment of Units 1 and 2. ***FY 2020 OCO Plans:*** N/A. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Funding decreased in FY 2020 by $13.172M as the majority of the engineering development, integration, and test/certification for building the final systems will be accomplished in FY 2019. The FY 2020 funding will address final assembly and checkout of the final increment of ODIN systems to be installed shipboard in FY21, Additionally, sustainment of installed Units 1 and 2 begins in FY 2020.					
Accomplishments/Planned Programs Subtotals	39.625	33.107	19.935	0.000	19.935

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

The LPM is a government designed, developed, and produced system that will provide eight units for use on DDG 51 class ships. This effort will transition the developed LPM capabilities to the Fleet, while informing the development of future prototyping capabilities and program of record efforts.

E. Performance Metrics

- Conduct Technical Design Reviews (TDRs)
- Procure hardware for units 1 and 2
- Perform assembly, integration, and checkout of units 1 and 2

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- Conduct Test & Evaluation of units 1 and 2
- Perform installation of units 1 and 2
- Procure hardware for units 3, 4 and 5
- Perform assembly, integration, and checkout of units 3, 4 and 5
- Conduct Test & Evaluation of units 3, 4 and 5
- Perform installation of units 3, 4 and 5
- Procure hardware for units 6, 7 and 8
- Perform assembly, integration and checkout of units 6, 7 and 8
- Conduct Test & Evaluation of units 6, 7 and 8
- Perform installation of units 6, 7 and 8
- Provide sustainment of units 1 - 8

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
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Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Hardware & Software - Material Buys	C/FFP	NSWC DD : Dahlgren, VA	0.000	16.842	Dec 2017	10.242	Dec 2018	2.000	Dec 2019	-		2.000	Continuing	Continuing	Continuing
Engineering/Development	WR	NSWC DD : Dahlgren, VA	3.022	7.037	Nov 2017	6.086	Nov 2018	3.200	Nov 2019	-		3.200	Continuing	Continuing	Continuing
Software Development	WR	NSWC DD : Dahlgren, VA	0.000	4.294	Nov 2017	2.445	Nov 2018	1.750	Nov 2019	-		1.750	Continuing	Continuing	Continuing
Engineering Development	C/CPFF	PSU EOC : Freeport, PA	0.000	2.420	Feb 2018	1.760	Dec 2018	1.500	Dec 2019	-		1.500	Continuing	Continuing	Continuing
Engineering/Development	WR	NSWC PHD : Port Hueneme, CA	0.155	0.330	Nov 2017	0.539	Nov 2018	0.200	Nov 2019	-		0.200	Continuing	Continuing	Continuing
Engineering/Development	WR	NSWC Crane : Crane, IN	0.000	0.300	Nov 2017	0.020	Nov 2018	0.050	Nov 2019	-		0.050	Continuing	Continuing	Continuing
Engineering/Development	WR	NRL : Washington, D.C.	0.000	0.260	Nov 2017	0.060	Nov 2018	0.000		-		0.000	Continuing	Continuing	Continuing
		Subtotal	3.177	31.483		21.152		8.700		-		8.700	Continuing	Continuing	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Platform Integration/ ILS/ Installation	C/CPFF	CACI : Washington, D.C.	0.000	0.101	Sep 2018	0.194	Dec 2018	0.050	Dec 2019	-		0.050	Continuing	Continuing	Continuing
Spares	WR	NSWC DD : Dahlgren, VA	0.000	0.711	Nov 2017	0.000		0.750	Nov 2019	-		0.750	Continuing	Continuing	Continuing
Platform Integration/ILS/ Installation	WR	NSWC DD : Dahlgren, VA	2.014	2.328	Nov 2017	2.733	Nov 2018	2.579	Nov 2019	-		2.579	Continuing	Continuing	Continuing
Platform Integration	C/CPAF	BIW : Bath, ME	0.030	0.214	Feb 2018	0.060	Jan 2019	0.207	Jan 2020	-		0.207	Continuing	Continuing	Continuing
Platform Integration	C/CPFF	Lockheed Martin : Moorestown, NJ	0.000	0.265	Feb 2018	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Systems Engineering	WR	SSC PAC : San Diego, CA	0.140	0.770	Nov 2017	0.290	Nov 2018	0.250	Nov 2019	-		0.250	Continuing	Continuing	Continuing

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
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Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Safety, Product Support, Security & Operations	WR	NSWC Dahlgren : Dahlgren, VA	3.612	1.511	Nov 2017	1.253	Nov 2018	0.900	Nov 2019	-		0.900	Continuing	Continuing	Continuing
Platform Integration	WR	NSWC Crane : Crane, IN	0.000	0.156	Nov 2017	0.000		0.050	Nov 2019	-		0.050	Continuing	Continuing	Continuing
Platform Integration/ILS/ Installation	WR	NSWC PHD : Port Hueneme, CA	0.000	0.840	Nov 2017	2.200	Nov 2018	3.574	Nov 2019	-		3.574	Continuing	Continuing	Continuing
Packaging, Handling, Storage & Transportation, De-Install, Refurbishment	WR	NSWC DD : Dahlgren, VA	1.155	0.088	Nov 2017	0.091	Nov 2018	0.093	Nov 2019	-		0.093	Continuing	Continuing	Continuing
		Subtotal	6.951	6.984		6.821		8.453		-		8.453	Continuing	Continuing	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Test Planning & Execution	WR	PHD NSWC : Port Hueneme, CA	0.605	0.275	Nov 2017	0.700	Nov 2018	0.700	Nov 2019	-		0.700	Continuing	Continuing	Continuing
Test Planning & Execution	WR	NSWC DD : Dahlgren, VA	2.097	0.370	Nov 2017	3.187	Nov 2018	1.000	Nov 2019	-		1.000	Continuing	Continuing	Continuing
Test Planning & Execution	WR	NSWC Crane : Crane, IN	0.622	0.000		0.230	Nov 2018	0.250	Nov 2019	-		0.250	Continuing	Continuing	Continuing
Test Planning & Execution	WR	SSC PAC : San Diego, CA	0.000	0.000		0.434	Nov 2018	0.250	Nov 2019	-		0.250	Continuing	Continuing	Continuing
		Subtotal	3.324	0.645		4.551		2.200		-		2.200	Continuing	Continuing	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Mgmt/Support	TBD	TBD : TBD	0.000	0.000		0.000		0.275	Dec 2019	-		0.275	Continuing	Continuing	Continuing

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603925N / *Directed Energy and Electric Weapon System*	**Project (Number/Name)** 9823 / *Lasers for Navy applicat*

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Mgmt/Supportt	C/BA	Strategic Insight : Washington, D.C.	0.000	0.000		0.076	Dec 2018	0.075	Dec 2019	-		0.075	Continuing	Continuing	Continuing
Program Mgmt/Support	C/CPFF	TMB : Washington, D.C.	0.000	0.000		0.025	Dec 2018	0.000		-		0.000	Continuing	Continuing	Continuing
Program Mgmt/Support	C/CPFF	GRYPHON Technologies : Washington, D.C.	0.498	0.250	Jun 2018	0.250	Dec 2018	0.000		-		0.000	Continuing	Continuing	Continuing
Travel	Various	NAVSEA : Washington, D.C.	0.074	0.052	Feb 2018	0.052	Feb 2019	0.052	Feb 2020	-		0.052	Continuing	Continuing	Continuing
Program Mgmt/Support	C/CPIF	SPA : Washington, D.C.	0.355	0.211	Jun 2018	0.180	Dec 2018	0.180	Dec 2019	-		0.180	Continuing	Continuing	Continuing
		Subtotal	0.927	0.513		0.583		0.582		-		0.582	Continuing	Continuing	N/A

Remarks

LPM Program Management award is TBD due to planned competitive award of follow-on contract.

	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	14.379	39.625		33.107		19.935		-		19.935	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603925N / *Directed Energy and Electric Weapon System*	**Project (Number/Name)** 9823 / *Lasers for Navy applicat*

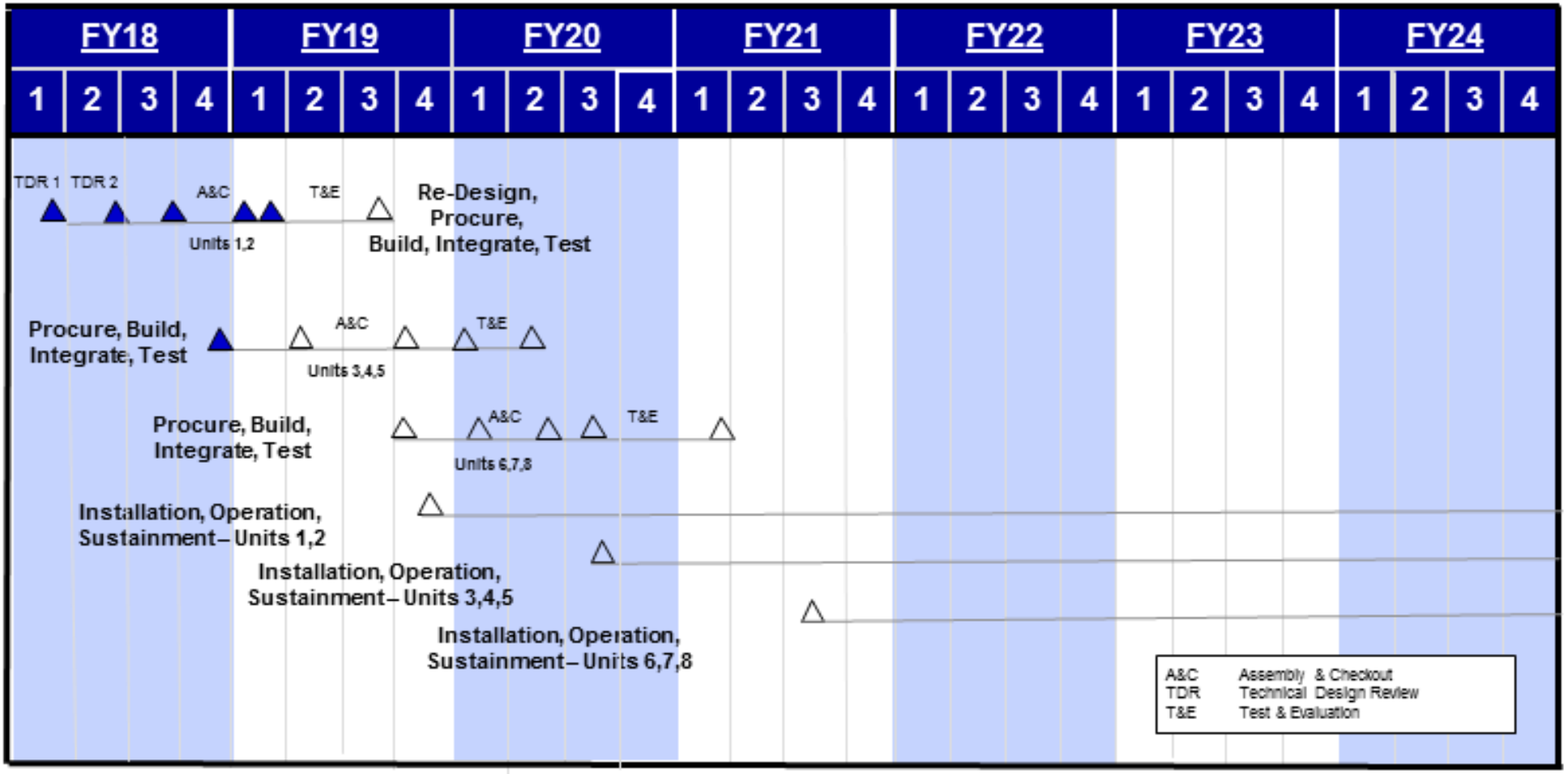


Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603925N / *Directed Energy and Electric Weapon System*	**Project (Number/Name)** 9823 / *Lasers for Navy applicat*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 9823				
Design/Develop Operational System	1	2018	3	2018
Technical Design Reviews (TDR) 1 and 2	1	2018	2	2018
Component Procurement Units 1 and 2	1	2018	4	2018
Assembly & Checkout Units 1 and 2	4	2018	1	2019
Component Procurement Units 3, 4 and 5	4	2018	2	2019
Integration Units 1 and 2	1	2019	1	2019
Test and Evaluation Units 1 and 2	1	2019	3	2019
Assembly & Checkout Unit's 3, 4 and 5	2	2019	4	2019
Integration Units 3, 4 and 5	3	2019	3	2019
Installation, Operation and Sustainment Units 1 and 2	4	2019	4	2024
Component Procurement Units 6, 7 and 8	4	2019	1	2020
Test & Evaluation Unit's 3, 4 and 5	1	2020	2	2020
Assembly & Checkout Unit's 6, 7 and 8	1	2020	2	2020
Integration Units 6, 7 and 8	2	2020	3	2020
Test and Evaluation Units 6, 7 and 8	3	2020	1	2021
Installation, Operation and Sustainment Units 3, 4 and 5	3	2020	4	2024
Installation, Operation and Sustainment Units 6, 7 and 8	3	2021	4	2024

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603925N / *Directed Energy and Electric Weapon System*	Project (Number/Name) 9999 / *Congressional Adds*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
9999: *Congressional Adds*	0.000	5.790	25.900	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	31.690
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Project 9999 (PU C407) - Advanced energy storage systems are the foundation of the electric weapons kill chain, and their applications and demands are increasing in defense and naval applications. These applications require innovative battery technologies that provide high power and energy density, and provide increased rates of discharge, while ensuring safety and optimal thermal management. High Energy Storage Modules research will involve development, assembly and initial Naval certification testing of a 1,000 volt high-rate, high-power-density Lithium-ion battery pack in order to increase Naval operational capabilities. The 1,000-volt battery pack will combine newly developed and patented battery cooling technologies with an established Lithium-ion battery chemistry, produced by a domestic manufacturer. High Energy Storage Modules with higher discharge rates will decrease the amount of batteries needed to meet peak shipboard power loads. This effort will substantially progress the state of the art for high-rate water-cooled battery packs, to help bolster Naval operational capabilities.

Project 9999 (PU C453) - Surface Navy Laser Weapon System (SNLWS) Program Re-phasing: Congress added funding in FY19 for re-phasing of the SNLWS development and fielding effort. This funding supports procurement of HELIOS long lead materials related to early award of the contract to Lockheed Martin Aculight.

Project 9999 (PU C440) - Congressional Add - Electromagnetic Railgun Program: Congress added funding in FY19 for ship-based program/technical development and ship integration related risk reduction. Electromagnetic railgun provides increased capability for the following mission sets: Naval Surface Fire Support (NSFS), Integrated Air and Missile Defense (IAMD), Fast Attack Craft and Fast Inshore Attack Craft (FAC/FIAC), and future potential for Anti-Surface Warfare (ASuW). This funding supports the testing and refinement of pulse current transfer, mount, and hypervelocity projectile component development. In addition, this project supports the continuing effort to define and evolve requirements related to mount and platform interface management and maturations of specifications for tactical railgun weapon system.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019
Congressional Add: High Energy Storage Modules	5.790	0.000
FY 2018 Accomplishments: - Initiated prototype development based on systems and design engineering efforts. - Resourced Navy technical agents and SMEs to work with OEM to define interface requirements, operational requirements, integration considerations and safety test plan. - Initiated modeling and simulation demonstrations in order to support FY19 operational, thermal and safety development and FY19 T&E.		

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603925N / *Directed Energy and Electric Weapon System*	**Project (Number/Name)** 9999 / *Congressional Adds*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019
- Initiated contracting for FY19 SBIR Phase III to execute scale-up and produce cells and battery packs to support initial test and evaluation. - Developed basis for 1000VDC battery system employment. - Develop prototype and conduct modeling and simulation demonstrations in order to support operational, thermal and safety development and A19 T&E. - Execute SBIR Phase III for scale-up and produce cells and battery packs to support initial test and evaluation. -Perform cycle and safety Test & Evaluation at the cell and module level in accordance with NAVSEAINST 9310. ***FY 2019 Plans:*** N/A		
Congressional Add: Electromagnetic Railgun ***FY 2018 Accomplishments:*** N/A ***FY 2019 Plans:*** - Conduct Pulse Current Transfer Development/Testing to upgrade Electric Weapon Systems Integration Lab (EWSIL) with hardware/software necessary to support testing and conduct test events. - Complete design and fabrication work necessary to add cooling and elevation evaluation capabilities to EWSIL. - Conduct design and fabrication work necessary for prototyping of low-loss coaxial buswork. - Conduct Mount Component Development to builds and refine prototype design for blowback mitigation system for use with railgun. - Conduct Topside Integration/Platform and System Trade studies. - Continue Mount/Platform Interface Development. - Continue railgun system materials testing and analysis. - Initiate Projectile Interface Development.	0.000	10.000
Congressional Add: SNLWS Program Rephasing ***FY 2018 Accomplishments:*** N/A. ***FY 2019 Plans:*** - Procure the following long lead materials: Beam Director subsystem and Beam Control subsystem.	0.000	15.900
Congressional Adds Subtotals	5.790	25.900

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603925N / *Directed Energy and Electric Weapon System*	**Project (Number/Name)** 9999 / *Congressional Adds*

D. Acquisition Strategy

Project 9999 (PU C407)- Leverage Naval Surface Warfare Center resources and competencies to support technical direction, contracting methodologies (utilizing SBIR Phase III technology transfer) and safety certification capabilities.

The Surface Navy Laser Weapon System (SNLWS) was initiated under the authority granted by the Middle-Tier Acquisition legislation (Section 804 of the FY16 NDAA) in accordance with CNO's direction. The SNLWS program supports the National Defense Strategy of building a more lethal force by leveraging mature technology to deliver proven laser weapon capability to the Fleet. HELIOS provides a capability to address Anti-Surface Warfare and Counter-Intelligence, Surveillance and Reconnaissance (C-ISR) gaps with the ability to dazzle and destroy Unmanned Aerial Systems (UAS) and defeat Fast Inshore Attack Craft (FIAC). SNLWS provides for industry-developed and government integrated capability to the Fleet in as short a timeframe as possible, thereby addressing the National Defense Strategy direction to foster a culture of affordability. SNLWS includes the development of an advanced prototype laser weapon system in the 60 kW or higher class. Competition is utilized for system development and prototype production efforts. The acquisition strategy permits accelerated fielding of laser weapon systems in the Fleet. The acquisition strategy consists of a baseline development and production of a single test unit followed by options for fixed price production units.

Project 9999 (PU C440) - Leverage Naval Surface Warfare Center and University Affiliated Research Centers (UARC) resources and competencies to support electromagnetic railgun system engineering activities to mature technologies in support of transition to a Program of Record. These study and prototype activities provide influence on prototype design and test to optimize readiness and capability for transition to a Navy tactical application.

E. Performance Metrics

Project 9999 (PU C407):
-Produce Interface Control Documents to define electrical, thermal, and controls approaches to maximize applicability of 1000V batteries
-Produce test plans for cell, module, and system level abusive testing in accordance with Navy requirements
-Perform Cell-level Safety Testing
-Perform Safety and Performance Testing at the Module Level
-Establish mature design and perform scale up of microfibrous media-phase change materials (MFM-PCM) battery packs to support 1,000VDC battery builds

Project 9999 (PU C453):
Supports conduct of SNLWS Preliminary Design Review

Project 9999 (PU C440):
-Install and conduct test events: design and fabricate necessary hardware, update test plans for testing, conduct Test Event Readiness Reviews, generate respective test reports.
-Produce design, fabricate, and test prototype coaxial buswork.
-Refine and build prototype design for blowback mitigation system.
-Produce updated Systems Engineering Plan (SEP), Configuration Management (CM) Plan, and the Technical Risk Assessment Planning (TRAP) and maturation of specifications for tactical RGWS.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603925N / *Directed Energy and Electric Weapon System*	**Project (Number/Name)** 9999 / *Congressional Adds*

-Produce design, fabricate, and test armatures for Railgun launch packages.
-Conduct testing, mitigation designs and testing.
-Produce test reports from railgun materials testing.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603925N / *Directed Energy and Electric Weapon System*	Project (Number/Name) 9999 / *Congressional Adds*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
C407-High Energy Storage Modules	C/CPFF	Intramicron : Auburn, AL	0.000	4.836	Jan 2019	0.000		0.000		-		0.000	0.000	4.836	-
C453- SNLWS Development	C/CPIF	Lock Martin Aculight : Bothell, WA	0.000	0.000		14.990	Nov 2018	0.000		-		0.000	0.000	14.990	-
C440- APCT Hardware Fabrication	MIPR	DOTC : Picatinny Arsenal, NJ	0.000	0.000		0.860	Jun 2019	0.000		-		0.000	0.000	0.860	-
C440- PCT/Breech Interface and Blowback Mitigation Fabrication	WR	NSWC Dahlgren : Dahlgren, VA	0.000	0.000		0.200	Feb 2019	0.000		-		0.000	0.000	0.200	-
		Subtotal	0.000	4.836		16.050		0.000		-		0.000	0.000	20.886	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
C407-Power & Energy IPT	WR	NSWC Philadelphia : Philadelphia, PA	0.000	0.575	Jul 2018	0.000		0.000		-		0.000	0.000	0.575	-
C407-Support to Power & Energy IPT	WR	NSWC Crane : Crane, IN	0.000	0.379	Jul 2018	0.000		0.000		-		0.000	0.000	0.379	-
C453- Support SNLWS Development	WR	NSWC Dahlgren : Dahlgren, VA	0.000	0.000		0.910	Feb 2019	0.000		-		0.000	0.000	0.910	-
C440-APCT Development Support and Oversight	WR	NSWC Dahlgren, : Dahlgren, VA	0.000	0.000		2.019	Feb 2019	0.000		-		0.000	0.000	2.019	-
C440-Mount Component Development, SE Support, and Technical Oversight	WR	NSWC Dahlgren : Dahlgren, VA	0.000	0.000		0.819	Feb 2019	0.000		-		0.000	0.000	0.819	-
C440-Blowback Mitigation	FFRDC	APL : Laurel, MD	0.000	0.000		0.200	Feb 2019	0.000		-		0.000	0.000	0.200	-
C440-Mount Platform Interface Development, Requirements and Specification Management	WR	NSWC Dahlgren : Dahlgren, VA	0.000	0.000		0.570	Feb 2019	0.000		-		0.000	0.000	0.570	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603925N / *Directed Energy and Electric Weapon System*	Project (Number/Name) 9999 / *Congressional Adds*	

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
C440-Topside Integration / Platform Studies, SE Support, and Technical Oversight	WR	NSWC Dahlgren : Dahlgren, VA	0.000	0.000		0.250	Feb 2019	0.000		-		0.000	0.000	0.250	-
C440- System Trade Studies	WR	NSWC Dahlgren : Dahlgren, VA	0.000	0.000		0.250	Feb 2019	0.000		-		0.000	0.000	0.250	-
C440- Munition Interface Development and Technical Oversight	WR	NSWC Dahlgren : Dahlgren, VA	0.000	0.000		0.706	Feb 2019	0.000		-		0.000	0.000	0.706	-
C440- Program Technical Oversight	WR	NSWC Dahlgren : Dahlgren, VA	0.000	0.000		0.500	Feb 2019	0.000		-		0.000	0.000	0.500	-
		Subtotal	0.000	0.954		6.224		0.000		-		0.000	0.000	7.178	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
C440- APCT Test Execution	WR	NSWC Dahlgren : Dahlgren, VA	0.000	0.000		2.020	Feb 2019	0.000		-		0.000	0.000	2.020	-
C440- Risk Reduction and Railgun Testing	WR	NSWC Dahlgren : Dahglren, VA	0.000	0.000		0.706	Feb 2019	0.000		-		0.000	0.000	0.706	-
C440- Railgun Materials Testing	WR	Naval Post Graduate School : San Diego, CA	0.000	0.000		0.900	Oct 2019	0.000		-		0.000	0.000	0.900	-
		Subtotal	0.000	0.000		3.626		0.000		-		0.000	0.000	3.626	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	5.790		25.900		0.000		-		0.000	0.000	31.690	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603925N / *Directed Energy and Electric Weapon System*	**Project (Number/Name)** 9999 / *Congressional Adds*

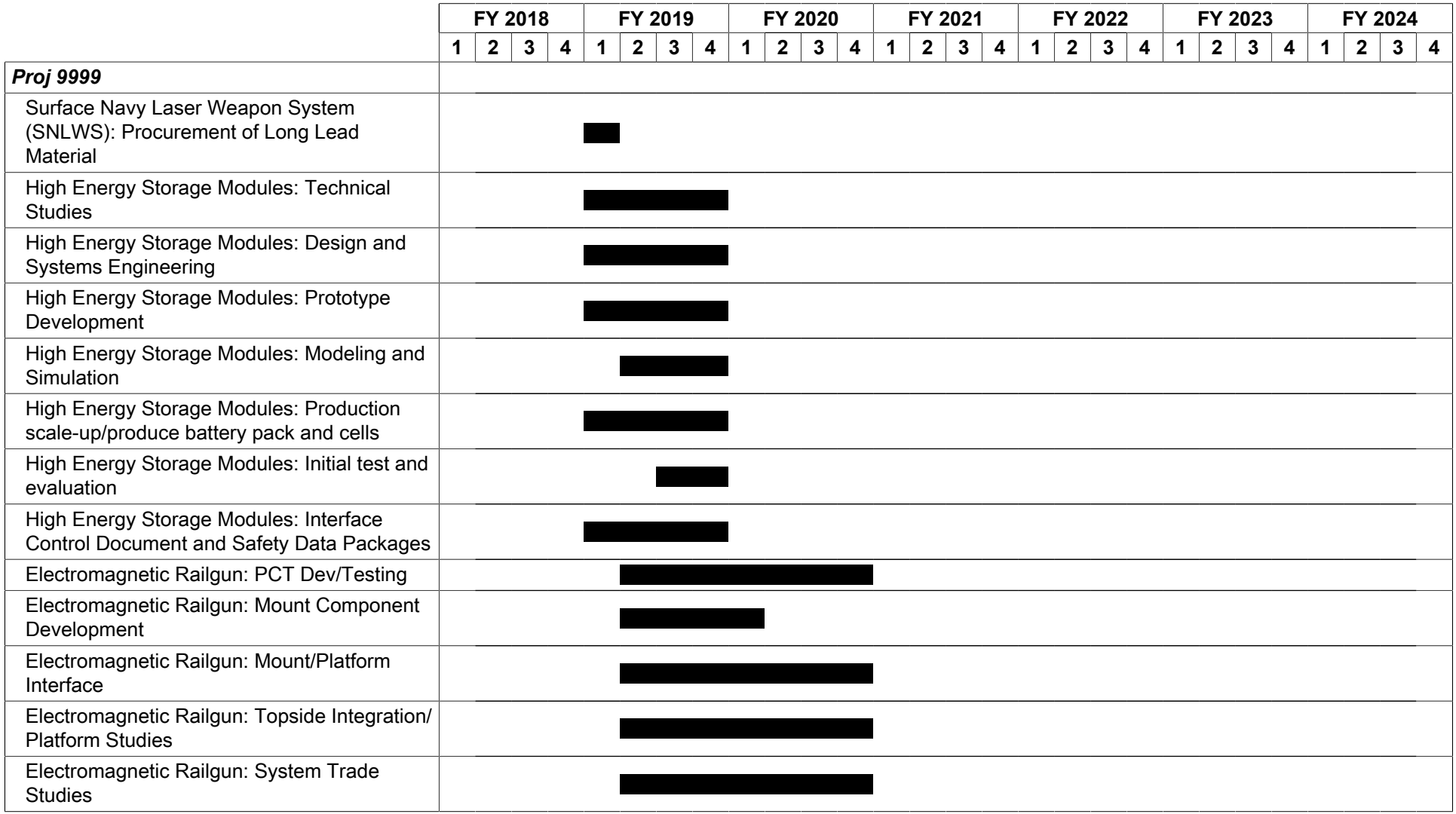


Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603925N / *Directed Energy and Electric Weapon System*	**Project (Number/Name)** 9999 / *Congressional Adds*

	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Electromagnetic Railgun: Projectile/RGS Interface Development						[redacted]																						

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603925N / *Directed Energy and Electric Weapon System*	**Project (Number/Name)** 9999 / *Congressional Adds*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 9999				
Surface Navy Laser Weapon System (SNLWS): Procurement of Long Lead Material	1	2019	1	2019
High Energy Storage Modules: Technical Studies	1	2019	4	2019
High Energy Storage Modules: Design and Systems Engineering	1	2019	4	2019
High Energy Storage Modules: Prototype Development	1	2019	4	2019
High Energy Storage Modules: Modeling and Simulation	2	2019	4	2019
High Energy Storage Modules: Production scale-up/produce battery pack and cells	1	2019	4	2019
High Energy Storage Modules: Initial test and evaluation	3	2019	4	2019
High Energy Storage Modules: Interface Control Document and Safety Data Packages	1	2019	4	2019
Electromagnetic Railgun: PCT Dev/Testing	2	2019	4	2020
Electromagnetic Railgun: Mount Component Development	2	2019	1	2020
Electromagnetic Railgun: Mount/Platform Interface	2	2019	4	2020
Electromagnetic Railgun: Topside Integration/Platform Studies	2	2019	4	2020
Electromagnetic Railgun: System Trade Studies	2	2019	4	2020
Electromagnetic Railgun: Projectile/RGS Interface Development	2	2019	4	2020

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy											Date: March 2019	
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0604014N *I (U)F/A-18 Infrared Search and TRack (IRST)*							
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
Total Program Element	0.000	68.087	108.689	113.456	-	113.456	83.645	34.785	25.607	9.518	Continuing	Continuing
2069: *F/A-18 Infrared Search and Track (IRST)*	0.000	68.087	108.689	113.456	-	113.456	83.645	34.785	25.607	9.518	Continuing	Continuing
Program MDAP/MAIS Code: **Project MDAP/MAIS Code(s):** P510												

A. Mission Description and Budget Item Justification

The F/A-18 E/F Infra-Red Search and Track (IRST) system is a passive long-wave Infra-Red (IR) sensor that provides an alternate fire control system in a high Electronic Attack (EA) / Radio Detection and Ranging (RADAR) denied environment. The IRST Block II Engineering Change Proposal (ECP) upgrades two Weapons Replaceable Assemblies (WRAs); the Infra-Red Receiver (IRR) and processor in order to provide full Capabilities Development Document (CDD) capability and enhanced warfighting capability through an improved engagement timeline, improved situational awareness, longer range passive detection and tracking, and a larger field of regard with specification performance.

IRST was previously completed under Program Element 0204136N F/A-18 Squadrons and has been transferred to Program Element 0604014N F/A-18 Infrared Search and Track (IRST).

B. Program Change Summary ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	0.000	108.700	120.927	-	120.927
Current President's Budget	68.087	108.689	113.456	-	113.456
Total Adjustments	68.087	-0.011	-7.471	-	-7.471
• Congressional General Reductions	-	-0.011			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-2.813	0.000			
• Program Adjustments	0.000	0.000	-7.471	-	-7.471
• Rate/Misc Adjustments	0.000	0.000	0.000	-	0.000
• Congressional Directed Reductions Adjustments	-16.000	-	-	-	-
• Congressional Add Adjustments	86.900	-	-	-	-

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0604014N *I (U)F/A-18 Infrared Search and TRack (IRST)*

Change Summary Explanation

The FY 2020 funding request was reduced by $10.000 million to account for the availability of prior year execution balances.

Technical: Not applicable.
Schedule: The schedule has been updated to reflect program execution status.

The FY 2020 budget has a net increase of $4.8 million. This is due to increase to flight testing and support of fly-fix-fly testing of final software builds effecting data analysis. After achieving Block II ECP Milestone C on 4 December 2018, $3.0 million was added via tech correction to support Block II risk reduction activities. Additional flight tests will be conducted for sensor tuning and integrated developmental/operational flight test.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604014N / *(U)F/A-18 Infrared Search and TRack (IRST)*	Project (Number/Name) 2069 / *F/A-18 Infrared Search and Track (IRST)*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
2069: *F/A-18 Infrared Search and Track (IRST)*	0.000	68.087	108.689	113.456	-	113.456	83.645	34.785	25.607	9.518	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Project MDAP/MAIS Code: P510

Note

Infrared Search and Track was funded in FY16 and prior under PE 0204136N / F/A-18 Squadrons, PU 1662 F/A-18 Improvements. Funding was realigned to a new PU 2069 / F/A-18 Infrared Search and Track (IRST)in FY17 and then transferred to a new PE 0604014N / F/A-18 Infrared Search and Track (IRST) under PU 2069 / F/A-18 Infrared Search and Track (IRST) in FY18.

A. Mission Description and Budget Item Justification

F/A-18 Infra-Red Search and Track (IRST): The F/A-18 E/F Infrared Search and Track system is a passive long-wave Infra-Red sensor which provides an alternate fire control system in a high Electronic Attack / Radio Detection and Ranging denied environment. The Infrared Search and Track Block II Engineering Change Proposal upgrades two Weapons Replaceable Assemblies; the Infra-Red Receiver and processor; and modifies the sensor assembly structure accordingly in order to provide full Capabilities Development Document capability and enhanced warfighting capability through an improved engagement timeline, improved situational awareness, longer range passive detection and tracking and a larger field of regard with specification performance.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Infra-Red Search and Track (IRST)	68.087	108.689	113.456	0.000	113.456
Articles:	-	-	-	-	-
Description: Technology development and engineering and manufacturing development of an IRST sensor for the F/A-18 E/F. Block I supported technology development and engineering and manufacturing development of an IRST sensor for the F/A-18E/F to provide an alternate fire control system in a high Electronic Attack / Radio Detection and Ranging (RADAR) denied environment. Block I systems currently in production will be utilized as test assets for continued integration, tactics development and aircrew familiarization; will be upgraded via retrofit to a Block II configuration prior to fleet delivery. Block II IRST upgrades the Infra-Red Receiver (IRR) and processor to provide full Capabilities Development Document (CDD) capability and enhanced warfighting capability through an improved engagement timeline, improved situational awareness, longer range passive detection and tracking and a larger field of regard with specification performance.					
FY 2019 Plans:					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604014N / *(U)F/A-18 Infrared Search and TRack (IRST)*	**Project (Number/Name)** 2069 / *F/A-18 Infrared Search and Track (IRST)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Continue IRST Block II ECP Development Phase 2 (hardware and software). Conduct IRST Block II Technology Readiness Review. Continue IRST Integration Testing (H14 and H16). Continue development of support equipment. Continue King Air Integration Lab flight testing. Continue Block I/II prototype/EDM conversions and upgrades to full Block II configuration. ***FY 2020 Base Plans:*** Continue IRST Block II ECP Development Phase 2 (hardware and software). Continue IRST Integration Testing with H16. Continue development of support equipment. Continue Block I/II prototype/EDM conversions and upgrades to full Block II configuration. Continue Block II prototype and begin Block II EDM configuration lab and flight test, flight worthiness, and qualification. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increase of $4.8M due primarily to risk reduction activities, increased flight test, associated analysis, and software updates.					
Accomplishments/Planned Programs Subtotals	68.087	108.689	113.456	0.000	113.456

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• APN/05250: *F-18 Series Mod (OSIP 04-14)*	134.034	60.195	85.835	-	85.835	185.110	229.598	199.719	208.859	321.601	1,582.317

Remarks

D. Acquisition Strategy

The Infrared Search and Track system is an evolutionary Navy acquisition program with Block I and Block II capabilities. The Infrared Search and Track Block I system developed by the Navy provides a basic capability, supported integration of the sensor onto a fuel tank and into the aircraft and supported aeromechanical flight test required for clearance and carrier qualification of the system. Infrared Search and Track Block I is in the Production and Deployment phase following a successful Milestone C decision in December 2014 and will support continued integration with the F/A-18E/F Advanced Mission Computer software through flight testing with System Configuration Sets H14 and H16.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604014N / *(U)F/A-18 Infrared Search and TRack (IRST)*	**Project (Number/Name)** 2069 / *F/A-18 Infrared Search and Track (IRST)*

Infrared Search and Track Block II is an Engineering Change Proposal that upgrades two Weapons Replaceable Assemblies and provides full Capabilities Development Document capability. Early risk reduction activities were initiated in FY2016 and the program executed a pre-development In-Progress Review (IPR 1) in October 2017. The IRST Block II ECP achieved Milestone C on 4 December 2018 and entered into low rate initial production (APN-5 funded) to achieve an Initial Operating Capability in 4th Quarter FY2021.

E. Performance Metrics

Infrared Search and Track Program achieved Milestone B on 17 June 2011, achieved Milestone C on 02 December 2014. Infrared Search and Track Block II Pre-Development IPR-1 was conducted 1st Quarter 2018; Block II ECP Milestone C was achieved on 4 December 2018. Infrared Search and Track Block II systems are beginning production in FY2019 (LRIP III, APN-5, Qty-6) and will achieve Initial Operating Capability in 4th Quarter FY 2021

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604014N / *(U)F/A-18 Infrared Search and TRack (IRST)*	**Project (Number/Name)** 2069 / *F/A-18 Infrared Search and Track (IRST)*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Primary Development (Hardware/Software) Infra-Red Search and Track	Various	Boeing : St. Louis, MO	0.000	30.733	Dec 2017	49.228	Dec 2018	46.200	Dec 2019	-		46.200	137.658	263.819	263.819
Hardware Development	MIPR	USAF (MIT) : Hanscom AFB, MA	0.000	0.060	Dec 2017	1.020	Jul 2019	1.040	Jul 2020	-		1.040	Continuing	Continuing	Continuing
Software Development	WR	NAWCWD : China Lake, CA	0.000	1.423	Dec 2017	3.348	Nov 2018	4.359	Nov 2019	-		4.359	Continuing	Continuing	Continuing
Infrared Search and Track Support Equipment Development	WR	NAWCAD : Lakehurst, NJ	0.000	0.045	Nov 2017	0.050	Nov 2018	0.812	Nov 2019	-		0.812	Continuing	Continuing	Continuing
Primary Development	Various	NSMA : Various	0.000	24.217	Jan 2018	42.518	Nov 2018	40.368	Nov 2019	-		40.368	Continuing	Continuing	Continuing
		Subtotal	0.000	56.478		96.164		92.779		-		92.779	Continuing	Continuing	N/A

Remarks

Prior years were funded under Program Element (PE) 0204136N under Project Units (PUs) 1662 and 2069. NAWCWD China Lake, CA, software development increase supports increased software corrections identified during increased flight testing to support Initial Operating Capability in FY21.

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Development Support	WR	NAWCWD : China Lake, CA	0.000	1.143	Nov 2017	1.181	Nov 2018	1.205	Nov 2019	-		1.205	Continuing	Continuing	Continuing
Development Support	WR	NAWCAD : Patuxent River, MD	0.000	1.637	Nov 2017	3.136	Nov 2018	3.199	Nov 2019	-		3.199	Continuing	Continuing	Continuing
Development Support	WR	NSWC : Indian Head, MD	0.000	0.000		0.060	Nov 2018	0.062	Nov 2019	-		0.062	Continuing	Continuing	Continuing
Development Support	WR	NAWCWD : Pt. Mugu, CA	0.000	0.000		0.022	Dec 2018	0.023	Nov 2019	-		0.023	Continuing	Continuing	Continuing
Development Support	WR	FRC Southeast : Jacksonville, FL	0.000	0.900	Nov 2017	0.890	Nov 2018	0.908	Nov 2019	-		0.908	Continuing	Continuing	Continuing

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604014N / *(U)F/A-18 Infrared Search and TRack (IRST)*	Project (Number/Name) 2069 / *F/A-18 Infrared Search and Track (IRST)*	

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Development Support	C/CPFF	NRL : Washington, DC	0.000	0.339	Dec 2017	0.350	Dec 2018	0.357	Dec 2019	-		0.357	0.369	1.415	1.415
Development Support	WR	NAVSUP : Mechanicsburg, PA	0.000	0.020	Jan 2018	0.042	Jan 2019	0.043	Jan 2020	-		0.043	Continuing	Continuing	Continuing
Obsolescence Redesign	Various	Various : Various	0.000	0.250	Dec 2017	0.255	Dec 2018	0.260	Dec 2019	-		0.260	Continuing	Continuing	Continuing
		Subtotal	0.000	4.289		5.936		6.057		-		6.057	Continuing	Continuing	N/A

Remarks

Prior years were funded under Program Element (PE) 0204136N under Project Units (PUs) 1662 and 2069. NRL total cost reflects effort funded under current PE; prior year funding included $338 thousand for first year of contract effort in FY17 under PE 0204136N which is reflected in target value of contract.

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Developmental Test & Evaluation	WR	NAWCAD : Patuxent River, MD	0.000	1.429	Nov 2017	1.696	Nov 2018	3.816	Nov 2019	-		3.816	Continuing	Continuing	Continuing
Developmental Test & Evaluation	WR	NAWCWD : China Lake, CA	0.000	4.824	Nov 2017	2.183	Nov 2018	5.349	Nov 2019	-		5.349	Continuing	Continuing	Continuing
Operational Test & Evaluation	WR	OPTEVFOR : VX-9	0.000	0.000		1.500	Dec 2018	3.775	Dec 2019	-		3.775	Continuing	Continuing	Continuing
Operational Test & Evaluation - CSS	Various	OPTEVFOR : VX-9	0.000	0.100	Jul 2018	0.120	Jul 2019	0.360	Jul 2020	-		0.360	Continuing	Continuing	Continuing
Operational Test & Evaluation - CSS	Various	OPTEVFOR : Norfolk, VA	0.000	0.000		0.100	Mar 2019	0.300	Mar 2020	-		0.300	Continuing	Continuing	Continuing
		Subtotal	0.000	6.353		5.599		13.600		-		13.600	Continuing	Continuing	N/A

Remarks

Prior years funded in PE 0204136N under PUs 1662 and 2069. Increased flight testing in FY20 to support fly-fix-fly testing of final software builds, sensor tuning, and integrated developmental/operational flight test period.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604014N / *(U)F/A-18 Infrared Search and TRack (IRST)*	**Project (Number/Name)** 2069 / *F/A-18 Infrared Search and Track (IRST)*

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Travel	Various	NAVAIR : Patuxent River, MD	0.000	0.020	Oct 2017	0.020	Oct 2018	0.020	Oct 2019	-		0.020	Continuing	Continuing	Continuing
Program Management Support - MISC	Various	NAWCAD : Patuxent River, MD	0.000	0.947	Oct 2017	0.970	Oct 2018	1.000	Oct 2019	-		1.000	Continuing	Continuing	Continuing
		Subtotal	0.000	0.967		0.990		1.020		-		1.020	Continuing	Continuing	N/A

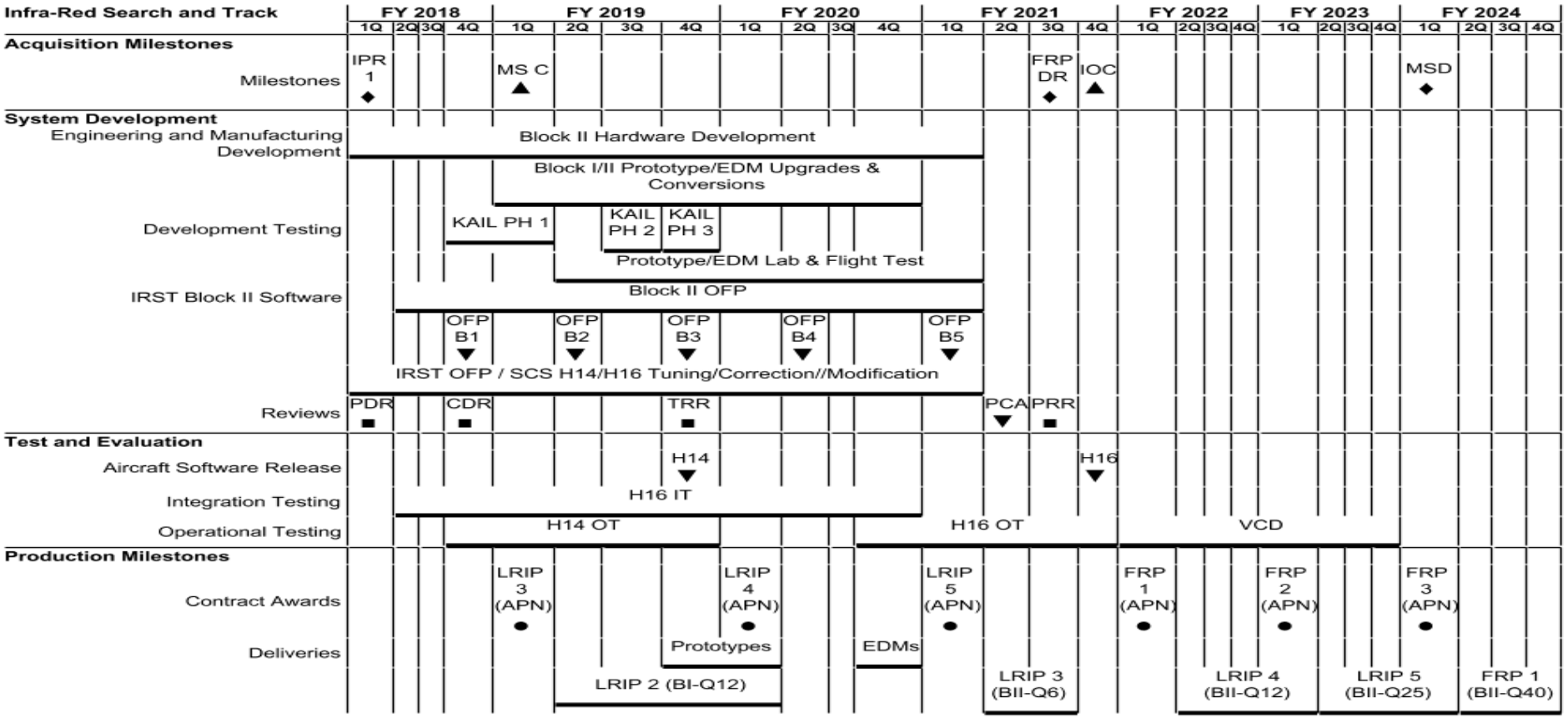
Remarks

Prior years were funded under Program Element (PE) 0204136N under Project Units (PUs) 1662 and 2069.

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	68.087		108.689		113.456		-		113.456	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604014N / *(U)F/A-18 Infrared Search and TRack (IRST)*	**Project (Number/Name)** 2069 / *F/A-18 Infrared Search and Track (IRST)*



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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604014N / *(U)F/A-18 Infrared Search and TRack (IRST)*	**Project (Number/Name)** 2069 / *F/A-18 Infrared Search and Track (IRST)*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Infra-Red Search and Track				
Acquisition Milestones: Milestones: Full Rate Production Decision Review (FRP DR)	3	2021	3	2021
Acquisition Milestones: Milestones: Gate 6 / CSB (IPR 1)	1	2018	1	2018
Acquisition Milestones: Milestones: Block II ECP Milestone C	1	2019	1	2019
Acquisition Milestones: Milestones: Initial Operating Capability (IOC)	4	2021	4	2021
Acquisition Milestones: Milestones: Material Support Date	1	2024	1	2024
System Development: Engineering and Manufacturing Development: Block II ECP Hardware Development	1	2018	1	2021
System Development: Engineering and Manufacturing Development: Sensor Hardware Conversion and Upgrades (Block I/II Prototype & EDM)	1	2019	4	2020
System Development: Development Testing: King Air Integration Lab Block II Phase I	4	2018	1	2019
System Development: Development Testing: King Air Integration Lab Block II Phase II	3	2019	3	2019
System Development: Development Testing: King Air Integration Lab Block II Phase III	4	2019	4	2019
System Development: Development Testing: Block II Test Asset Lab and Flight Testing	2	2019	1	2021
System Development: IRST Block II Software: IRST Block II Software Development	2	2018	1	2021
System Development: IRST Block II Software: IRST OFP SW B1	4	2018	4	2018
System Development: IRST Block II Software: IRST OFP SW B2	2	2019	2	2019
System Development: IRST Block II Software: IRST OFP SW B3	4	2019	4	2019
System Development: IRST Block II Software: IRST OFP SW B4	2	2020	2	2020
System Development: IRST Block II Software: IRST OFP SW B5	1	2021	1	2021
System Development: IRST Block II Software: IRST OFP SW Performance Tuning, Correction & Modification with SCS H14/H16	1	2018	1	2021
System Development: Reviews: Block II ECP System PDR	1	2018	1	2018

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604014N / *(U)F/A-18 Infrared Search and TRack (IRST)*	**Project (Number/Name)** 2069 / *F/A-18 Infrared Search and Track (IRST)*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
System Development: Reviews: Block II ECP System CDR	4	2018	4	2018
System Development: Reviews: Technology Readiness Review (TRR)	4	2019	4	2019
System Development: Reviews: Block II ECP Delta PCA	2	2021	2	2021
System Development: Reviews: Block II ECP PRR	3	2021	3	2021
Test and Evaluation: Aircraft Software Release: SCS H14 Fleet Release	4	2019	4	2019
Test and Evaluation: Aircraft Software Release: SCS H16 Fleet Release	4	2021	4	2021
Test and Evaluation: Integration Testing: SCS H16 Integration Testing	2	2018	4	2020
Test and Evaluation: Operational Testing: SCS H14 Operational Testing	4	2018	4	2019
Test and Evaluation: Operational Testing: Verification of Correction of Deficiencies	1	2022	4	2023
Test and Evaluation: Operational Testing: SCS H16 Operational Testing	4	2020	4	2021
Production Milestones: Contract Awards: Block II LRIP 3 (APN)	1	2019	1	2019
Production Milestones: Contract Awards: Block II LRIP 4 (APN)	1	2020	1	2020
Production Milestones: Contract Awards: Block II LRIP 5 (APN)	1	2021	1	2021
Production Milestones: Contract Awards: Block II FRP 1 (APN)	1	2022	1	2022
Production Milestones: Contract Awards: Block II FRP 2 (APN)	1	2023	1	2023
Production Milestones: Contract Awards: Block II FRP 3 (APN)	1	2024	1	2024
Production Milestones: Deliveries: Block II Prototype Test Assets (RDTE)	4	2019	1	2020
Production Milestones: Deliveries: Block II EDM Test Assets (RDTE)	4	2020	4	2020
Production Milestones: Deliveries: LRIP 2 (Block I Lot 2 - Qty 12)	2	2019	1	2020
Production Milestones: Deliveries: LRIP 3 (Block II Lot 1 - Qty 6)	2	2021	3	2021
Production Milestones: Deliveries: LRIP 4 (Block II Lot 2 - Qty 12)	2	2022	1	2023
Production Milestones: Deliveries: LRIP 5 (Block II Lot 3 - Qty 25)	2	2023	1	2024
Production Milestones: Deliveries: FRP 1 (Block II Lot 4 - Qty 40)	2	2024	4	2024

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0604027N *I (U)Digital Warfare*

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	0.000	14.476	20.000	50.120	-	50.120	55.744	46.142	41.466	42.995	Continuing	Continuing
3255: *AI Dev Ops*	0.000	0.000	0.000	25.000	-	25.000	25.000	15.000	10.000	10.000	Continuing	Continuing
3256: *Warfighting Pilots*	0.000	0.000	0.000	2.000	-	2.000	3.000	4.000	5.000	6.000	Continuing	Continuing
3425: *Digital Warfare*	0.000	14.476	20.000	23.120	-	23.120	27.744	27.142	26.466	26.995	Continuing	Continuing

A. Mission Description and Budget Item Justification

Digital Warfare (DW) supports systems of systems digital engineering and requirements allocation, development of data technical baselines, digital architectures and data models, and provides for experimentation and data science for enterprise and warfare pilots in support of a composeable, modular Navy. DW provides the digital environment that supports the cross-functional/organizational teams performing the modeling and data science work.

B. Program Change Summary ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	0.000	26.691	26.120	-	26.120
Current President's Budget	14.476	20.000	50.120	-	50.120
Total Adjustments	14.476	-6.691	24.000	-	24.000
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-6.691			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.524	0.000			
• Program Adjustments	0.000	0.000	24.000	-	24.000
• Rate/Misc Adjustments	-0.001	0.000	0.000	-	0.000
• Congressional Add Adjustments	15.001	-	-	-	-

Change Summary Explanation

FY18 increase due to funding transfer into this PE from SPAWAR PE 0604231N_3425, NAVSEA PE0603582N_3425 and NAVAIR PE 0605217N_3425.

FY19 decrease is due to Congressional reduction of $6.7 million in project 3425 Digital Warfare due to unjustified request.

FY20 increased due to increase for Artificial Intelligence (AI) development effort and Combat Identification & Targeting (CID&T) Standard and Model Development, Implementation sustainment efforts.

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0604027N *I (U)Digital Warfare*

The FY 2020 funding request was reduced by $3 million to account for the availability of prior year execution balances.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604027N / *(U)Digital Warfare*	Project (Number/Name) 3255 / *AI Dev Ops*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
3255: *AI Dev Ops*	0.000	0.000	0.000	25.000	-	25.000	25.000	15.000	10.000	10.000	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Note

This project is a continuation of a FY2019 Defense-Wide funding effort (Project Harbinger) that was a pathfinder for Navy Artificial Intelligence (AI) Developmental / Operations (DevOps). This PE shifts funding of an existing FY2019 effort to Navy (RDT&E) in FY2020. This project is a new start for the Navy in FY2020.

A. Mission Description and Budget Item Justification

Digital Warfare (DW) requires a comprehensive AI training and DevOps environment for advanced software tools to be deployed in support of highly volatile and rapidly changing warfare and threat environments. Such DevOps efforts are critical in the move to engage the warfighter directly in the development of advanced capabilities in establishing the framework and processes necessary to rapidly discover, develop, mature, certify, field, and train AI and human-machine teams. This overall effort supports our National Defense Strategy 2018 for building a more lethal force by investing in Advanced Autonomous Systems to gain the associated competitive military advantages of this modern capability .

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: New Accomplishment/Planned Program Entry	0.000	0.000	25.000	0.000	25.000
Articles:	-	-	-	-	-
FY 2019 Plans: Funded in FY2019 from Defense Wide PE 0305245D8Z PRJ 245 for $5.2M total					
FY 2020 Base Plans: -$8M to maintain the Project Harbinger effort started under the Algorithmic Warfare Cross-Functional Team (AWCFT). The $8M includes acoustic data acquisition and transfer ($0.4M), data labeling efforts ($1.5M), data engineering lab ($1M), algorithm development and computing infrastructure ($3.6M), algorithm integration ($1.2M), and fielding to fleet ($0.3M). Increase above the $5.2M in AWCFT FY19 funding is for algorithm development and integration. DWO works directly with Undersea Warfighting Development Center (Groton) and COMSUBFOR (Norfolk) for Harbinger and has already tested it on a VACL SSN. This is in direct support of our National Defense Strategy to build a more lethal force using Advanced Autonomous Systems and the CNO's Design 2.0 LOE Green Paragraph 5. -$2M for data architecture team (funds people) to develop a robust and sustainable data strategy for Naval operations to include all sensor data (acoustic, ISR, EW, etc). This expertise does not currently exist in the DoN. -$15M for a DWO project to apply AI/DevOps to the operational level of war. It will develop planning and execution decision aids in support of U.S. Pacific Fleet and the Navy's Distributed Maritime Operations (DMO)					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604027N / *(U)Digital Warfare*	**Project (Number/Name)** 3255 / *AI Dev Ops*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Concept. The project will clean and integrate existing Navy data, leveraging and expanding upon the AI DevOps components established for Project Harbinger. It includes data acquisition and transfer ($1.1M), data labeling efforts ($2.5M), data engineering lab ($2M), algorithm development and computing infrastructure ($7.3M), algorithm integration ($1.9M), and fielding to fleet ($0.2M). This is in direct support of our National Defense Strategy to build a more lethal force using Advanced Autonomous Systems and the CNO's Design 2.0 LOE Blue Paragraph 6. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increase from FY 2019 to FY 2020 -- Project 3255 AI (Artificial Intelligence) Dev Ops is added in FY 2020.					
Accomplishments/Planned Programs Subtotals	0.000	0.000	25.000	0.000	25.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

DW is a non-acquisition effort that informs and matures Navy decisions, which in turn impacts acquisition programs.

E. Performance Metrics

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604027N / *(U)Digital Warfare*	Project (Number/Name) 3255 / *AI Dev Ops*	

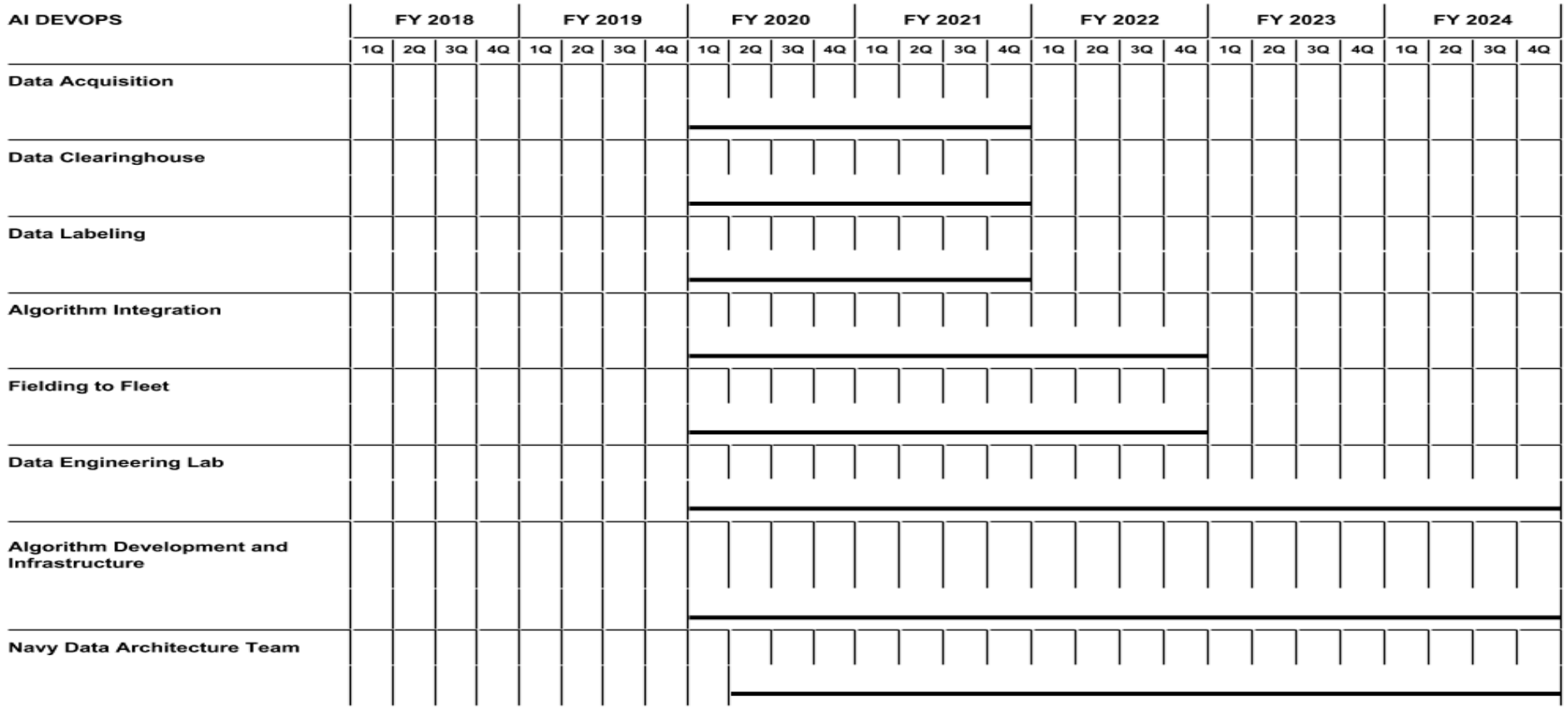
Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
AI DEVOPS	C/CPFF	UARC's : Various	0.000	0.000		0.000		7.000	Oct 2019	-		7.000	Continuing	Continuing	Continuing
AI DEVOPS	WR	WDC,SSCs : Various	0.000	0.000		0.000		5.100	Oct 2019	-		5.100	Continuing	Continuing	Continuing
AI DEVOPS	Various	Various : Various	0.000	0.000		0.000		12.900	Oct 2019	-		12.900	Continuing	Continuing	Continuing
		Subtotal	0.000	0.000		0.000		25.000		-		25.000	Continuing	Continuing	N/A

	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	0.000		0.000		25.000		-		25.000	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604027N / *(U)Digital Warfare*	**Project (Number/Name)** 3255 / *AI Dev Ops*



2020PB - 0604027N - 3255

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604027N / *(U)Digital Warfare*	**Project (Number/Name)** 3255 / *AI Dev Ops*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
AI DEVOPS				
Data Acquisition: Data Acquisition	1	2020	4	2021
Data Clearinghouse: Data Clearinghouse	1	2020	4	2021
Data Labeling: Data Labeling	1	2020	4	2021
Algorithm Integration: Algorithm Integration	1	2020	4	2022
Fielding to Fleet: Fielding to Fleet	1	2020	4	2022
Data Engineering Lab: Data Engineering Lab	1	2020	4	2024
Algorithm Development and Infrastructure: Algorithm Development and Infrastructure	1	2020	4	2024
Navy Data Architecture Team: Navy Data Architecture Team	2	2020	4	2024

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604027N / *(U)Digital Warfare*	Project (Number/Name) 3256 / *Warfighting Pilots*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
3256: *Warfighting Pilots*	0.000	0.000	0.000	2.000	-	2.000	3.000	4.000	5.000	6.000	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Note

This project is a new start in FY2020

A. Mission Description and Budget Item Justification

DW requires extensive information exchanges and message compatibility in order to fully exploit kinetic weapons / target pairing tools. These tools and the related weapons require a robust and extensive set of data to properly engage a target. The Warfighting Pilot effort begins the process of creating message and data standards that will drive Navy to a uniform set of message standards and data. In order to fully leverage and improve the information exchange and weapon employment opportunities, regardless of data link or message type used, a standardized data and message standard is required to maximize todays sensors for over-the-horizon combat identification & targeting.

DWO funds support the various teams and efforts necessary to establish the Track Data Standard. The result will be a fully defined and documented message standard that will be capable of implementation across multiple data link systems. The funds will also support the development of operational and physics based models for various kinetic long range weapon systems.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: New Accomplishment/Planned Program Entry	0.000	0.000	2.000	0.000	2.000
Articles:	-	-	-	-	-
FY 2019 Plans: N/A					
FY 2020 Base Plans: Build conversion standards of multi-security combat identification source data to confidence pedigree index. -Develop weapons "meta-models" for use in mission planning tools enabling more accurate prediction of employment outcomes. -Document field data for message standards. -Coordinate with message standards governance elements across DoD to enable the resulting standard inclusion into existing systems and weapons.					
FY 2020 OCO Plans:					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604027N / *(U)Digital Warfare*	**Project (Number/Name)** 3256 / *Warfighting Pilots*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increase of $2.000 from FY 2019 to FY 2020 supports building conversion standards of multi-security combat identification source data to confidence pedigree index, developing weapons "meta-models" for use in mission planning tools, and coordinating with message standards governance elements across DoD to enable the resulting standard inclusion into existing systems and weapons.					
Accomplishments/Planned Programs Subtotals	0.000	0.000	2.000	0.000	2.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604027N / *(U)Digital Warfare*	Project (Number/Name) 3256 / *Warfighting Pilots*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Warfighting Pilots	WR	SSCs : Various	0.000	0.000		0.000		1.250	Oct 2019	-		1.250	Continuing	Continuing	Continuing
Warfighting Pilots	C/CPFF	JHU/APL : Laurel, MD	0.000	0.000		0.000		0.500	Oct 2019	-		0.500	Continuing	Continuing	Continuing
Warfighting Pilots	C/CPFF	Various : Various	0.000	0.000		0.000		0.250	Oct 2019	-		0.250	Continuing	Continuing	Continuing
		Subtotal	0.000	0.000		0.000		2.000		-		2.000	Continuing	Continuing	N/A

	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	0.000		0.000		2.000		-		2.000	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604027N / *(U)Digital Warfare*	**Project (Number/Name)** 3256 / *Warfighting Pilots*

Warfighting Pilots	Start		End		FY17				FY18				FY19				FY20				FY21				FY22				FY23			
	Quarter	Year	Quarter	Year	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Track Message Development																																
Message Standard Data Collection	4	2020	1	2021																												
CID&T Data Flow Models	2	2020	1	2021																												
Draft Standard Development	2	2020	2	2021																												
Message testing	4	2020	4	2021																												
Program Integration	1	2022	3	2023																												
Weapon Meta Models																																
Meta Model Data Collection	2	2020	1	2021																												
Model Development Spiral 1	4	2020	4	2021																												
Model Development Spiral 2	4	2021	4	2022																												
Model Development Spiral 3	1	2023	4	2023																												

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604027N / *(U)Digital Warfare*	**Project (Number/Name)** 3256 / *Warfighting Pilots*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 3256				
Message Standard Data Collection	4	2020	1	2021
CID&T Data Flow Models	2	2020	1	2021
Draft Standard Development	2	2020	2	2021
Message Detail	4	2020	4	2021
Program Integration	1	2022	3	2023
Meta Model Data Collection	2	2020	1	2021
Model Development Spiral 1	4	2020	4	2021
Model Development Spiral 2	4	2021	4	2022
Model Development Spiral 3	1	2023	4	2023

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604027N / *(U)Digital Warfare*	Project (Number/Name) 3425 / *Digital Warfare*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
3425: *Digital Warfare*	0.000	14.476	20.000	23.120	-	23.120	27.744	27.142	26.466	26.995	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Note

Digital Warfare (DW) was previously funded in SPAWAR PE 0604231N (Tactical Command System), NAVSEA PE 0603582N (Combat System Integration), and NAVAIR 0605217N (Common Avionics) under DW Proj 3425 for FY18 and prior. FY20 and out funding was transferred from SPAWAR and NAVAIR and consolidated under NAVSEA. Mission functions and tasking remain unchanged due to this transfer. FY19 funding to be transferred under NAVSEA once enactment of the FY19 funding occurs.

A. Mission Description and Budget Item Justification

The DW technical initiatives directly support the Chief of Naval Operations (CNO) vision of inherent interoperability across the Navy enabling faster deployment of capabilities to the warfighter.

Naval Air Systems Command (NAVAIR), Naval Sea Systems Command (NAVSEA), Space and Naval Warfare Command (SPAWAR), Program Executive Offices (PEOs), warfare and system centers, University Affiliated Research Centers (UARCs)/Federally Funded Research and Development Centers (FFRDCs), and industry partners will support the Digital Warfare Office (DWO) under the Office of the Chief of Naval Operations (OPNAV) N2N6.

In order to develop capability from the top down, the DWO will develop requirements for System of Systems (SoS) to include all of the associated interoperability requirements. Due to the complexity of this work, the DWO will evolve the traditional requirements development methodology to a MBSE methodology that will encompasses associated model extensions, reports, views, configuration management, model development support, and documentation. This work will be completed by a series of teams, each focused on a separate threat domain, and made up of system modelers, fleet representatives, Program of Record (PoR) representatives, architecture, and interoperability experts. The products generated by these teams will include data technical baselines for domain areas with individual profiles for each program of record, coordinated requirements recommendations, and potential areas for Science and Technology (S&T) and experimentation to fill gaps. The DWO will include emerging digital technologies including human/machine teaming, data science, and artificial intelligence.

DWO funding supports development of requirements modeling and data science experimentation environment at multiple security level. This environment will host the authoritative source of truth for Naval Echelon I requirements development. The DWO will support experimentation to provide necessary fidelity in the requirements allocation process, focusing on areas that may provide solutions across multiple domains.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Digital Warfare (DW) Model Based Systems Engineering (MBSE)	0.000	10.342	0.000	0.000	0.000
Articles:	-	-	-	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604027N / *(U)Digital Warfare*	**Project (Number/Name)** 3425 / *Digital Warfare*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
FY 2019 Plans: -Provide SME support for the domain functional decomposition based on prioritized mission areas to include Anti-Submarine Warfare, Surface Warfare, Electronic Warfare and Air Warfare. -Establish and implement required extensions to model requirements trace and reports that will be used in the Joint Capabilities Integration and Development System (JCIDS) process. -Validate current standards across the SYSCOMs to form the overarching Navy Data Technical Baseline (DTB) in order to facilitate tailoring of each standard for the PoR DTB. -Continue to validate different SYSCOM architectures and guidance to produce a Navy-wide high level architectural framework. -Develop functional baseline architecture of Navy capabilities that maps back to mission threads. -Tune configuration of, and cyber monitor, the distributed Model Based Systems Engineering (MBSE) and data science prototype environment for remote accessibility over a given network enclave, including but not limited to Non-Secure Internet Protocol Router (NIPR), Secure Internet Protocol Router (SIPR), and JointWorldwide Intelligence Communications System (JWICS). Investigate cloud computing with respect to the modeling environment. -Integrate cyber requirements across all Digital Warfare (DW) architecture and standard efforts and verify cyber requirements are captured as part of the modeling process. -Provide subject matter expert support for data science teams in the exploration of data analysis, information and knowledge extraction techniques and application to mission area requirements. -Participate in the definition of MBSE tool functionality and views based on Echelon I stakeholder requirements. Collaboratively develop tool extensions to complement JCIDS and Program Objective Memorandum (POM) processes. -Curate models in the modeling environment and support development across SYSCOMs in Modeling Standards and Policies for Science and Technology (S&T) and Programs of Record (PoRs). -Develop an overarching DTB and DTB profiles for PoRs under SYSCOM cognizance. Assess PoRs against their DTB profile during all Systems Engineering Technical Review events and gate reviews.					
FY 2020 Base Plans: N/A					
FY 2020 OCO Plans: N/A					
FY 2019 to FY 2020 Increase/Decrease Statement:					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604027N / *(U)Digital Warfare*	**Project (Number/Name)** 3425 / *Digital Warfare*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
FY19 to FY20 decrease result of realignment of $10.342M under BSO 24.					
Title: DIGITAL WARFARE	0.000	8.539	0.000	0.000	0.000
Articles:	-	-	-	-	-
FY 2019 Plans: N/A					
FY 2020 Base Plans: N/A					
FY 2020 OCO Plans: N/A					
FY 2019 to FY 2020 Increase/Decrease Statement: A decrease of $8.539 between FY19 to FY20 is due to the consolidation of sub lines into one Project Code. (3425.S19/-$8.539) is moved to Project (3425.S24 - Digital Warfare).					
Title: SYSCOM/PEO DW Support	14.476	1.119	23.120	0.000	23.120
Articles:	-	-	-	-	-
FY 2019 Plans: - Continue to develop functional baseline architecture of Navy capabilities that maps back to mission threads. Provide SME support for the domain functional decomposition based on prioritized mission areas to include Anti-Submarine Warfare, Surface Warfare, Electronic Warfare, Air Warfare, and Strike Warfare. Develop an overarching Data Technical Baseline (DTB) and DTB profiles for PoRs. - Scale the distributed Model Based Systems Engineering (MBSE) and data science environment for remote accessibility over a given network enclave, including but not limited to Non-Secure Internet Protocol Router (NIPR), Secure Internet Protocol Router (SIPR), and Joint Worldwide Intelligence Communications System (JWICS). Port the existing environment to cloud computing. - Continue to participate in the definition of MBSE tool functionality and views based on Echelon I stakeholder requirements. Develop tool extensions to complement Joint Capabilities Integration and Development System (JCIDS) and Program Objective Memorandum (POM) processes. - Curate existing models in the modeling environment and support development of Modeling Standards and Policies for systems engineering - Continue to support fleet experimentation to provide necessary fidelity in the requirements allocation process, focusing on areas that may provide solutions across multiple domains.					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604027N / *(U)Digital Warfare*	**Project (Number/Name)** 3425 / *Digital Warfare*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
- Provide Subject Matter Expert support for data science teams in data exploration and analysis, information and knowledge extraction techniques, and application to mission area data requirements in support of enterprise productivity and warfighting pilots. Explore Machine Learning techniques to support human/machine teaming for decision making. ***FY 2020 Base Plans:*** - Continue to develop functional baseline architecture of Navy capabilities that maps back to mission threads. Provide SME support for the domain functional decomposition based on prioritized mission areas to include Anti-Submarine Warfare, Surface Warfare, Electronic Warfare, Air Warfare, and Strike Warfare. Develop an overarching Data Technical Baseline (DTB) and DTB profiles for PoRs. Generate PoR requirements based on functional models. - Support the distributed Model Based Systems Engineering (MBSE) and data science environment over multiple security enclaves. Test and deploy additional industry standard tools as required. Continue to scale to meet user demand. - Develop tool extensions to complement Joint Capabilities Integration and Development System (JCIDS) and Program Objective Memorandum (POM) processes. - Curate existing models in the modeling environment. - Continue to support fleet experimentation to provide necessary fidelity in the requirements allocation process, focusing on areas that may provide solutions across multiple domains. - Provide Subject Matter Expert support for data science teams in data exploration and analysis, information and knowledge extraction techniques, and application to mission area data requirements in support of enterprise productivity and warfighting pilots. Apply Machine Learning techniques to support human/machine teaming for decision making. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increased of $3.120 between FY 2019 & FY 2020 is for the stand up of multiple concurrent teams on the unclassified and classified networks. An over all Increase of $15.881 between FY19 to FY20 is the total of (3425.L39/-$10.342) plus (3425.S19/-$8.539) which is being moved to one Project (3425 - Digital Warfare) instead of three separate ones. The 3425 - Digital Warfare in FY 2020 funding request was reduced by $3 million to account for the availability of prior year execution balances.					
Accomplishments/Planned Programs Subtotals	14.476	20.000	23.120	0.000	23.120

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604027N / *(U)Digital Warfare*	**Project (Number/Name)** 3425 / *Digital Warfare*

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

DW is a non-acquisition effort that informs and matures Navy decisions, which in turn impacts acquisition programs.

E. Performance Metrics

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604027N / *(U)Digital Warfare*	Project (Number/Name) 3425 / *Digital Warfare*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Digital Warfare (DW)	WR	SSC LANT : Charleston, SC	0.000	0.000		2.280	Dec 2018	0.000		-		0.000	0.000	2.280	-
Digital Warfare (DW)	FFRDC	MITRE : McLean, VA	0.000	0.000		0.615	Nov 2018	0.000		-		0.000	0.000	0.615	-
Digital Warfare (DW)	C/CPFF	VENCORE : Chantilly, VA	0.000	0.000		4.026	Dec 2018	0.000		-		0.000	0.000	4.026	-
Digital Warfare (DW)	C/CPFF	SAIC : McLean, VA	0.000	0.000		3.421	Jan 2019	0.000		-		0.000	0.000	3.421	-
Digital Warfare	C/CPFF	JHU/APL : Laurel, MD	0.000	1.875	May 2018	0.000		3.000	Oct 2019	-		3.000	Continuing	Continuing	Continuing
Digital Warfare	MIPR	MITRE : McLean, VA	0.000	0.430	May 2018	0.000		0.750	Oct 2019	-		0.750	Continuing	Continuing	Continuing
Digital Warfare	C/CPFF	GTRI : San Diego, CA	0.000	0.475	May 2018	0.000		0.750	Oct 2019	-		0.750	Continuing	Continuing	Continuing
Digital Warfare	WR	NAWCs : Various	0.000	1.199	May 2018	0.000		2.500	Oct 2019	-		2.500	Continuing	Continuing	Continuing
Digital Warfare	WR	SSCs : Various	0.000	1.500	May 2018	0.000		2.500	Oct 2019	-		2.500	Continuing	Continuing	Continuing
Digital Warfare	WR	NRL : Washington, DC	0.000	0.700	May 2018	0.000		1.500	Oct 2019	-		1.500	Continuing	Continuing	Continuing
Digital Warfare	C/CPFF	G2OPS : San Diego, CA	0.000	0.500	May 2018	0.000		1.000	Oct 2019	-		1.000	Continuing	Continuing	Continuing
Digital Warfare	C/CPFF	Various : Various	0.000	4.422	May 2018	0.000		4.620	Oct 2019	-		4.620	Continuing	Continuing	Continuing
		Subtotal	0.000	11.101		10.342		16.620		-		16.620	Continuing	Continuing	N/A

Remarks

Digital Warfare funding was transferred to SYSCOM/PEO DW Support in FY20 and out.

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Digital Warfare Support	WR	NAVAIR : Patuxent River, MD	0.000	0.000		2.482	Oct 2018	0.000		-		0.000	0.000	2.482	-
Digital Warfare	WR	NSWCs : Various	0.000	1.775	May 2018	0.119	Dec 2018	2.250	Dec 2019	-		2.250	Continuing	Continuing	Continuing
Digital Warfare	WR	NUWC : Various	0.000	1.600	May 2018	0.500	Dec 2018	2.000	Dec 2019	-		2.000	Continuing	Continuing	Continuing
Digital Warfare	C/CPFF	Various : Various	0.000	0.000		0.500	Dec 2018	1.750	Dec 2019	-		1.750	Continuing	Continuing	Continuing

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604027N / *(U)Digital Warfare*	Project (Number/Name) 3425 / *Digital Warfare*	

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
		Subtotal	0.000	3.375		3.601		6.000		-		6.000	Continuing	Continuing	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Contract Engineer Support	Various	Various : Various	0.000	0.000		6.057	Dec 2018	0.000		-		0.000	0.000	6.057	-
Digital Warfare	C/CPFF	Various : Various	0.000	0.000		0.000		0.500	Dec 2019	-		0.500	Continuing	Continuing	Continuing
		Subtotal	0.000	0.000		6.057		0.500		-		0.500	Continuing	Continuing	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	14.476		20.000		23.120		-		23.120	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604027N / *(U)Digital Warfare*	Project (Number/Name) 3425 / *Digital Warfare*	

FY19	Start		End		FY17				FY18				FY19				FY20				FY21				FY22				FY23			
	Quarter	Year	Quarter	Year	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Theater ASW Spiral 2 (C2)	1	2019	1	2019																												
Undersea Spiral 3 (Sensors)	1	2019	4	2019																												
Undersea Spiral 4 (Weapons)	3	2019	4	2019																												
Surface Spiral 1 (Pilot)	1	2019	1	2019																												
Surface Spiral 2 (C2)	1	2019	4	2019																												
Surface Spiral 3 (Sensors)	3	2019	4	2019																												
Surface Sprial 4 (Weapons)	3	2019	4	2019																												
IW/EW Spiral 1 (Pilot)	1	2019	4	2019																												
IW/EW Spiral 2 (C2)	3	2019	4	2019																												
Air Spiral 1 (Pilot)	2	2019	2	2019																												
Air Spiral 2 (C2)	4	2019	4	2019																												
Land Sprial 1 (Pilot)	2	2019	4	2019																												
Land Spiral 2 (C2)	4	2019	4	2019																												
Digital Pilot Modeling and Analysis	1	2019	4	2019																												

** Note this schedule has been incorporated with 3425.S24 -- Digital Warfare starting with FY 2020

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604027N / *(U)Digital Warfare*	Project (Number/Name) 3425 / *Digital Warfare*	

	Start		End		FY17				FY18				FY19				FY20				FY21				FY22				FY23			
	Quarter	Year	Quarter	Year	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
DW Support	1	2019	4	2023																												

** Note this schedule has been incorporated with 3425.S24 -- Digital Warfare starting with FY 2020

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604027N / *(U)Digital Warfare*	**Project (Number/Name)** 3425 / *Digital Warfare*

	Start		End		FY17				FY18				FY19				FY20				FY21				FY22				FY23			
	Quarter	Year	Quarter	Year	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
SCHEDULE DETAILS CONSOLIDATED TO INCLUDE 19 & 39 TASK DETAILS FY 2020 & Out																																
Undersea Spiral 1 (TASW C2)	1	2018	4	2018																												
Undersea Spiral 2 (ASW C2)	4	2018	3	2019																												
Undersea Spiral 3 (Sensors)	3	2019	3	2020																												
Undersea Spiral 4 (Weapons)	3	2020	3	2021																												
Undersea Spiral 5 (Readiness)	3	2021	3	2022																												
Undersea Req Curation/Threat Updates	4	2018	4	2023																												
Surface Spiral 1 (MOC C2)	3	2018	3	2019																												
Surface Spiral 2 (SUW C2)	3	2019	3	2020																												
Surface Spiral 3 (Sensors)	3	2020	3	2021																												
Surface Spiral 4 (Weapons)	3	2021	3	2022																												
Surface Spiral 5 (Readiness)	3	2022	3	2023																												
Surface Req Curation/Threat Updates	3	2019	4	2023																												
IW/EW Spiral 1 (C2)	4	2018	4	2019																												
IW/EW Spiral 2 (Sensors)	3	2019	3	2020																												
IW/EW Spiral 3 (Weapons)	3	2020	3	2021																												
IW/EW Spiral 4 (Readiness)	3	2021	3	2022																												
IW/EW Req Curation/Threat Updates	4	2019	4	2023																												
Air Spiral 1 (C2)	2	2019	2	2020																												
Air Spiral 2 (Sensors)	2	2020	2	2021																												
Air Spiral 3 (Weapons)	2	2021	2	2022																												
Air Spiral 4 (Readiness)	2	2022	2	2023																												
Air Req Curation/Threat Updates	2	2020	4	2023																												
Land Spiral 1 (C2)	3	2019	3	2020																												
Land Spiral 2 (Sensors)	3	2020	3	2021																												
Land Spiral 3 (Weapons)	3	2021	3	2022																												
Land Spiral 4 (Readiness)	3	2022	3	2023																												
Land Req Curation/Threat Updates	3	2020	4	2023																												
MBSE/Data Science Environment	1	2018	4	2023																												
MBSE Methodology/Tool Development	1	2018	4	2023																												
Pilots and Experimentation (Aperiodic)	1	2018	4	2023																												

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604027N / *(U)Digital Warfare*	**Project (Number/Name)** 3425 / *Digital Warfare*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 3425.L39				
The following items have been moved/consolidated with 3425.S24 for FY2020 and out:	1	2018	4	2023
--Theater ASW Spiral 2 (C2)	1	2019	1	2019
--Undersea Spiral 3 (Sensors)	1	2019	4	2019
--Undersea Spiral 4 (Weapons)	3	2019	4	2019
--Surface Spiral 1 (Pilot)	1	2019	1	2019
--Surface Spiral 2 (C2)	1	2019	4	2019
--Surface Spiral 3 (Sensors)	3	2019	4	2019
--Surface Sprial 4 (Weapons)	3	2019	4	2019
--IW/EW Spiral 1 (Pilot)	1	2019	4	2019
--IW/EW Spiral 2 (C2)	3	2019	4	2019
--Air Spiral 1 (Pilot)	2	2019	2	2019
--Air Spiral 2 (C2)	4	2019	4	2019
--Land Sprial 1 (Pilot)	2	2019	4	2019
--Land Spiral 2 (C2)	4	2019	4	2019
--Digital Pilot Modeling and Analysis	1	2019	4	2019
The following items have been moved/consolidated with 3425.S24 for FY2020 and out	1	2018	4	2023
--DW Support	1	2019	4	2023
SCHEDULE DETAILS CONSOLIDATED TO INCLUDE 19 & 39 TASK DETAILS.	1	2018	4	2023
Undersea Spiral 1 (TASW C2)	1	2018	1	2024
Undersea Spiral 2 (ASW C2)	4	2018	3	2019
Undersea Spiral 3 (Sensors)	3	2019	3	2020

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0604028N *I (U)Small and Medium Unmanned Undersea Vehicles*

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	0.000	0.000	16.717	32.527	-	32.527	53.991	20.506	30.748	13.044	Continuing	Continuing
3123: *SMCM UUV*	0.000	0.000	16.717	22.747	-	22.747	20.666	16.413	6.789	2.541	Continuing	Continuing
3785: *Razorback*	0.000	0.000	0.000	9.780	-	9.780	33.325	4.093	23.959	10.503	Continuing	Continuing

Note

FY 2018 and prior funding for Project 3123 in Program Element (PE) 0603502N. Project 3123 SMCM UUV realigned from PE 0603502N starting in FY 2019.

Razorback is not a new start program. FY 2019 and prior funding in PE 0604218N. Project 3785 Razorback realigned from PE 0604218N starting in FY 2020. SAFECAP is not a new start. FY 2019 and prior funding in PE 0603561N.

SAFECAP realigned from PE 0603561N Project 2033 to PE 0604028N Project 3785 beginning in FY 2020.

A. Mission Description and Budget Item Justification

Small and Medium Unmanned Undersea Vehicles (UUVs) are a segment of the Navy's UUV Family of Systems (FoS) defined as having a diameter between 3 inches and 10 inches for small UUVs and a diameter of 10 inches to 21 inches for medium UUVs. The UUVs can be launched by submarines, surface ships, or larger UUVs, and can be recovered by surface ships and submarines. This class of UUVs can have one or more types of sensors to perform multiple missions including Intelligence Preparation of the Operational Environment (IPOE), battlespace awareness, and mine warfare. In order to accelerate future capability and support steady growth of the Navy's UUV FoS, the Knifefish Surface Mine Countermeasures Unmanned Undersea Vehicle (SMCM UUV) program develops advanced medium class UUVs to support clandestine mine detection capability against volume, bottom, and buried mines. Equipment includes vehicles and associated systems support equipment. In parallel, Block Upgrade design efforts aligned to Fleet needs, are ongoing to support insertion of incremental capability when the technology is ready. Planned Block Upgrade candidates being considered include increased detection range capability, communications upgrades, on-board sonar processing and target recognition, command and control improvements, increased operational depth, and other smaller tasks, as well as future payloads as required. Littoral Battlespace Sensing - Autonomous Undersea Vehicle Submarine Variant (LBS-AUV(S)), also known as Razorback, is a medium class UUV capable of persistent, autonomous, ocean sensing and data collection in support of Navy Intelligence Preparation of the Operational Environment (IPOE) mission. Razorback is deployed from host submarines in two variants: from the Dry Deck Shelter (DDS) or from the Torpedo Tube. The DDS deployed Razorback variant has been procured beginning in FY 2017 with Fleet operational deployments planned for FY 2020. Development of requirements and submarine integration efforts commenced in FY 2019 for the torpedo tube deployed variant, which will be competitively sourced to industry by FY 2021.

In order to deploy Razorback, or other small or medium class UUVs from a host submarine platform with sufficient endurance to perform a desired mission, high energy density sources such as lithium ion batteries are used. Consequently, safety is paramount and mitigation systems must be in place to prevent or stop a high energy casualty event. SAFECAP is being developed as an active mitigation strategy that includes a shock qualified capsule that aides in the launch and recovery of small and medium sized vehicles through the torpedo tube. It also contains a Battery Casualty Detection System that constantly monitors battery health and status, providing early

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0604028N *I (U)Small and Medium Unmanned Undersea Vehicles*

warning signs of a battery short via an alarm. In the event of a casualty, the capsule and vehicle portion of SAFECAP are flooded via the fire hose connections and the event is extinguished.

B. Program Change Summary ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	0.000	16.717	22.747	-	22.747
Current President's Budget	0.000	16.717	32.527	-	32.527
Total Adjustments	0.000	0.000	9.780	-	9.780
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Program Adjustments	0.000	0.000	9.780	-	9.780

Change Summary Explanation

Program Changes: FY 2020 +$9,780K UUV Family of Systems (FoS) realignment
Technical: Not applicable.
Schedule: Not applicable.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604028N / *(U)Small and Medium Unmanned Undersea Vehicles*	Project (Number/Name) 3123 / *SMCM UUV*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
3123: *SMCM UUV*	0.000	0.000	16.717	22.747	-	22.747	20.666	16.413	6.789	2.541	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Note

FY 2018 and prior funding in PE 0603502N. Project 3123 SMCM UUV realigned from PE 0603502N starting in FY 2019.

Operational Assesment (OA) was delayed from FY 2018 to FY 2019 in order to implement fixes/updates to system performance discovered during FY 2018 Developmental Testing (DT) prior to Milestone C (MS C). MS C shifts from 4Q FY 2018 to 2Q FY 2019. As a result, Initial Operational Capability (IOC) shifts into FY 2020, and Full Rate Production (FRP) Decision shifts to FY 2021.

A. Mission Description and Budget Item Justification

As part of the UUV Family of Systems (FoS) and in support of the Mine Countermeasures (MCM) Mission Package (MP), the Knifefish Surface Mine Countermeasures Unmanned Undersea Vehicle (SMCM UUV) program develops advanced medium class UUVs to support clandestine mine detection capability against volume, bottom, and buried mines. Equipment includes vehicles and associated systems support equipment. In parallel, Block Upgrade design efforts aligned to Fleet needs are ongoing to support insertion of incremental capability when the technology is ready. Planned Block Upgrade candidates being considered include increased detection range capability, communications upgrades, on-board sonar processing and target recognition, command and control improvements, increased operational depth, and other smaller tasks, as well as potential future payloads as required.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Knifefish Development	0.000	9.072	17.820	0.000	17.820
Articles:	-	-	-	-	-
FY 2019 Plans: Complete fixes/updates from prior DT into the EDM and LRIP design and verify that system reliability and mine hunting performance have improved. Complete DT regression testing and Operational Assessment. Perform Launch and Recovery integration efforts for the LCS Independence variant. Complete Block 1 development efforts (3X sonar range improvement and reacquisition/identification maneuver that will significantly reduce false alarms). Maintain GFE support systems (Support Container, Launch & Recovery Device) through DT/OA. Release competitive production award Request for Proposal (RFP) to Industry.					
FY 2020 Base Plans: Continue engineering and acquisition efforts for competitive production award. Conduct LCS Freedom variant integration testing and begin LCS Freedom variant integration. Begin development for Block 2 (deeply buried					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604028N / *(U)Small and Medium Unmanned Undersea Vehicles*	**Project (Number/Name)** 3123 / *SMCM UUV*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
mine hunting, increased operating depth limit, mine case burial estimation, Net-Centric Sensor Analysis for Mine Warfare interoperability) capability and integrate into the Knifefish system. Begin prototype fuel cell integration and transition from ONR for a future Block Upgrade. Continued maintenance of GFE support systems for Block upgrade and LCS integration testing. Achieve Initial Operational Capability (IOC). ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increases due to Block upgrade and LCS integration efforts.					
Title: Knifefish Support ***Articles:*** ***FY 2019 Plans:*** Provide engineering support of fixes/updates to EDM systems, LCS L&R integration efforts, support the completion of Block 1 development efforts for 3X range extension and reduced false alarms. Provide acquisition support for MS C and to prepare RFP for competitive production award. ***FY 2020 Base Plans:*** Provide engineering support for Block 2 upgrade development, LCS integration, and prototype fuel cell efforts. Provide acquisition support of competitive procurement activities and IOC. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Decrease due to completion of DT/OA in FY 2019.	0.000 -	4.403 -	3.165 -	0.000 -	3.165 -
Title: Knifefish Test and Evaluation ***Articles:*** ***FY 2019 Plans:*** Conduct second phase of DT from Vessel of Opportunity (VOO). Conduct and complete OA in support of MS C in 2Q FY 2019. Conduct Block 1 Upgrade testing. ***FY 2020 Base Plans:***	0.000 -	2.460 -	0.800 -	0.000 -	0.800 -

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604028N / *(U)Small and Medium Unmanned Undersea Vehicles*	**Project (Number/Name)** 3123 / *SMCM UUV*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Complete final integration testing from the LCS Independence variant and initial integration testing on the Freedom variant. Conduct Operational Testing (OT) from LCS, and other testing from VOO, as required. Conduct testing related to Block Upgrade efforts. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Decrease in funding due to completion of DT/OA.					
Title: Knifefish Management Services ***Articles:***	0.000 -	0.782 -	0.962 -	0.000 -	0.962 -
FY 2019 Plans: Conduct acquisition and management of development, procurement, and program activities including final Block 1 and initial Block 2 and fuel cell efforts, MS C, LRIP award, and preparation of RFP for competitive production award. ***FY 2020 Base Plans:*** Conduct acquisition and management of development, test, and program activities supporting Block 2 and fuel cell efforts, and competitive procurement activities, and IOC. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Slight increase due to increased management of competitive production award and Block Upgrade efforts.					
Accomplishments/Planned Programs Subtotals	0.000	16.717	22.747	0.000	22.747

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• OPN/2622: *Minesweeping Replacement*	57.343	32.367	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
• OPN/1601: *LCS MCM Mission Modules*	45.146	98.901	197.129	-	197.129	222.831	222.523	233.151	243.503	1,213.078	2,655.367

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604028N / *(U)Small and Medium Unmanned Undersea Vehicles*	**Project (Number/Name)** 3123 / *SMCM UUV*

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• RDTEN/0603502N/3123: *SMCM UUV*	21.799	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	178.219
• OPN/1611: *Small & Medium UUV*	0.000	0.000	40.547	-	40.547	38.817	24.310	8.564	35.170	Continuing	Continuing

Remarks

The above OPN funding lines (1601/1611) account for several programs, of which the Knifefish program is only a portion.

D. Acquisition Strategy

The Knifefish program, initiated in FY 2011 and competitively sourced to General Dynamics Mission Systems (GDMS), develops SMCM UUVs equipped with advanced Low Frequency Broadband (LFBB) sonar to provide volume, bottom, and buried mine detection capability, when operated from the Littoral Combat Ship (LCS) Mine Countermeasures Mission Package (MCM MP) or Vessel of Opportunity (VOO). An Engineering Development Model (EDM) system was fabricated and tested through Developmental Testing (DT). After incorporating fixes and upgrades discovered during DT and from Fleet operator inputs, an Operational Assessment (OA) will be conducted from a VOO in order to inform a Milestone C (MS C) decision and Low Rate Initial Production (LRIP) award of five Knifefish systems. Operational integration testing with the LCS will occur as test ships are available, but prior to Initial Operational Capability (IOC). Following LCS Integration Testing, a full and open competitive production contract will be awarded. The overall approach is to deliver systems through incrementally increasing capability via three Block Upgrades, balancing technology development maturity against a manageable level of risk to the program. New capability Block Upgrades will not transition to the production system until stable requirements are established, demonstrated, and verified for each respective Block. Knifefish is designated as an ACAT III program.

E. Performance Metrics

Successful MS C in 3Q FY 2019, competitive production award in 3Q FY 2020 and IOC in 4Q FY 2020.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604028N / *(U)Small and Medium Unmanned Undersea Vehicles*	**Project (Number/Name)** 3123 / *SMCM UUV*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Knifefish Development & Engineering Support	C/CPIF	General Dynamics AIS : McLeansville, NC	0.000	0.000		8.520	Dec 2018	2.694	Dec 2019	-		2.694	Continuing	Continuing	Continuing
Hardware/Software Development - Support Equipment	WR	NSWC, PC : PANAMA CITY, FL	0.000	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Knifefish Block 1 Development Contractor	C/CPIF	GDMS : McLeansville, NC	0.000	0.000		0.552	Nov 2018	13.326	Nov 2019	-		13.326	Continuing	Continuing	Continuing
Knifefish Block 1 Development	TBD	Various : Various	0.000	0.000		0.000		1.800	Jan 2020	-		1.800	0.000	1.800	-
		Subtotal	0.000	0.000		9.072		17.820		-		17.820	Continuing	Continuing	N/A

Remarks

FY 2018 and prior funding in Program Element (PE) 0603502N.

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Engineering Support	WR	NSWC, PC : PANAMA CITY, FL	0.000	0.000		2.866	Dec 2018	1.450	Dec 2019	-		1.450	Continuing	Continuing	Continuing
Engineering Support	WR	NUWC, Newport : NEWPORT, RI	0.000	0.000		0.974	Dec 2018	0.850	Dec 2019	-		0.850	Continuing	Continuing	Continuing
Engineering Support	WR	Various : Various	0.000	0.000		0.563	Dec 2018	0.865	Dec 2019	-		0.865	Continuing	Continuing	Continuing
		Subtotal	0.000	0.000		4.403		3.165		-		3.165	Continuing	Continuing	N/A

Remarks

FY 2018 and prior funding in Program Element (PE) 0603502N.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604028N / *(U)Small and Medium Unmanned Undersea Vehicles*	Project (Number/Name) 3123 / *SMCM UUV*	

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Government T&E Support	WR	Various : Various	0.000	0.000		0.145	Jan 2019	0.000		-		0.000	0.000	0.145	-
Test and Evaluation	WR	COMOPTEVFOR : NORFOLK, VA	0.000	0.000		0.115	Dec 2018	0.415	Dec 2019	-		0.415	0.000	0.530	-
Government T&E Support	WR	NSWC, PC : PANAMA CITY, FL	0.000	0.000		2.200	Nov 2018	0.385	Dec 2019	-		0.385	0.000	2.585	-
		Subtotal	0.000	0.000		2.460		0.800		-		0.800	0.000	3.260	N/A

Remarks

FY 2018 and prior funding in Program Element (PE) 0603502N.

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management Support	C/CPFF	Various : WASHINGTON, DC	0.000	0.000		0.682	Feb 2019	0.887	Feb 2020	-		0.887	0.000	1.569	-
Travel	WR	NAVSEA : WNY, DC	0.000	0.000		0.100	Dec 2018	0.075	Dec 2019	-		0.075	0.000	0.175	-
		Subtotal	0.000	0.000		0.782		0.962		-		0.962	0.000	1.744	N/A

Remarks

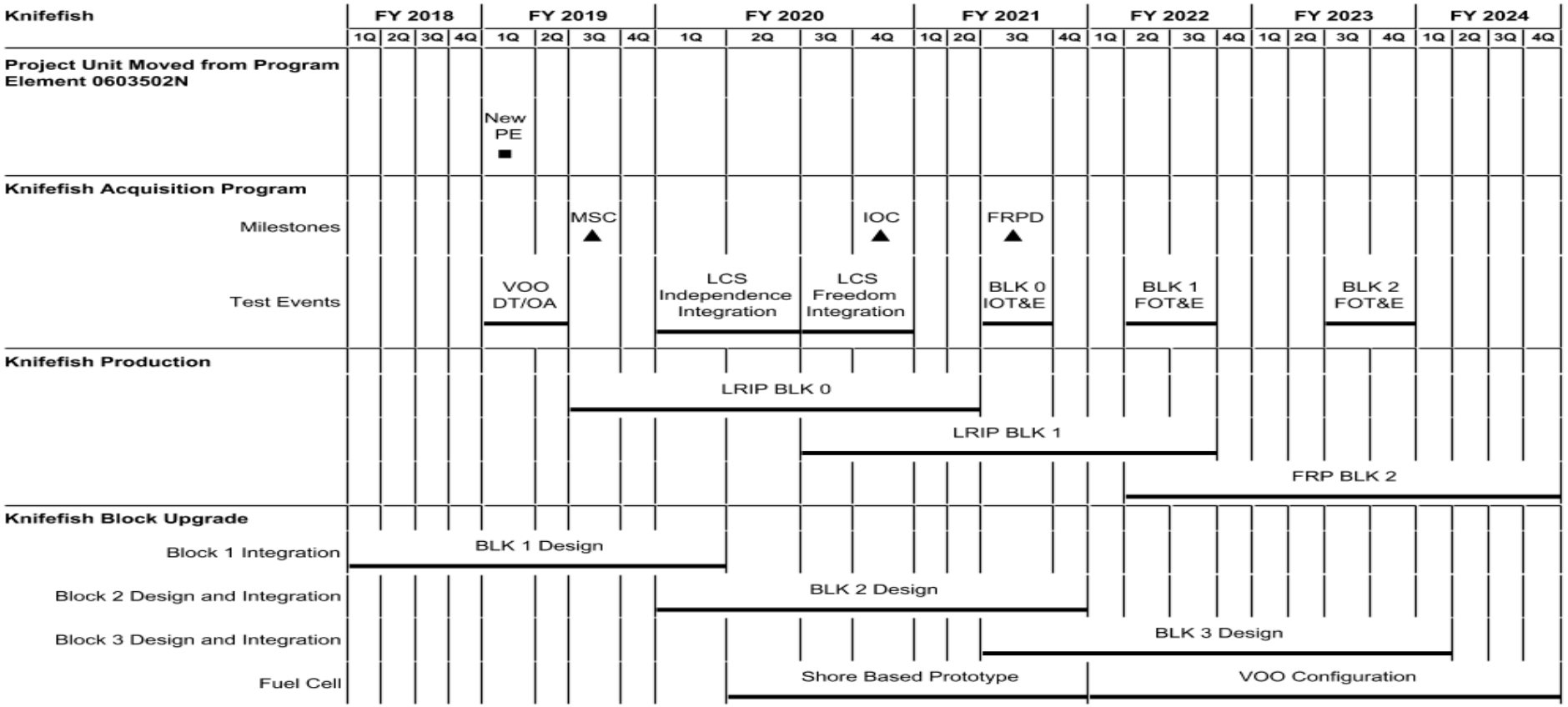
FY 2018 and prior funding in Program Element (PE) 0603502N.

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	0.000		16.717		22.747		-		22.747	Continuing	Continuing	N/A

Remarks

FY 2018 and prior funding in Program Element (PE) 0603502N.

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604028N / *(U)Small and Medium Unmanned Undersea Vehicles*	**Project (Number/Name)** 3123 / *SMCM UUV*



2020PB - 0604028N - 3123

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604028N / *(U)Small and Medium Unmanned Undersea Vehicles*	**Project (Number/Name)** 3123 / *SMCM UUV*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Knifefish				
Project Unit Moved from Program Element 0603502N:	1	2019	1	2019
Knifefish Acquisition Program: Milestones: Initial Operations Capability	4	2020	4	2020
Knifefish Acquisition Program: Milestones: Milestone C	3	2019	3	2019
Knifefish Acquisition Program: Milestones: Knifefish Full Rate Production Decision	3	2021	3	2021
Knifefish Acquisition Program: Test Events: VOO DT/OA	1	2019	2	2019
Knifefish Acquisition Program: Test Events: LCS Independence Variant Integration	1	2020	2	2020
Knifefish Acquisition Program: Test Events: LCS Freedom Variant Integration	3	2020	4	2020
Knifefish Acquisition Program: Test Events: Block 0 IOT&E	3	2021	3	2021
Knifefish Acquisition Program: Test Events: Block 1 FOT&E	2	2022	3	2022
Knifefish Acquisition Program: Test Events: Block 2 FOT&E	3	2023	4	2023
Knifefish Production: BLK 0 LRIP	3	2019	2	2021
Knifefish Production: BLK 1 LRIP	3	2020	3	2022
Knifefish Production: BLK 2 FRP	2	2022	4	2024
Knifefish Block Upgrade: Block 1 Integration: Design	1	2018	1	2020
Knifefish Block Upgrade: Block 2 Design and Integration: Design	1	2020	4	2021
Knifefish Block Upgrade: Block 3 Design and Integration: Design	3	2021	1	2024
Knifefish Block Upgrade: Fuel Cell: Shore Based Prototype	2	2020	4	2021
Knifefish Block Upgrade: Fuel Cell: VOO Configuration	1	2022	4	2024

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604028N / *(U)Small and Medium Unmanned Undersea Vehicles*	Project (Number/Name) 3785 / *Razorback*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
3785: *Razorback*	0.000	0.000	0.000	9.780	-	9.780	33.325	4.093	23.959	10.503	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Note

Razorback is not a new start program. FY 2019 and prior funding in PE 0604218N. Project 3785 Razorback realigned from PE 0604218N starting in FY 2020.

SAFECAP is not a new start program. It is a continuation effort being transferred from PE 0603561N Project 2033 to PE 0604028N Project 3785 beginning FY 2020.

A. Mission Description and Budget Item Justification

A part of the UUV Family of Systems (FoS), Littoral Battlespace Sensors - Autonomous Undersea Vehicle, Submarine variant (LBS-AUV(S)) or Razorback is a medium class UUV capable of persistent, autonomous, ocean sensing and data collection in support of Navy Intelligence Preparation of the Operational Environment (IPOE) mission. Razorback is deployed from host submarines in two variants: from the Dry Deck Shelter (DDS) or from the torpedo tube. The DDS deployed Razorback variant has been procured beginning in FY 2017 with Fleet operational deployments planned for FY 2020. Development of requirements and submarine integration efforts commenced in FY 2019 for the torpedo tube deployed variant, which will be competitively sourced to industry by FY 2021.

In order to deploy Razorback or other small or medium class UUVs from a host submarine platform with sufficient endurance to perform a desired mission, high energy density sources such as lithium ion batteries are used. Consequently, safety is paramount and mitigation systems must be in place to prevent or stop a high energy casualty event. SAFECAP is being developed as an active mitigation strategy that includes a shock qualified capsule that aides in the launch and recovery of small and medium sized UUVs through the torpedo tube, including Razorback. It also contains a Battery Casualty Detection System that constantly monitors battery health and status, providing early warning signs of a battery short. In the event of a casualty, the capsule and vehicle portion of SAFECAP are flooded via fire hose connections and the event is extinguished.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Product Development - Razorback	0.000	0.000	4.922	0.000	4.922
Articles:	-	-	-	-	-
FY 2019 Plans: FY 2019 funding in Program Element (PE) 0604218N Project 2345.					
FY 2020 Base Plans: Develop Razorback Request for Proposal (RFP) to industry for the Torpedo Tube Launch & Recovery (TTL&R) variant. Perform risk reduction engineering efforts to increase opportunities for industry competition for critical					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604028N / *(U)Small and Medium Unmanned Undersea Vehicles*	**Project (Number/Name)** 3785 / *Razorback*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
technologies including command and control, submarine integration, architecture standards, and host platform recovery. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** FY 2019 funding in Program Element (PE) 0604218N Project 2345; FY 2020 funding in PE 0604028N Project 3785. Increased funding due to Razorback integration efforts.					
Title: Product Development - SAFECAP	0.000	0.000	2.150	0.000	2.150
Articles:	-	-	-	-	-
FY 2019 Plans: FY 2019 funding in Program Element (PE) 0603561N Project 2033. ***FY 2020 Base Plans:*** SAFECAP transitions from Program Element (PE) 0603561N Project 2033. - Perform SAFECAP Capstone Test - Li-Ion Battery Certification - VIRGINIA CLASS Shock Assessment - Continue Early Fault Detection Effort ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** No significant change. FY 2019 funding in Program Element (PE) 0603561N Project 2033; FY 2020 funding realigned to PE 0604028N Project 3785.					
Title: Support	0.000	0.000	2.250	0.000	2.250
Articles:	-	-	-	-	-
FY 2019 Plans: N/A ***FY 2020 Base Plans:***					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604028N / *(U)Small and Medium Unmanned Undersea Vehicles*	**Project (Number/Name)** 3785 / *Razorback*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Provide acquisition and engineering support for competitive procurement activities and submarine integration efforts, including TEMPALT development and technical reviews, and Li-ion battery certification efforts. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** FY 2019 funding in Program Element (PE) 0604218N Project 2345; FY 2020 funding in PE 0604028N Project 3785. Increased funding due to support required for Razorback integration efforts.					
Title: Management Services ***Articles:*** ***FY 2019 Plans:*** N/A ***FY 2020 Base Plans:*** Provide technical guidance, project planning, program management, financial and contracting management, and travel for RFP release and submarine integration efforts. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** FY 2019 funding in Program Element (PE) 0604218N Project 2345; FY 2020 funding in PE 0604028N Project 3785. Increased funding due to management required for Razorback integration efforts.	0.000 -	0.000 -	0.458 -	0.000 -	0.458 -
Accomplishments/Planned Programs Subtotals	0.000	0.000	9.780	0.000	9.780

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• OPN 1611: *Small & Medium UUV*	0.000	0.000	40.547	-	40.547	38.817	24.310	8.564	35.170	Continuing	Continuing

Remarks

The above OPN funding line accounts for several programs, of which the RAZORBACK program is only a portion.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604028N / *(U)Small and Medium Unmanned Undersea Vehicles*	**Project (Number/Name)** 3785 / *Razorback*

D. Acquisition Strategy

The Razorback torpedo tube deployed variant will be a competitively sourced Medium class UUV to support missions for the Submarine Force. Razorback will leverage lessons learned about mission capabilities and submarine integration from previous science and technology UUV demonstrations, the LBS-AUV systems operated by Naval Oceanographic Command (NAVO) and from the Razorback Dry Deck Shelter variant. Requirements generation and initial submarine integration efforts occur in FY 2019, followed by Request for Proposal (RFP) development and release to industry in FY 2020. SAFECAP development and submarine integration efforts will continue in parallel to requirements and RFP development in order to provide Li-ion battery casualty mitigations to support Razorback vehicles.

E. Performance Metrics

Successful RFP release to industry in FY 2020 and competitive award in FY 2021. Successful certification of SAFECAP for use of Lithium Ion (Li-ion) batteries on Razorback on host submarines.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604028N / *(U)Small and Medium Unmanned Undersea Vehicles*	Project (Number/Name) 3785 / *Razorback*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Product Development - SAFECAP	WR	NUWC NPT : Newport, RI	0.000	0.000		0.000		1.354	Oct 2019	-		1.354	Continuing	Continuing	Continuing
Product Development - SAFECAP	C/CPFF	Sandia National Labs : Albuquerque, NM	0.000	0.000		0.000		0.450	Oct 2019	-		0.450	Continuing	Continuing	Continuing
Product Development - SAFECAP	WR	NSWC CD : West Bethesda, MD	0.000	0.000		0.000		0.150	Oct 2019	-		0.150	Continuing	Continuing	Continuing
Product Development - SAFECAP	WR	PNSY : Portsmouth NH	0.000	0.000		0.000		0.150	Oct 2019	-		0.150	Continuing	Continuing	Continuing
Product Development - RAZORBACK	C/CPIF	NUWC NPT : Newport, RI	0.000	0.000		0.000		4.922	Mar 2020	-		4.922	0.000	4.922	-
		Subtotal	0.000	0.000		0.000		7.026		-		7.026	Continuing	Continuing	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Engineering Support - RAZORBACK	WR	NUWC Newport : Newport, RI	0.000	0.000		0.000		2.250	Nov 2019	-		2.250	0.000	2.250	-
		Subtotal	0.000	0.000		0.000		2.250		-		2.250	0.000	2.250	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Travel - SAFECAP	Various	NAVSEA HQ : Washington DC	0.000	0.000		0.000		0.046	Oct 2019	-		0.046	Continuing	Continuing	Continuing
Travel - RAZORBACK	Various	NAVSEA HQ : Washington DC	0.000	0.000		0.000		0.050	Oct 2019	-		0.050	0.000	0.050	-
Management - RAZORBACK	Various	Various : Various	0.000	0.000		0.000		0.408	Dec 2019	-		0.408	0.000	0.408	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604028N / *(U)Small and Medium Unmanned Undersea Vehicles*	**Project (Number/Name)** 3785 / *Razorback*

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
		Subtotal	0.000	0.000		0.000		0.504		-		0.504	Continuing	Continuing	N/A

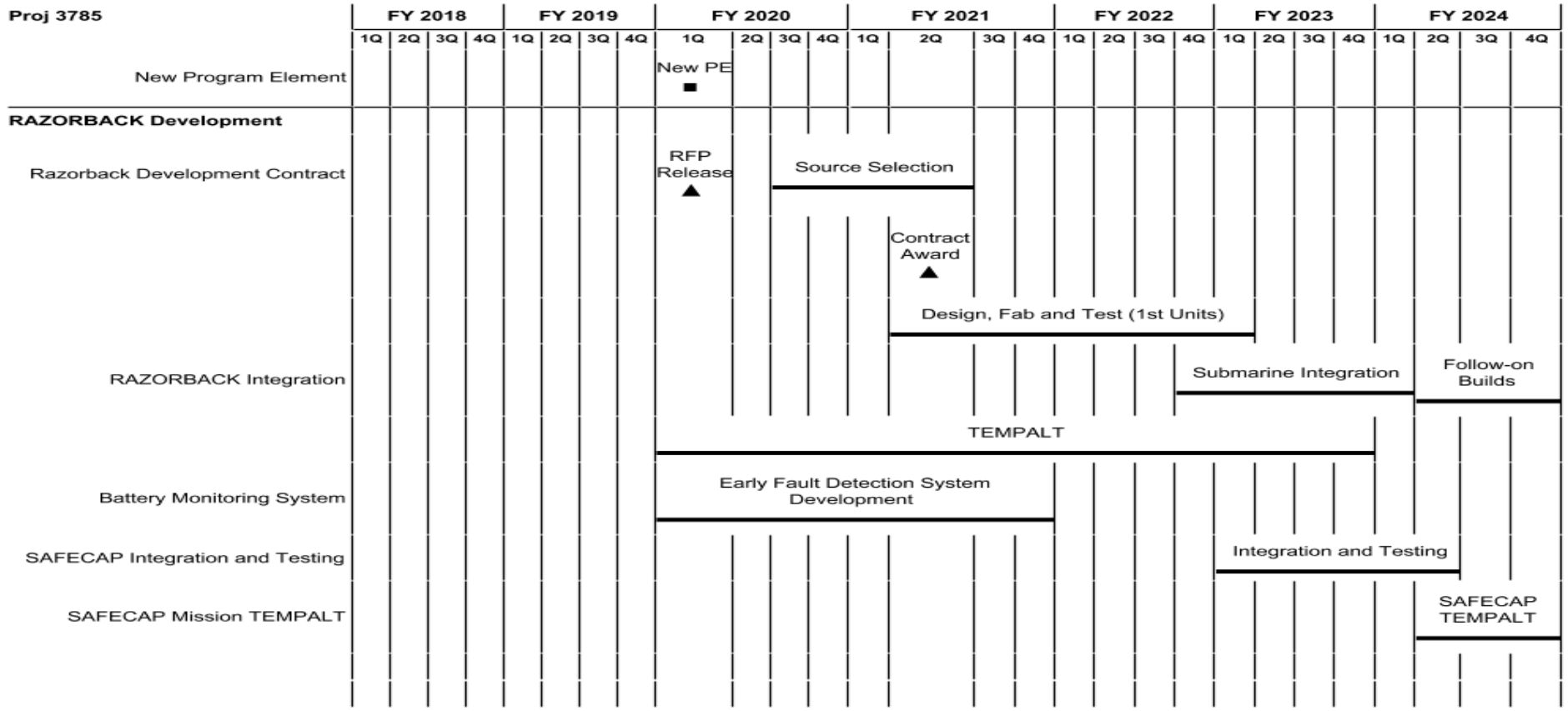
	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	0.000		0.000		9.780		-		9.780	Continuing	Continuing	N/A

Remarks

Razorback is not a new start program. Razorback realigned from Program Element (PE) 0604218N Project 2345 to PE 0604028N Project 3785 beginning in FY 2020.

SAFECAP is not a new start. SAFECAP realigned from PE 0603561N Project 2033 to PE 0604028N Project 3785 beginning in FY 2020.

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604028N / *(U)Small and Medium Unmanned Undersea Vehicles*	**Project (Number/Name)** 3785 / *Razorback*



2020PB - 0604028N - 3785

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604028N / *(U)Small and Medium Unmanned Undersea Vehicles*	**Project (Number/Name)** 3785 / *Razorback*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 3785				
New Program Element: Schedule Detail	1	2020	1	2020
RAZORBACK Development: Razorback Development Contract: RFP	1	2020	1	2020
RAZORBACK Development: Razorback Development Contract: Source Selection	3	2020	2	2021
RAZORBACK Development: Razorback Development Contract: Contract Award	2	2021	2	2021
RAZORBACK Development: Razorback Development Contract: Design, Fabricate, and Test	2	2021	1	2023
RAZORBACK Development: RAZORBACK Integration: Submarine Integration	4	2022	1	2024
RAZORBACK Development: RAZORBACK Integration: Follow-on Builds	2	2024	4	2024
RAZORBACK Development: RAZORBACK Integration: TEMPALT	1	2020	4	2023
RAZORBACK Development: Battery Monitoring System: Early Fault Detection System Development	1	2020	4	2021
RAZORBACK Development: SAFECAP Integration and Testing: System Shakedown Testing	1	2023	2	2024
RAZORBACK Development: SAFECAP Mission TEMPALT: TEMPALT	2	2024	4	2024

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0604029N *I (U)Unmanned Undersea Vehicle Core Technologies*

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	0.000	0.000	27.483	54.376	-	54.376	52.704	42.516	39.625	40.174	Continuing	Continuing
3393: *UxS Autonomy, C2,*	0.000	0.000	12.353	8.563	-	8.563	6.640	4.063	5.674	5.787	Continuing	Continuing
3395: *UxS Payloads*	0.000	0.000	8.080	16.565	-	16.565	10.420	7.280	8.991	9.171	Continuing	Continuing
3396: *UxS Endurance*	0.000	0.000	7.050	16.782	-	16.782	23.266	21.484	19.651	19.745	Continuing	Continuing
4053: *UxS Platform*	0.000	0.000	0.000	12.466	-	12.466	12.378	9.689	5.309	5.471	Continuing	Continuing

Note

FY 2018 and prior funding in Program Element (PE) 0604536N. Projects moved from PE 0604536N starting in FY 2019. FY 2020 establishes new project descriptions that focus on the key enabling technology areas in support of the entire UUV Family of Systems (FoS).

A. Mission Description and Budget Item Justification

In order to accelerate future capabilities and support steady growth of the Navy's Unmanned Undersea Vehicle (UUV) Family of Systems (FoS), UUV Core Technologies will: Drive standardization across the UUV family of systems; Enable Fleet learning and experimentation via Industry involvement and capability demonstrations; Transition mature technologies from the Science and Technology communities and Industry that are aligned to Fleet priorities. This Program Element leverages ONR, DARPA, and Industry technology development efforts in the key areas of autonomy, communications, command and control (C2), precision navigation, endurance and energy, payload integration, and host ship/submarine integration and launch and recovery.

B. Program Change Summary ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	0.000	30.187	59.523	-	59.523
Current President's Budget	0.000	27.483	54.376	-	54.376
Total Adjustments	0.000	-2.704	-5.147	-	-5.147
• Congressional General Reductions	-	-0.081			
• Congressional Directed Reductions	-	-2.623			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Program Adjustments	0.000	0.000	-5.147	-	-5.147

Change Summary Explanation

Program Changes:

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0604029N *I (U)Unmanned Undersea Vehicle Core Technologies*

FY18 - No Changes
FY19 - -$2,623K Congressional reductions ($330K Project 3393 Unjustified Growth; $635K Project 3395 Concurrency; $1,658K Project 3396 Concurrency), $81K FFRDC reduction
FY20 - -$5,147K UUV portfolio rebalance
Technical: Not applicable.
Schedule: Not applicable.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604029N / *(U)Unmanned Undersea Vehicle Core Technologies*	Project (Number/Name) 3393 / *UxS Autonomy, C2,*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
3393: *UxS Autonomy, C2,*	0.000	0.000	12.353	8.563	-	8.563	6.640	4.063	5.674	5.787	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Note

FY 2018 and prior funding in Program Element (PE) 0604536N. Project moved from PE 0604536N starting in FY 2019. Project renamed UxS Autonomy, C2 starting in FY20 (previously titled Adv Undersea Prototyping-Remote Command & Control in FY19 and prior years).

A. Mission Description and Budget Item Justification

The Autonomy and Command and Control (C2) portion of this project funds efforts to develop common standards, interfaces, and systems to support cross-domain applications. These efforts include advanced development, prototyping and demonstrations to accelerate the design and development of system commonality and interoperability for the cross-domain (Surface and Sub-Surface, Aviation and Ground) requirements of the Navy.

Coordinating with the Common Control System (CCS) where applicable, autonomy development efforts will demonstrate scalable, adaptable and interoperable warfighting capabilities across various unmanned systems. The advanced development emphasis will encourage innovation and enable rapid integration of UxS capabilities across domains while common standards, interfaces, and systems development occurs in parallel. Autonomy and C2 architectures and interface definitions will be incorporated into near-term and future UUV requests for proposals (RFP) to drive contractor development efforts.

In summary, coordinated autonomy and C2 efforts will define, develop and demonstrate capability that advance new technology, hardware and software of control systems that will be used to operate multiple and dissimilar Naval UxSs.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Product Development	0.000	10.123	7.067	0.000	7.067
Articles:	-	-	-	-	-
FY 2019 Plans: Autonomy: Complete and publish Architecture Design Document and continue interface documents development and delivery. Commence development of modeling and simulation and autonomy software development. Continue cybersecurity safety and standards review with Navy and Industry partners. Initiate an autonomy lab to test and integrate autonomy solutions. C2: Complete and publish Architecture Design Document. Complete requirements analysis in support of Requests for Proposals (RFPs). Commence modeling and simulation. Begin extension of Common Control System (CCS) to the maritime domain. Define interface requirements and software components for command and control of UUVs to be implemented in specifications on future UUV programs and inserted into future					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604029N / *(U)Unmanned Undersea Vehicle Core Technologies*	**Project (Number/Name)** 3393 / *UxS Autonomy, C2,*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
phases of current UUV programs. Continue coordination and integration with UUV Homeport and UUV Operations Center (UOC) at the Naval Undersea Warfare Center Keyport in support of UUV operations. Survey communications and autonomy technologies, identify gaps, strategize future investments to overcome limitations. ***FY 2020 Base Plans:*** Autonomy: Update standards and Interface Control Documents as needed, and continue Cyber/Safety/ Standards development. Investigate autonomy metrics and tech insertion process. Demonstrate autonomy software integration with a UUV using simulation and in-water test. Continue support of autonomy lab standup. C2: Update models for CCS software extensions and begin detailed design of CCS implementation into first UUV program. Continue coordination and integration efforts at UUV Homeport and UOC. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** FY 2019 to FY 2020 decrease due to reconfiguration of Core Technology projects.					
Title: Support	0.000	1.780	1.194	0.000	1.194
Articles:	-	-	-	-	-
FY 2019 Plans: Autonomy: Update documentation and continue work on development of common autonomy standards, interfaces, and systems; support modeling/simulation efforts and test bed development. Incorporate standards, interface requirements into RFPs. C2: Update CCS documentation and support testing and design efforts. Incorporate standards, interface requirements into RFPs. ***FY 2020 Base Plans:*** Autonomy: Update documentation and continue work to integrate common autonomy standards, interfaces, and systems; support modeling/simulation efforts and test bed development. C2: Update CCS documentation and continue to support development and implementation efforts. ***FY 2020 OCO Plans:***					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604029N / *(U)Unmanned Undersea Vehicle Core Technologies*	**Project (Number/Name)** 3393 / *UxS Autonomy, C2,*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Slight decrease from FY 2019 to FY 2020 due to efficiencies in coordination of autonomy and common control efforts.					
Title: Management Services	0.000	0.450	0.302	0.000	0.302
Articles:	-	-	-	-	-
FY 2019 Plans: Autonomy: Provide guidance, project planning, financial and contracting support, and coordination for development of common autonomy standards, interfaces, systems, and common control efforts. C2: Provide guidance, project planning, financial and contracting support, and coordination of Common Control System (CCS) analysis and implementation. ***FY 2020 Base Plans:*** Autonomy: Continue guidance, project planning, financial and contracting support, and coordination of common autonomy standards, interfaces, and systems. C2: Continue guidance, project planning, financial and contracting support, and coordination of CCS analysis and implementation. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Slight decrease from FY 2019 to FY 2020 due to efficiencies in coordination of autonomy and common control efforts.					
Accomplishments/Planned Programs Subtotals	0.000	12.353	8.563	0.000	8.563

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604029N / *(U)Unmanned Undersea Vehicle Core Technologies*	**Project (Number/Name)** 3393 / *UxS Autonomy, C2,*

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• RDTEN/0604536N/3393: *Adv Undersea Prototyping-Remote Command & Control*	2.000	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	3.486

Remarks

Funding moved to new Program Element (PE) 0604029N in FY 2019.

D. Acquisition Strategy

UUV Core Technology efforts will accelerate future capabilities and support steady growth of the Navy's Unmanned Undersea Vehicle (UUV) Family of Systems (FoS). UUV Core Technologies will: drive standardization across the UUV FoS; enable Fleet learning and experimentation via industry involvement and capability demonstrations;
and transition mature technologies from the Science and Technology communities and Industry of which are aligned to Fleet priorities. The program will leverage existing efforts from the Naval Research and Development Enterprise and will utilize rapid contracting approaches such as the Naval Undersea Warfare Center (NUWC) Newport UUV Family of Systems multi-award Indefinite Delivery Indefinite Quantity contract to facilitate Industry involvement. Coordination with UxS platforms will eliminate redundant efforts, encourage innovation, and improve coordination of unmanned systems across multiple domains. The objective of this project (UxS Autonomy, C2) is to develop requirements and standards, define key interfaces, and mandate compliance to common architecture for Autonomy and Common Control System (CCS) to improve unmanned system capability, reliability and affordability through enabling system modularity, permitting standardized test and evaluation, and enabling cross-platform communication and collaborative mission engagement.

E. Performance Metrics

Publish architecture standards and interface documents, prescribe system developer compliance in RFPs, and successfully demonstrate CCS and autonomy software to the standards through surrogate systems.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604029N / *(U)Unmanned Undersea Vehicle Core Technologies*	Project (Number/Name) 3393 / *UxS Autonomy, C2,*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
UUV Operation Center	WR	NUWC KPT : Keyport, WA	0.000	0.000		2.000	Dec 2018	2.000	Jan 2020	-		2.000	Continuing	Continuing	Continuing
Future Capability Studies	WR	Various : Various	0.000	0.000		1.635	Dec 2018	0.000		-		0.000	0.000	1.635	-
Common Control System (CCS) Cross-Domain Architecture Development	Various	Various : Various	0.000	0.000		2.895	Dec 2018	1.225	Jan 2020	-		1.225	Continuing	Continuing	Continuing
Autonomy Architutures Development/Lab	Various	Various : Various	0.000	0.000		3.593	Dec 2018	3.342	Dec 2019	-		3.342	Continuing	Continuing	Continuing
Precision Navigation	Various	Various : Various	0.000	0.000		0.000		0.500	Dec 2019	-		0.500	Continuing	Continuing	Continuing
		Subtotal	0.000	0.000		10.123		7.067		-		7.067	Continuing	Continuing	N/A

Remarks

FY 2018 and prior funding in Program Element (PE) 0604536N.

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Energy Prototype Engineering Support 1	SS/CPFF	Various : Various	0.000	0.000		0.794	Dec 2018	0.000		-		0.000	Continuing	Continuing	Continuing
Autonomy Support	Various	NAVSEA Activities : Washington, DC	0.000	0.000		0.506	Dec 2018	0.280	Dec 2019	-		0.280	Continuing	Continuing	Continuing
Common Control System (CCS) Engineering Support	Various	Various : Various	0.000	0.000		0.480	Dec 2018	0.250	Dec 2019	-		0.250	Continuing	Continuing	Continuing
Precision Navigation	Various	Various : Various	0.000	0.000		0.000		0.664	Jan 2020	-		0.664	0.000	0.664	-
		Subtotal	0.000	0.000		1.780		1.194		-		1.194	Continuing	Continuing	N/A

Remarks

FY 2018 and prior funding in Program Element (PE) 0604536N.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604029N / *(U)Unmanned Undersea Vehicle Core Technologies*	**Project (Number/Name)** 3393 / *UxS Autonomy, C2,*

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Energy Prototype	Various	Various : Various	0.000	0.000		0.150	Jan 2019	0.000		-		0.000	Continuing	Continuing	Continuing
Autonomy	Various	NAVSEA Activities : Washington, DC	0.000	0.000		0.150	Jan 2019	0.115	Dec 2019	-		0.115	Continuing	Continuing	Continuing
Common Control System (CCS)	Various	Various : Various	0.000	0.000		0.150	Jan 2019	0.115	Feb 2020	-		0.115	Continuing	Continuing	Continuing
Precision Navigation	Various	Various : Various	0.000	0.000		0.000		0.072	Feb 2020	-		0.072	0.000	0.072	-
		Subtotal	0.000	0.000		0.450		0.302		-		0.302	Continuing	Continuing	N/A

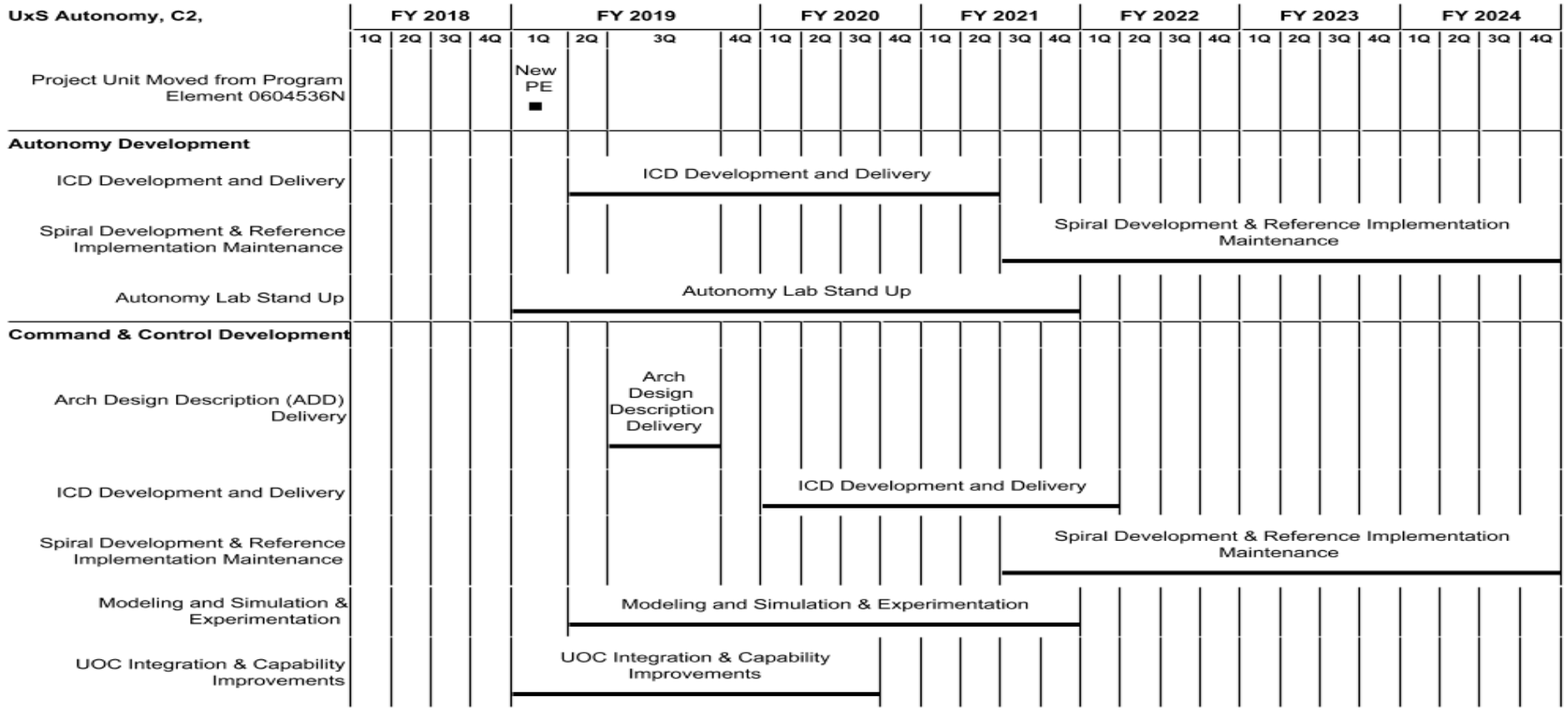
Remarks

FY 2018 and prior funding in Program Element (PE) 0604536N.

	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	0.000		12.353		8.563		-		8.563	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604029N / *(U)Unmanned Undersea Vehicle Core Technologies*	**Project (Number/Name)** 3393 / *UxS Autonomy, C2,*



2020PB - 0604029N - 3393

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604029N / *(U)Unmanned Undersea Vehicle Core Technologies*	**Project (Number/Name)** 3393 / *UxS Autonomy, C2,*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
UxS Autonomy, C2,				
Project Unit Moved from Program Element 0604536N: New PE	1	2019	1	2019
Autonomy Development: ICD Development and Delivery: ICD Development and Delivery	2	2019	2	2021
Autonomy Development: Spiral Development & Reference Implementation Maintenance:	3	2021	4	2024
Autonomy Development: Autonomy Lab Stand Up:	1	2019	4	2021
Command & Control Development: Arch Design Description (ADD) Delivery:	3	2019	3	2019
Command & Control Development: ICD Development and Delivery:	1	2020	1	2022
Command & Control Development: Spiral Development & Reference Implementation Maintenance:	3	2021	4	2024
Command & Control Development: Modeling and Simulation & Experimentation:	2	2019	4	2021
Command & Control Development: UOC Integration & Capability Improvements:	1	2019	3	2020

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604029N / *(U)Unmanned Undersea Vehicle Core Technologies*	Project (Number/Name) 3395 / *UxS Payloads*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
3395: *UxS Payloads*	0.000	0.000	8.080	16.565	-	16.565	10.420	7.280	8.991	9.171	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Note

FY 2018 and prior funding in Program Element (PE) 0604536N. Projects moved from PE 0604536N starting in FY 2019. Project renamed UxS Payloads starting in FY20 (previously titled Adv Undersea Prototyping-Explosive Payloads in FY19 and prior years).

A. Mission Description and Budget Item Justification

Funding supports advanced prototyping, integration, and demonstration of undersea payloads initially with XLUUV class vehicles, and then eventually with Large, Medium, and Small UUVs in the UUV Family of Systems (FoS). These efforts leverage developments at ONR, DARPA, industry, and other activities for undersea payloads, and work to complete analysis of feasibility, policy, lethality and performance of integrating undersea sensor and weapons systems. The program will design new hardware, investigate and develop new interfaces/systems to increase lethality in both undersea and surface targets and investigate the possibilities of employing non-lethal payloads and other sensor systems across the UUV FoS, as applicable.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Product Development	0.000	6.789	13.749	0.000	13.749
Articles:	-	-	-	-	-
FY 2019 Plans: Continue development of UUV undersea payload systems, including advanced XLUUV payloads. Complete Initial Technical Review for XLUUV payload and order initial material in support of design. Complete initial trade study for non-lethal payloads of the XLUUVs, and re-focus efforts on payloads for Medium UUVs. Continue UUV payload interface development and deliver Interface Control Documents (ICDs). Commence safety and certification analyses. Parallel payload development efforts will enable small to medium UUVs to be submarine launched and recovered.					
FY 2020 Base Plans: Complete Final Technical Review for XLUUV advanced payload. Procure material and fabricate prototypes. Refine CONOPS for demonstrations, finalize ICDs and continue ICD delivery, and continue payload autonomy software development. Initiate integration and test of common payload module. Conduct demonstrations of payload capabilities. Initiate Automated Target Recognition (ATR) maturation efforts. Begin transition of energy and communications payload from ONR. Continue payloads efforts for Medium UUVs.					
FY 2020 OCO Plans:					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604029N / *(U)Unmanned Undersea Vehicle Core Technologies*	**Project (Number/Name)** 3395 / *UxS Payloads*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increase from FY2019 to FY2020 for integration and testing of payload module and completion of prototype fabrication efforts.					
Title: Support	0.000	0.991	2.153	0.000	2.153
Articles:	-	-	-	-	-
FY 2019 Plans: Support XLUUV payload design efforts. Support Payload Integration Group interface development.					
FY 2020 Base Plans: Support XLUUV payload design and test efforts, and begin logistics support. Payload Integration Group continues to guide and support standard interface development and assists in technology integration. Provide technical support for ATR development.					
FY 2020 OCO Plans: N/A					
FY 2019 to FY 2020 Increase/Decrease Statement: Increase from FY 2019 to FY 2020 due to increase in payload effort development.					
Title: Management Services	0.000	0.300	0.663	0.000	0.663
Articles:	-	-	-	-	-
FY 2019 Plans: Provide guidance, project planning, financial and contracting support, and coordination for evaluation and integration of payloads.					
FY 2020 Base Plans: Continue guidance, project planning, financial and contracting support, and coordination for evaluation and integration of payloads.					
FY 2020 OCO Plans: N/A					
FY 2019 to FY 2020 Increase/Decrease Statement:					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604029N / *(U)Unmanned Undersea Vehicle Core Technologies*	**Project (Number/Name)** 3395 / *UxS Payloads*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Slight increase from FY 2019 to FY 2020 due to increase in payload effort development.					
Accomplishments/Planned Programs Subtotals	0.000	8.080	16.565	0.000	16.565

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• RDTEN/0604536N/3395: *Adv Undersea Prototyping-Explosive Payloads*	1.936	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	3.156

Remarks

Funding moved to new Program Element (PE) 0604029N in FY 2019.

D. Acquisition Strategy

UUV Core Technology efforts will accelerate future capabilities and support steady growth of the Navy's Unmanned Undersea Vehicle (UUV) Family of Systems (FoS). UUV Core Technologies will: drive standardization across the UUV FoS; enable Fleet learning and experimentation via Industry involvement and capability demonstrations;
and transition mature technologies from the Science and Technology communities and Industry of which are aligned to Fleet priorities. The program will leverage existing efforts from the Naval Research and Development Enterprise and will utilize rapid contracting approaches such as the Naval Undersea Warfare Center (NUWC) Newport UUV Family of Systems multi-award Indefinite Delivery Indefinite Quantity contract to facilitate Industry involvement. Coordination with UxS platforms will eliminate redundant efforts, encourage innovation, and improve coordination of unmanned systems across multiple domains. The objective of this project (UxS Payloads) is to evaluate, mature, and integrate advanced, innovative payloads onto UUVs to improve warfighting capabilities. Payloads are defined by Navy Fleet capability needs and are developed by leveraging modular designs through collaborative efforts with industry, ONR, DARPA, and the entire Naval Research and Development Enterprise. A Payload Integration Group (IDD) will define Government-owned interfaces to ensure efficient and affordable payload integration across the UUV FoS to support interoperable, innovative solutions. Initial payloads will be integrated and demonstrated on the XLUUV and then be developed for integration into other applicable FoS UUVs after they are demonstrated successfully. communication and collaborative mission engagement.

E. Performance Metrics

Successful demonstrations of multiple undersea payloads. Detailed metrics are classified.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604029N / *(U)Unmanned Undersea Vehicle Core Technologies*	**Project (Number/Name)** 3395 / *UxS Payloads*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Payload Interface Design & Fabrication	C/CPIF	Various : Various	0.000	0.000		4.400	Jan 2019	4.100	Dec 2019	-		4.100	0.000	8.500	-
Command and Control	WR	Various : Various	0.000	0.000		1.609	Dec 2018	0.000		-		0.000	0.000	1.609	-
Safety	WR	NSWC Indian Head : Indian Head, MD	0.000	0.000		0.780	Jan 2019	0.624	Jan 2020	-		0.624	0.000	1.404	-
Aotomatic Target Recognition	WR	Various : Various	0.000	0.000		0.000		3.000	Jan 2020	-		3.000	Continuing	Continuing	Continuing
Component Development	WR	Various : Various	0.000	0.000		0.000		3.025	Dec 2019	-		3.025	Continuing	Continuing	Continuing
ONR FNC Project	WR	Various : Various	0.000	0.000		0.000		3.000	Dec 2019	-		3.000	Continuing	Continuing	Continuing
		Subtotal	0.000	0.000		6.789		13.749		-		13.749	Continuing	Continuing	N/A

Remarks

FY 2018 and prior funding under PE 0604536N. Project renamed UxS Payloads starting in FY20 (previously titled Adv Undersea Prototyping-Explosive Payloads in FY19 and prior years).

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Technical Support	WR	Various : Various	0.000	0.000		0.991	Dec 2019	0.200	Feb 2020	-		0.200	Continuing	Continuing	Continuing
Payload Integration Group	Various	Various : Various	0.000	0.000		0.000		1.000	Dec 2019	-		1.000	Continuing	Continuing	Continuing
Engineering Support	Various	Various : Various	0.000	0.000		0.000		0.600	Nov 2019	-		0.600	Continuing	Continuing	Continuing
Integrated Logistic Support	Various	Various : Various	0.000	0.000		0.000		0.353	Nov 2019	-		0.353	Continuing	Continuing	Continuing
		Subtotal	0.000	0.000		0.991		2.153		-		2.153	Continuing	Continuing	N/A

Remarks

FY 2018 and prior funding under PE 0604536N. Project renamed UxS Payloads starting in FY20 (previously titled Adv Undersea Prototyping-Explosive Payloads in FY19 and prior years).

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604029N / *(U)Unmanned Undersea Vehicle Core Technologies*	Project (Number/Name) 3395 / *UxS Payloads*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Management & Management Support	WR	Various : Various	0.000	0.000		0.300	Nov 2018	0.663	Dec 2019	-		0.663	Continuing	Continuing	Continuing
		Subtotal	0.000	0.000		0.300		0.663		-		0.663	Continuing	Continuing	N/A

Remarks

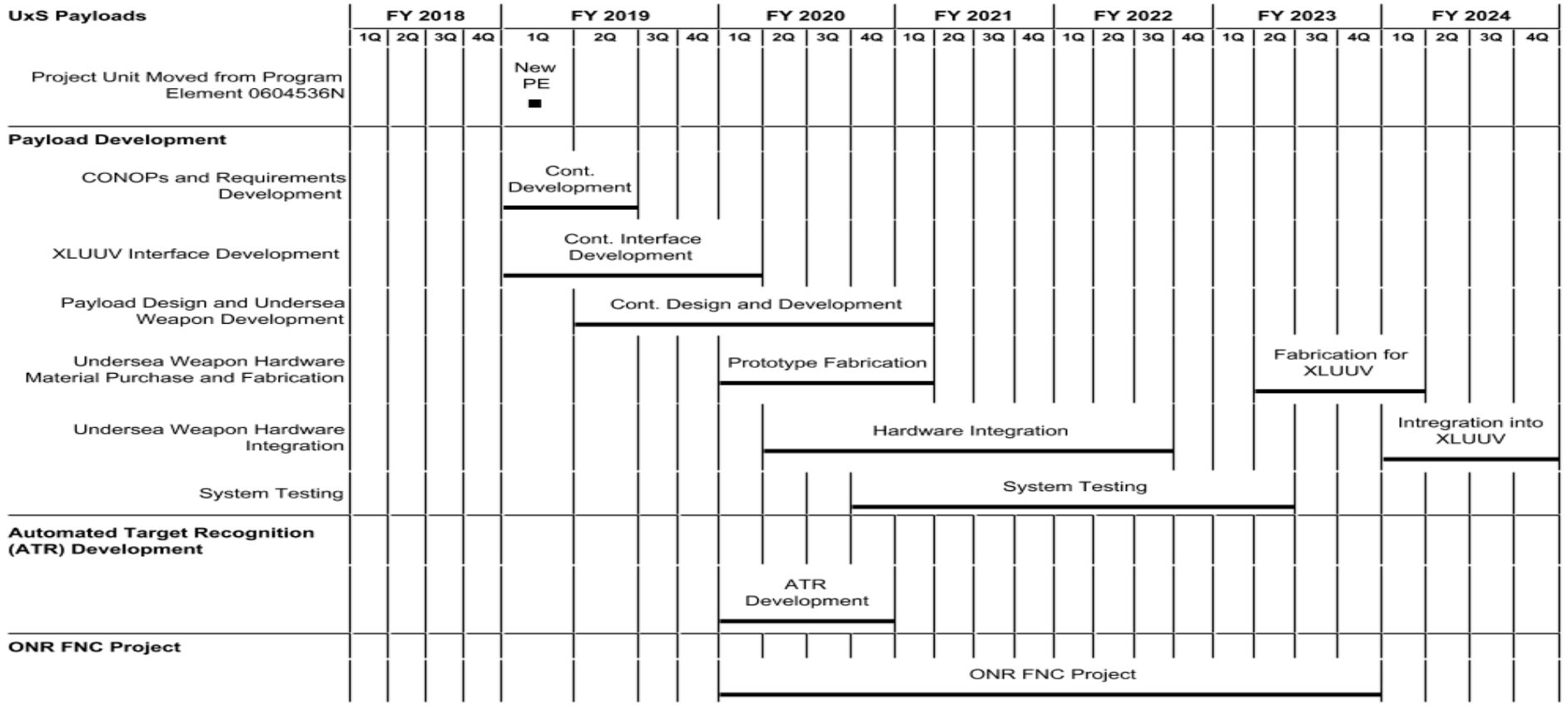
FY 2018 and prior funding under PE 0604536N. Project renamed UxS Payloads starting in FY20 (previously titled Adv Undersea Prototyping-Explosive Payloads in FY19 and prior years).

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	0.000		8.080		16.565		-		16.565	Continuing	Continuing	N/A

Remarks

FY 2018 and prior funding under PE 0604536N. Project renamed UxS Payloads starting in FY20 (previously titled Adv Undersea Prototyping-Explosive Payloads in FY19 and prior years).

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604029N / *(U)Unmanned Undersea Vehicle Core Technologies*	**Project (Number/Name)** 3395 / *UxS Payloads*



2020PB - 0604029N - 3395

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604029N / *(U)Unmanned Undersea Vehicle Core Technologies*	**Project (Number/Name)** 3395 / *UxS Payloads*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
UxS Payloads				
Project Unit Moved from Program Element 0604536N: New PE	1	2019	1	2019
Payload Development: CONOPs and Requirements Development: CONOPs and Requirements	1	2019	2	2019
Payload Development: XLUUV Interface Development: Schedule Detail	1	2019	1	2020
Payload Development: Payload Design and Undersea Weapon Development: Phase A concept design- XL UUV Interface development	2	2019	1	2021
Payload Development: Undersea Weapon Hardware Material Purchase and Fabrication: Schedule Detail	1	2020	1	2021
Payload Development: Undersea Weapon Hardware Material Purchase and Fabrication:	2	2023	1	2024
Payload Development: Undersea Weapon Hardware Integration: Hardware Integration	2	2020	3	2022
Payload Development: Undersea Weapon Hardware Integration: Integration into XLUUV	1	2024	4	2024
Payload Development: System Testing:	4	2020	2	2023
Automated Target Recognition (ATR) Development: ATR Development	1	2020	4	2020
ONR FNC Project: ONR FNC Project	1	2020	4	2023

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604029N / *(U)Unmanned Undersea Vehicle Core Technologies*	Project (Number/Name) 3396 / *UxS Endurance*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
3396: *UxS Endurance*	0.000	0.000	7.050	16.782	-	16.782	23.266	21.484	19.651	19.745	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Note

FY 2018 and prior funding in Program Element (PE) 0604536N. Project moved from PE 0604536N starting in FY 2019. Project 3396 renamed UxS Endurance starting in FY 2020 (previously titled Adv Undersea Prototyping-Non-Lethal Payloads in FY 2019 and prior years).

A. Mission Description and Budget Item Justification

Advanced undersea energy efforts leverages existing independent research and development of energy-dense systems to meet future power requirements for Unmanned Undersea Vehicle (UUV) Family of Systems (FoS) missions, which are limited by both constraints imposed by the operational environment and the amount of power that can be carried. Efforts under this project include research, development, test, and evaluation of advanced energy solutions. Energy development and transition efforts are applicable to all classes of UUVs for increased energy endurance and efficiency to extend the reach of unmanned undersea systems. Parallel efforts include development and certification of high energy density Lithium Ion (Li-Ion) batteries to enable UUV integration onboard submarines.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Product Development	0.000	6.975	13.929	0.000	13.929
Articles:	-	-	-	-	-
FY 2019 Plans: Conduct study of high safety and high reliability battery technologies, including survey of propagation resistant battery architecture and analysis of industry base with focus on cell quality assurance and supply. Investigate Industry fuel cell solutions for UUVs and begin trade studies on other Navy research and development efforts for development and integration on UUVs.					
FY 2020 Base Plans: Execute submarine integration for Li-Ion batteries, including full certification and testing. Commence modeling and simulation and testing of Li-Ion battery and battery management systems to evaluate performance and system safety. Certify and integrate a propagation resistant Li-Ion battery system for use on submarine deployed LDUUV. Continue small and XLUUV sized fuel cell integration and transition efforts as a high density UUV energy solution, including initial hardware and software integration.					
FY 2020 OCO Plans:					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604029N / *(U)Unmanned Undersea Vehicle Core Technologies*	**Project (Number/Name)** 3396 / *UxS Endurance*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** FY 2019 to FY 2020 increase due to increased priority and demand for high energy density UUV power systems (ie fuel cells) and increased Li-Ion certification efforts.					
Title: Support ***Articles:*** ***FY 2019 Plans:*** Prioritize certification of Li-Ion battery for operational use on submarine deployed UUV. Support design and testing efforts. Advise fuel cell design and development. ***FY 2020 Base Plans:*** Continue integration and related certification efforts of Li-Ion battery assets. Continue fuel cell development efforts, demonstrate technology on UUV platform. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increase from FY 2019 to FY 2020 due to increase in UxS Endurance efforts.	0.000 -	0.075 -	2.182 -	0.000 -	2.182 -
Title: Management Services ***Articles:*** ***FY 2019 Plans:*** N/A ***FY 2020 Base Plans:*** Provide guidance, project planning, financial and contracting support, and coordination for energy system evaluation and integration of payloads. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increase from FY 2019 to FY 2020 due to increase in UxS Endurance efforts	0.000 -	0.000 -	0.671 -	0.000 -	0.671 -
Accomplishments/Planned Programs Subtotals	0.000	7.050	16.782	0.000	16.782

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604029N / *(U)Unmanned Undersea Vehicle Core Technologies*	**Project (Number/Name)** 3396 / *UxS Endurance*

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• RDTEN/0604536N/3396: *Adv Undersea Prototyping-Non-Lethal Payloads*	0.978	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	1.478

Remarks

Funding moved to new Program Element (PE) 0604029N in FY 2019.

D. Acquisition Strategy

UUV Core Technology efforts will accelerate future capabilities and support steady growth of the Navy's Unmanned Undersea Vehicle (UUV) Family of Systems (FoS). UUV Core Technologies will: drive standardization across the UUV FoS; enable Fleet learning and experimentation via industry involvement and capability demonstrations;
and Transition mature technologies from the Science and Technology communities and Industry of which are aligned to Fleet priorities. The program will leverage existing efforts from the Naval Research and Development Enterprise and will utilize rapid contracting approaches such as the Naval Undersea Warfare Center (NUWC) Newport UUV Family of Systems multi-award Indefinite Delivery Indefinite Quantity contract to facilitate Industry involvement. Coordination with UxS platforms will eliminate redundant efforts, encourage innovation, and improve coordination of unmanned systems across multiple domains. The objective of this project (UxS Endurance) is to mature advanced energy systems developed by industry, NASA, ONR, DARPA, and the Naval Research and Development Enterprise, and integrate into UUVs for increased endurance, power, and reach; and develop safe, reliable battery solutions, including Li-Ion technologies, on UUVs for integration onto host surfaces ships and submarines.

E. Performance Metrics

Demonstrate use of advanced UUV Energy technology in an Advanced Development Model prototype and achieve certifications for Li-ion batteries on host platforms.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604029N / *(U)Unmanned Undersea Vehicle Core Technologies*	**Project (Number/Name)** 3396 / *UxS Endurance*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Design, Material, & Fabrication Efforts	WR	Various : Various	0.000	0.000		6.975	Nov 2018	0.000	Dec 2019	-		0.000	Continuing	Continuing	Continuing
Li-Ion Battery Certification	WR	NUWC : Newport, RI	0.000	0.000		0.000		5.000	Dec 2019	-		5.000	0.000	5.000	-
LD & XL Energy- Fuel Cell	TBD	Various : Various	0.000	0.000		0.000		3.034	Dec 2019	-		3.034	0.000	3.034	-
Propagation Resistant Li-Ion Battery	TBD	Various : Various	0.000	0.000		0.000		5.895	Dec 2019	-		5.895	0.000	5.895	-
		Subtotal	0.000	0.000		6.975		13.929		-		13.929	Continuing	Continuing	N/A

Remarks

FY 2018 and prior funding under PE 0604536N. Project 3396 renamed UxS Endurance starting in FY 2020 (previously titled Adv Undersea Prototyping-Non-Lethal Payloads in FY19 and prior years).

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Design Analysis	WR	NRL : WASHINGTON, D.C.	0.000	0.000		0.000		1.100	Dec 2019	-		1.100	Continuing	Continuing	Continuing
Program Support	C/FFP	various : Arlington, VA	0.000	0.000		0.075	Nov 2018	1.082	Jan 2020	-		1.082	Continuing	Continuing	Continuing
		Subtotal	0.000	0.000		0.075		2.182		-		2.182	Continuing	Continuing	N/A

Remarks

FY 2018 and prior funding under PE 0604536N. Project 3396 renamed UxS Endurance starting in FY 2020 (previously titled Adv Undersea Prototyping-Non-Lethal Payloads in FY19 and prior years).

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Management Task	Various	Various : Various	0.000	0.000		0.000		0.671	Dec 2019	-		0.671	0.000	0.671	-
		Subtotal	0.000	0.000		0.000		0.671		-		0.671	0.000	0.671	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604029N / *(U)Unmanned Undersea Vehicle Core Technologies*	**Project (Number/Name)** 3396 / *UxS Endurance*

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract

Remarks

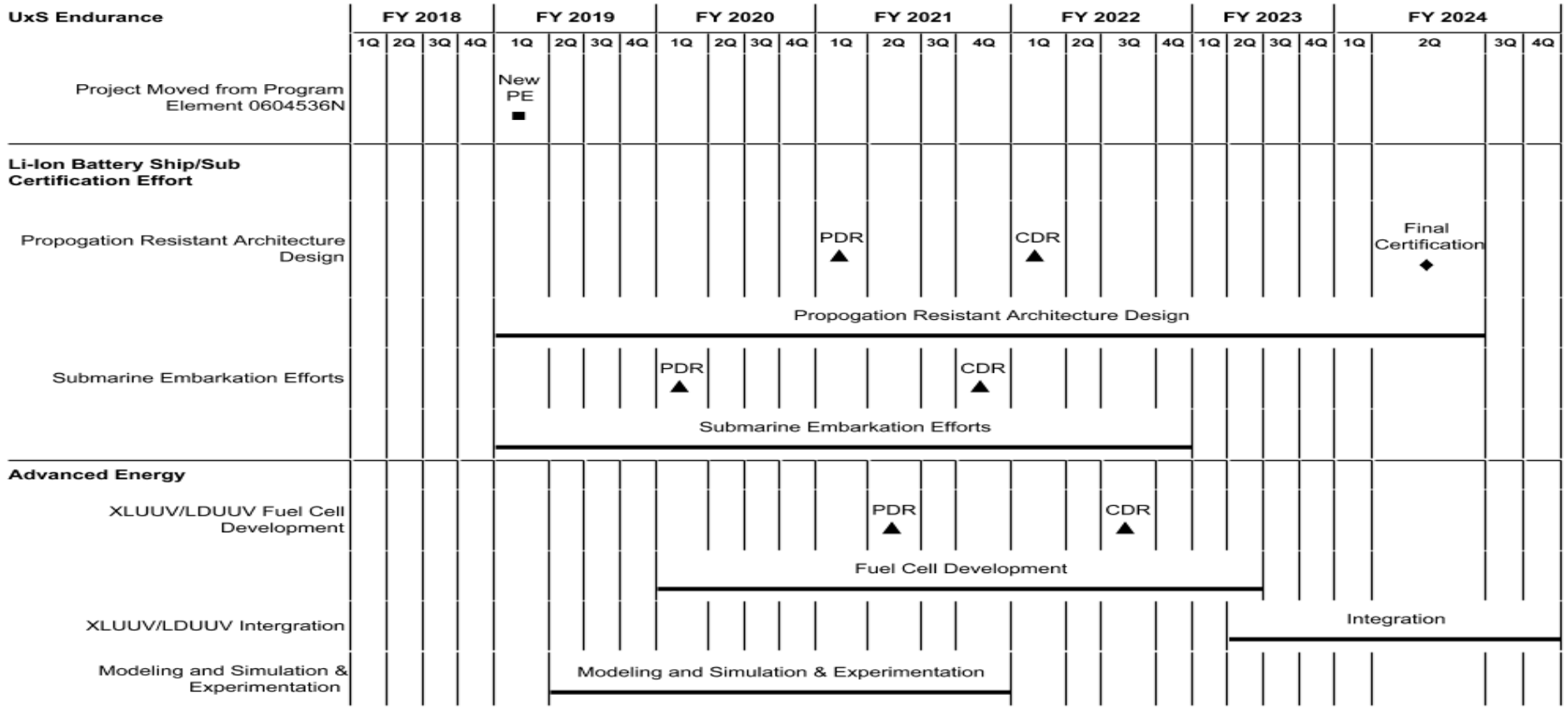
FY 2018 and prior funding under PE 0604536N.

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	0.000		7.050		16.782		-		16.782	Continuing	Continuing	N/A

Remarks

FY 2018 and prior funding under PE 0604536N. Project 3396 renamed UxS Endurance starting in FY 2020 (previously titled Adv Undersea Prototyping-Non-Lethal Payloads in FY19 and prior years).

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604029N / *(U)Unmanned Undersea Vehicle Core Technologies*	**Project (Number/Name)** 3396 / *UxS Endurance*



2020PB - 0604029N - 3396

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604029N / *(U)Unmanned Undersea Vehicle Core Technologies*	**Project (Number/Name)** 3396 / *UxS Endurance*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
UxS Endurance				
Project Moved from Program Element 0604536N:	1	2019	1	2019
Li-Ion Battery Ship/Sub Certification Effort: Propogation Resistant Architecture Design: Preliminary Design Review	1	2021	1	2021
Li-Ion Battery Ship/Sub Certification Effort: Propogation Resistant Architecture Design: Critical Design Review	1	2022	1	2022
Li-Ion Battery Ship/Sub Certification Effort: Propogation Resistant Architecture Design: Final Certification	2	2024	2	2024
Li-Ion Battery Ship/Sub Certification Effort: Propogation Resistant Architecture Design:	1	2019	2	2024
Li-Ion Battery Ship/Sub Certification Effort: Submarine Embarkation Efforts: Preliminary Design Review	1	2020	1	2020
Li-Ion Battery Ship/Sub Certification Effort: Submarine Embarkation Efforts: Critical Design Review	4	2021	4	2021
Li-Ion Battery Ship/Sub Certification Effort: Submarine Embarkation Efforts:	1	2019	4	2022
Advanced Energy: XLUUV/LDUUV Fuel Cell Development: Preliminary Design Review	2	2021	2	2021
Advanced Energy: XLUUV/LDUUV Fuel Cell Development: Critical Design Review	3	2022	3	2022
Advanced Energy: XLUUV/LDUUV Fuel Cell Development:	1	2020	2	2023
Advanced Energy: XLUUV/LDUUV Intergration:	2	2023	4	2024
Advanced Energy: Modeling and Simulation & Experimentation:	2	2019	4	2021

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604029N / *(U)Unmanned Undersea Vehicle Core Technologies*	Project (Number/Name) 4053 / *UxS Platform*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
4053: *UxS Platform*	0.000	0.000	0.000	12.466	-	12.466	12.378	9.689	5.309	5.471	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Note

UxS Platform is a continuation of two FY19 UUV Core Technologies efforts from PE 0604029N and are being transitioned over to PU 4053 beginning in FY20.

A. Mission Description and Budget Item Justification

UxS (Unmanned Systems) Platform is a non-acquisition program that supports rapid innovative research and development prototype efforts to enable integration of deployable and/or retrievable undersea vehicles, payload concepts, and offboard systems through design, manufacture, test/demonstration, evaluation, Rapid Fielding Temporary Alterations (RF TEMPALT) and validation for submarine & other platforms. In addition to research and development, the program will support engineering and integration of new and mature technologies to enable rapid prototyping and fielding of capabilities. This will lower the cost risks of incorporating new technologies prior to acquisition and provide rapid solutions to urgent war-fighter needs. Experimentation will be conducted with the Fleet (i.e., Commander, Naval Submarine Forces (COMSUBFOR), Unmanned Undersea Vehicle Squadron One (UUVRON ONE), etc.), enabling an agile environment through at-sea demonstrations, which will provide Fleet and acquisition stakeholders with relevant payload employment data to inform Concepts of Operations (CONOPs) and fielding decisions. The program will support transition of high-interest systems and/or payloads from research and development to Programs of Record (PoRs), as appropriate. UxS Platform is comprised of Rapid Innovative R&D Prototype Initiatives, RF TEMPALTs, Payload Integration, and Unmanned Undersea Vehicle (UUV) Homeport.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Product Development	0.000	0.000	12.094	0.000	12.094
Articles:	-	-	-	-	-
Description: Rapid Innovative R&D Prototype Initiatives is the development and/or prototyping of rapid technologies efforts that can be incorporated quickly into host platforms/vehicles to enhance Fleet capability. Initiatives will be determined by senior Navy leadership. All initiatives will be demonstrated to provide proof of concept before transitioning to a Program of Record (POR). Rapid Fielding Temporary Alterations (RF TEMPALTs) is the accelerated technical approval process that will support undersea rapid capability demonstrations (non-tactical) and tactical deployment of unmanned systems from host submarine platforms. Payload Integration will develop payload interface standards to include potential hardware for all known small and medium UUVs to enable streamlined development, training and vehicle reconfiguration. The UUV Homeport provides support for multiple UUV efforts, including (but not limited to) infrastructure, engineering, analysis, contracting, test and evaluation (T&E) of prototype support to the Fleet (UUVRON ONE) for capability development. New prototype undersea vehicles and systems will be purchased and/or leased for					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604029N / *(U)Unmanned Undersea Vehicle Core Technologies*	**Project (Number/Name)** 4053 / *UxS Platform*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
experimentations and demonstrations in warfighting environments. It will enable UUVRON ONE to conduct early assessment of new UUV technology capabilities, generate lessons learned, and provide feedback to the acquisition community. The UUV Homeport will also house the UUV Operations Center (UOC) which is the primary command and control center for Unmanned Systems. ***FY 2019 Plans:*** N/A ***FY 2020 Base Plans:*** Continue preliminary study to investigate the use of a NASA approved 18650 Li-Ion battery in a medium sized UUV. Continue a submarine (SSN) launch and recovery effort of small and medium UUVs. Initiate evaluations of vehicle autonomy and validation tools for the Navy's family of UUVs. Establish TEMPALT Coordination Activity (TCA) and databases for the Rapid Fielding TEMPALT process. Develop and implement plans to analyze, test, and certify payloads on small and medium UUVs to inform future transition(s) into PoRs. Develop and test a payload vehicle adapter to be used to merge commercial off the shelf / government off the shelf (COTS/GOTS) vehicle control (e.g., vehicle autonomy, power, communication network, etc.) with the mission payload suite. Conduct experimentation(s) and demonstration(s) of known NAVY UUV capability to inform acquisition decisions. Complete infrastructure study to support XL, Large, Medium, and Small UUV at UUV Homeport. Initiate submarine data exfiltration from UUVs development effort. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increase supports establishment of unmanned systems integration.					
Title: Management Services	0.000	0.000	0.372	0.000	0.372
Articles:	-	-	-	-	-
FY 2019 Plans: N/A ***FY 2020 Base Plans:***					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604029N / *(U)Unmanned Undersea Vehicle Core Technologies*	**Project (Number/Name)** 4053 / *UxS Platform*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Provide guidance, project planning, financial and contracting support, and coordination for development of prototype efforts for deployable and retrievable UUVs and payload concepts. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increase supports establishment of unmanned systems integration.					
Accomplishments/Planned Programs Subtotals	0.000	0.000	12.466	0.000	12.466

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

UUV Core Technology efforts will accelerate future capabilities and support steady growth of the Navy's Unmanned Undersea Vehicle (UUV) Family of Systems (FoS). UUV Core Technologies will: Drive standardization across the UUV FoS; Enable Fleet learning and experimentation via Industry involvement and capability demonstrations; and Transition mature technologies from the Science and Technology communities and Industry of which are aligned to Fleet priorities. By leveraging efforts from the Naval Research and Development Enterprise and Industry for associated technologies and payloads, and integrating them into UUVs at the appropriate level of technical maturity, UUV capabilities for the Fleet will be increasingly enhanced. Coordination with UxS platforms will eliminate redundant efforts, encourage innovation, and improve coordination of unmanned systems across multiple domains. PU 4053: UxS Platform is a non-acquisition program that leverages government laboratories, field activities, and industry to enable research and development efforts in support of technology and system development, manufacture, testing, and fielding on submarine host platforms. Engagement with industry will support development of R&D products for enhanced submarine capability via competitively awarded contracts and sole source Concept Formulation (CONFORM) contracts. These contracting vehicles will facilitate requirements development, prototype development, and prototype production support to allow rapid integration of payloads and offboard systems. Projects and technology capability solutions will transition for inclusion into existing ship baselines or initiation as new POR capabilities.

E. Performance Metrics

Deliver three to five Rapid Fielding TEMPALT projects annually as directed by the Undersea Domain senior leadership. Develop summary report(s) on demonstrations and/or experiments of approaches and predicted performance of new technology and enhanced capabilities.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604029N / *(U)Unmanned Undersea Vehicle Core Technologies*	**Project (Number/Name)** 4053 / *UxS Platform*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Product Development	WR	NUWC NPT : Newport, RI	0.000	0.000		0.000		0.300	Oct 2019	-		0.300	Continuing	Continuing	Continuing
Product Development	WR	NUWC KPT : Keyport, WA	0.000	0.000		0.000		2.959	Oct 2019	-		2.959	Continuing	Continuing	Continuing
Product Development	WR	NSWC CD : West Bethesda, MD	0.000	0.000		0.000		0.150	Oct 2019	-		0.150	Continuing	Continuing	Continuing
Product Development	WR	NRL : Washington DC	0.000	0.000		0.000		0.300	Oct 2019	-		0.300	Continuing	Continuing	Continuing
Product Development	FFRDC	ARL/PSU : Arlington VA	0.000	0.000		0.000		1.150	Oct 2019	-		1.150	Continuing	Continuing	Continuing
Product Development	FFRDC	ARL/UT : Austin, TX	0.000	0.000		0.000		1.800	Oct 2019	-		1.800	Continuing	Continuing	Continuing
Product Development	FFRDC	GTRI : Atlanta, GA	0.000	0.000		0.000		0.183	Oct 2019	-		0.183	Continuing	Continuing	Continuing
Product Development	WR	NSWC DD : Dahlgren, VA	0.000	0.000		0.000		0.052	Oct 2019	-		0.052	Continuing	Continuing	Continuing
Product Development	WR	NASA : Florida	0.000	0.000		0.000		0.500	Oct 2019	-		0.500	Continuing	Continuing	Continuing
Product Development	WR	PSNS : Bremerton, WA	0.000	0.000		0.000		0.200	Oct 2019	-		0.200	Continuing	Continuing	Continuing
Product Development	WR	PNSY : Portsmouth NH	0.000	0.000		0.000		1.000	Oct 2019	-		1.000	Continuing	Continuing	Continuing
Product Development	C/CPAF	Leidos : Reston, VA	0.000	0.000		0.000		3.500	Oct 2019	-		3.500	Continuing	Continuing	Continuing
		Subtotal	0.000	0.000		0.000		12.094		-		12.094	Continuing	Continuing	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Management Services	WR	Various : Various	0.000	0.000		0.000		0.372	Oct 2019	-		0.372	0.000	0.372	-
		Subtotal	0.000	0.000		0.000		0.372		-		0.372	0.000	0.372	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604029N / *(U)Unmanned Undersea Vehicle Core Technologies*	Project (Number/Name) 4053 / *UxS Platform*	

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	0.000		0.000		12.466		-		12.466	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604029N / *(U)Unmanned Undersea Vehicle Core Technologies*	**Project (Number/Name)** 4053 / *UxS Platform*

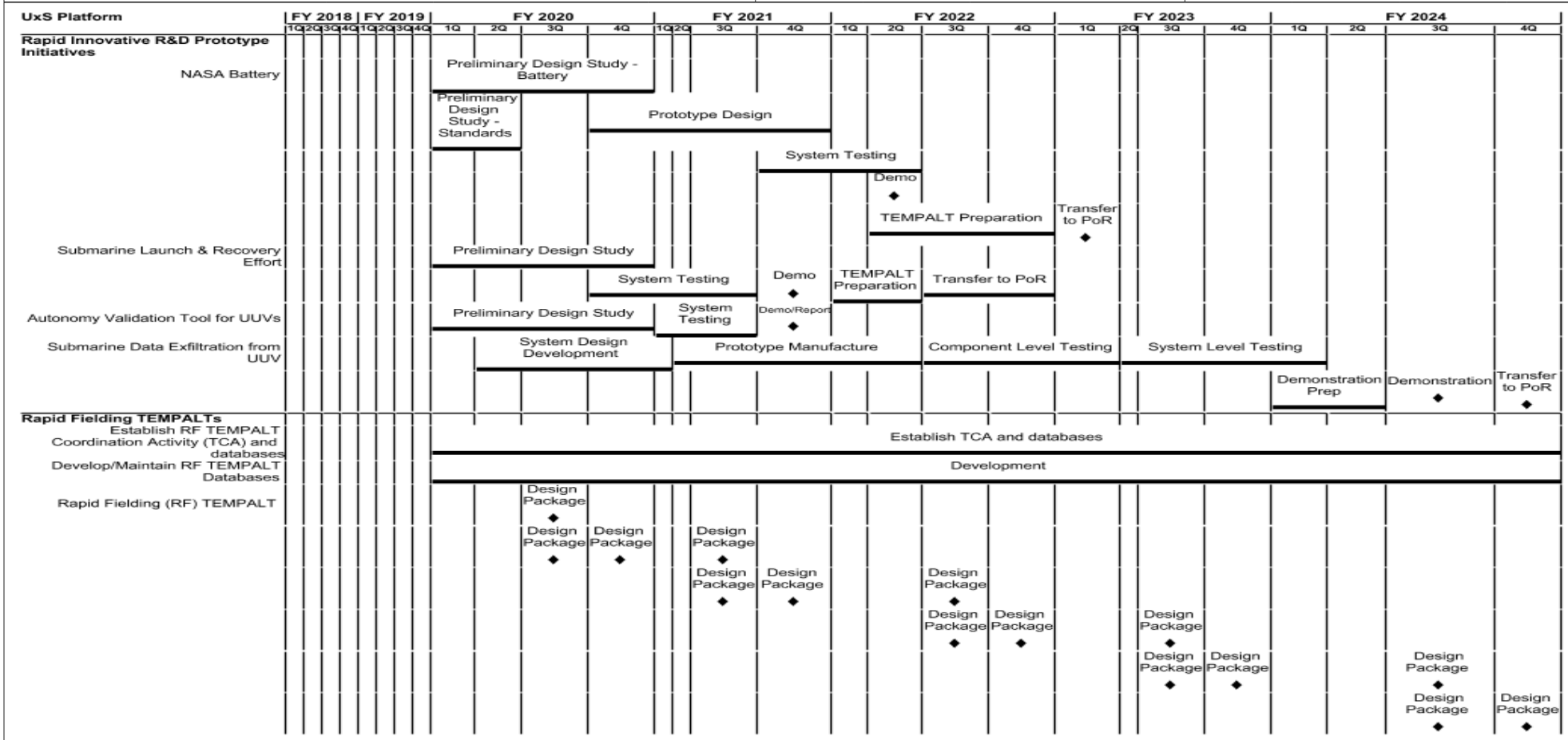
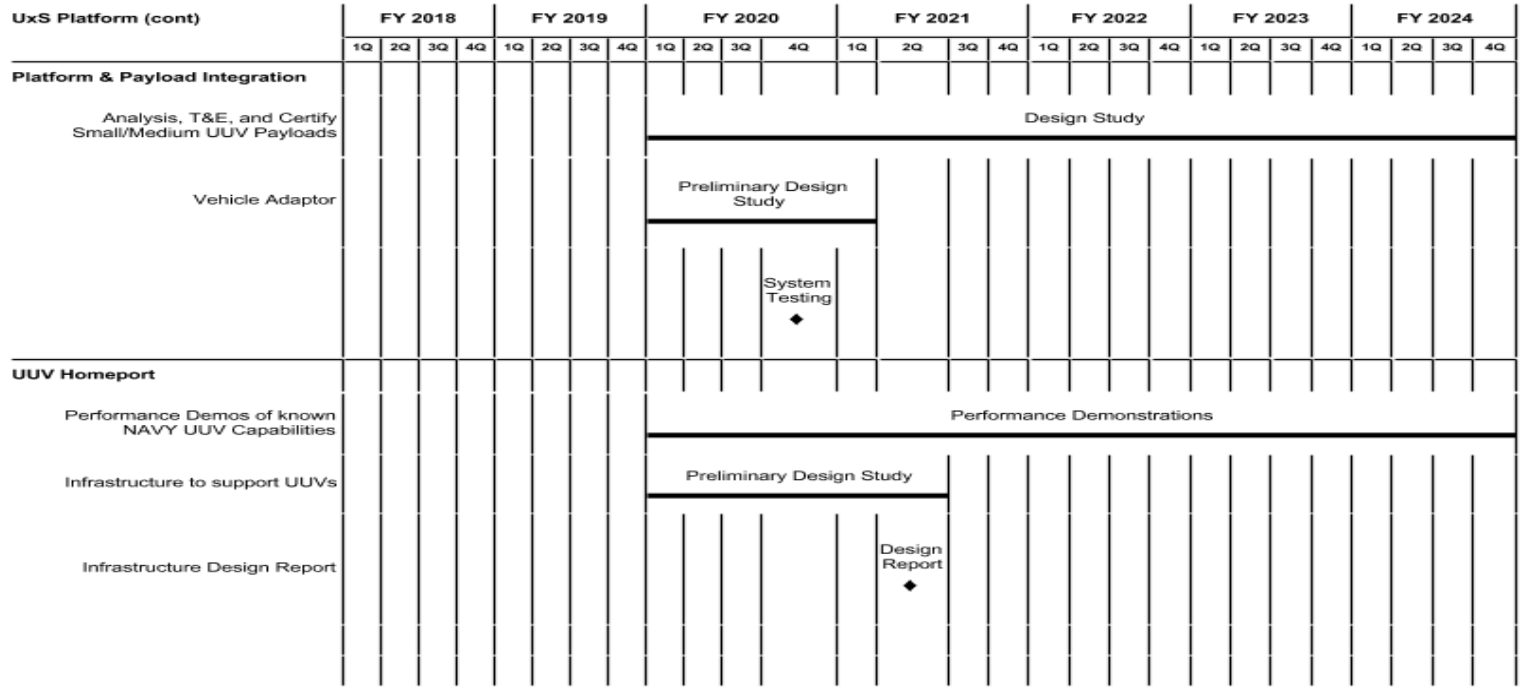


Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604029N / *(U)Unmanned Undersea Vehicle Core Technologies*	**Project (Number/Name)** 4053 / *UxS Platform*



2020PB - 0604029N - 4053

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604029N / *(U)Unmanned Undersea Vehicle Core Technologies*	**Project (Number/Name)** 4053 / *UxS Platform*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
UxS Platform				
Rapid Innovative R&D Prototype Initiatives: NASA Battery: Preliminary Design Study - NASA Battery	1	2020	4	2020
Rapid Innovative R&D Prototype Initiatives: NASA Battery: Preliminary Design Study - NASA/NAVY Standards	1	2020	2	2020
Rapid Innovative R&D Prototype Initiatives: NASA Battery: Prototype Design	4	2020	4	2021
Rapid Innovative R&D Prototype Initiatives: NASA Battery: System Testing	4	2021	2	2022
Rapid Innovative R&D Prototype Initiatives: NASA Battery: Performance /Platform Demo	2	2022	2	2022
Rapid Innovative R&D Prototype Initiatives: NASA Battery: TEMPALT Preparation 1	2	2022	4	2022
Rapid Innovative R&D Prototype Initiatives: NASA Battery: TDP Transfer to PoR 1	1	2023	1	2023
Rapid Innovative R&D Prototype Initiatives: Submarine Launch & Recovery Effort: Preliminary Design Study	1	2020	4	2020
Rapid Innovative R&D Prototype Initiatives: Submarine Launch & Recovery Effort: System Testing	4	2020	3	2021
Rapid Innovative R&D Prototype Initiatives: Submarine Launch & Recovery Effort: Performance / Platform Demo	4	2021	4	2021
Rapid Innovative R&D Prototype Initiatives: Submarine Launch & Recovery Effort: TEMPALT Preparation 2	1	2022	2	2022
Rapid Innovative R&D Prototype Initiatives: Submarine Launch & Recovery Effort: TDP Transfer to PoR 2	3	2022	4	2022
Rapid Innovative R&D Prototype Initiatives: Autonomy Validation Tool for UUVs: Preliminary Design Study	1	2020	4	2020
Rapid Innovative R&D Prototype Initiatives: Autonomy Validation Tool for UUVs: System Testing	1	2021	3	2021

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604029N / *(U)Unmanned Undersea Vehicle Core Technologies*	**Project (Number/Name)** 4053 / *UxS Platform*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Rapid Innovative R&D Prototype Initiatives: Autonomy Validation Tool for UUVs: Performance Demo/Report	4	2021	4	2021
Rapid Innovative R&D Prototype Initiatives: Submarine Data Exfiltration from UUV: System Design Development	2	2020	1	2021
Rapid Innovative R&D Prototype Initiatives: Submarine Data Exfiltration from UUV: Prototype Manufacture	2	2021	2	2022
Rapid Innovative R&D Prototype Initiatives: Submarine Data Exfiltration from UUV: Component Level Testing	3	2022	1	2023
Rapid Innovative R&D Prototype Initiatives: Submarine Data Exfiltration from UUV: System Level Testing	2	2023	1	2024
Rapid Innovative R&D Prototype Initiatives: Submarine Data Exfiltration from UUV: Demonstration Prep	1	2024	2	2024
Rapid Innovative R&D Prototype Initiatives: Submarine Data Exfiltration from UUV: Demonstration	3	2024	3	2024
Rapid Innovative R&D Prototype Initiatives: Submarine Data Exfiltration from UUV: Transfer to PoR	4	2024	4	2024
Rapid Fielding TEMPALTs: Establish RF TEMPALT Coordination Activity (TCA) and databases: Establish TCA and databases	1	2020	4	2024
Rapid Fielding TEMPALTs: Develop/Maintain RF TEMPALT Databases: Develop RF TEMPALT Databases	1	2020	4	2024
Rapid Fielding TEMPALTs: Rapid Fielding (RF) TEMPALT: Design Package 1	3	2020	3	2020
Rapid Fielding TEMPALTs: Rapid Fielding (RF) TEMPALT: Design Package 2	3	2020	3	2020
Rapid Fielding TEMPALTs: Rapid Fielding (RF) TEMPALT: Design Package 3	4	2020	4	2020
Rapid Fielding TEMPALTs: Rapid Fielding (RF) TEMPALT: Design Package 4	3	2021	3	2021
Rapid Fielding TEMPALTs: Rapid Fielding (RF) TEMPALT: Design Package 5	3	2021	3	2021
Rapid Fielding TEMPALTs: Rapid Fielding (RF) TEMPALT: Design Package 6	4	2021	4	2021
Rapid Fielding TEMPALTs: Rapid Fielding (RF) TEMPALT: Design Package 7	3	2022	3	2022
Rapid Fielding TEMPALTs: Rapid Fielding (RF) TEMPALT: Design Package 8	3	2022	3	2022

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604029N / *(U)Unmanned Undersea Vehicle Core Technologies*	**Project (Number/Name)** 4053 / *UxS Platform*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Rapid Fielding TEMPALTs: Rapid Fielding (RF) TEMPALT: Design Package 9	4	2022	4	2022
Rapid Fielding TEMPALTs: Rapid Fielding (RF) TEMPALT: Design Package 10	3	2023	3	2023
Rapid Fielding TEMPALTs: Rapid Fielding (RF) TEMPALT: Design Package 11	3	2023	3	2023
Rapid Fielding TEMPALTs: Rapid Fielding (RF) TEMPALT: Design Package 12	4	2023	4	2023
Rapid Fielding TEMPALTs: Rapid Fielding (RF) TEMPALT: Design Package 13	3	2024	3	2024
Rapid Fielding TEMPALTs: Rapid Fielding (RF) TEMPALT: Design Package 14	3	2024	3	2024
Rapid Fielding TEMPALTs: Rapid Fielding (RF) TEMPALT: Design Package 15	4	2024	4	2024
UxS Platform (cont)				
Platform & Payload Integration: Analysis, T&E, and Certify Small/Medium UUV Payloads: Preliminary Design Study	1	2020	4	2024
Platform & Payload Integration: Vehicle Adaptor: Preliminary Design Study	1	2020	1	2021
Platform & Payload Integration: Vehicle Adaptor: Vehicle Adaptor - System Testing	4	2020	4	2020
UUV Homeport: Performance Demos of known NAVY UUV Capabilities: Performance Demonstrations	1	2020	4	2024
UUV Homeport: Infrastructure to support UUVs: Preliminary Design Study	1	2020	2	2021
UUV Homeport: Infrastructure Design Report: Infrastructure Design Report	2	2021	2	2021

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0604030N *I (U)Rapid Prototyping, Experimentation and Dem*

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	0.000	25.225	28.596	36.197	-	36.197	41.977	42.358	43.266	44.131	Continuing	Continuing
0385: *Rapid Prototype Development*	0.000	21.314	28.596	36.197	-	36.197	41.977	42.358	43.266	44.131	Continuing	Continuing
9999: *Congressional Adds*	0.000	3.911	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	3.911

Note

FY 2018 funding for Project Unit (PU) 0385 reflects the congressionally directed transfer of $20 million from PE 0603382N Advanced Combat Systems Tech PU 0385 to PE 0604030N Rapid Prototyping, Experimentation and Demonstration (RPED) PU 0385 to support the Expeditionary Surveillance Towed Array Sensor System (SURTASS-E) RPED project. FY 2018 funding for PU 9999 reflects the Congressional Add of $3.911M to support the SURTASS-E RPED project.

A. Mission Description and Budget Item Justification

The Rapid Prototyping, Experimentation, and Demonstration (RPED) Program provides Department of the Navy (DON) leadership the ability to respond to urgent and emergent operational needs that require immediate actions to mitigate current threats, offset future threats, and leverage advances in technology that will enable Naval forces to maintain their operational and technological superiority over potential adversaries. In accordance with the 2018 National Defense Strategy (NDS) this program enables a more agile, lethal, and resilient force by rapidly developing and fielding needed warfighting capabilities. Projects funded in this program are aligned with the tenants of the Chief of Naval Operations Design for Maritime Superiority Version 2.0 to rapidly acquire key platforms and payloads to achieve high velocity outcomes. Concepts and enabling technologies include; directed energy weapons, hypersonics, autonomous and unmanned systems, artificial intelligence, machine learning, and multi-domain operations.

Oversight and accountability of projects funded by this program is provided by the DON Accelerated Acquisition Board of Directors (AABoD). Specific projects under this program will be selected and executed in accordance with the DON Accelerated Acquisition Process as described in SECNAVINST 5000.42.

Due to the number of efforts in this PE, the programs described herein are representative of the work included in this PE.

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0604030N *I (U)Rapid Prototyping, Experimentation and Dem*

B. Program Change Summary ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	0.000	48.796	36.197	-	36.197
Current President's Budget	25.225	28.596	36.197	-	36.197
Total Adjustments	25.225	-20.200	0.000	-	0.000
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-20.200			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	2.000	0.000			
• SBIR/STTR Transfer	-0.825	0.000			
• Program Adjustments	0.000	0.000	32.000	-	32.000
• Rate/Misc Adjustments	0.000	0.000	-32.000	-	-32.000
• Congressional Add Adjustments	24.050	-	-	-	-

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2018	FY 2019
Project: 9999: *Congressional Adds*		
Congressional Add: *Expeditionary SURTASS*	3.911	0.000
Congressional Add Subtotals for Project: 9999	3.911	0.000
Congressional Add Totals for all Projects	3.911	0.000

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604030N / *(U)Rapid Prototyping, Experimentation and Dem*	Project (Number/Name) 0385 / *Rapid Prototype Development*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
0385: *Rapid Prototype Development*	0.000	21.314	28.596	36.197	-	36.197	41.977	42.358	43.266	44.131	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Note

Efforts in this Project Unit (PU) 0385 were previously funded in PE 0603382N Advanced Combat Systems Tech; PU 0385 Rapid Prototype Development and PU 0399 Unmanned Rapid Prototype Development. Funds were transferred to this PU beginning in FY2019.

A. Mission Description and Budget Item Justification

The Rapid Prototyping, Experimentation, and Demonstration (RPED) Program provides Department of the Navy (DON) leadership the ability to respond to urgent and emergent operational needs that require immediate actions to mitigate current threats, offset future threats, and leverage advances in technology that will enable Naval forces to maintain their operational and technological superiority over potential adversaries. In accordance with the 2018 National Defense Strategy (NDS) this program enables a more agile, lethal, and resilient force by rapidly developing and fielding needed warfighting capabilities. Projects funded in this program are aligned with the tenants of the Chief of Naval Operations Design for Maritime Superiority Version 2.0 to rapidly acquire key platforms and payloads to achieve high velocity outcomes. Concepts and enabling technologies include; directed energy weapons, hypersonics, autonomous and unmanned systems, artificial intelligence, machine learning, and multi-domain operations.

Oversight and accountability of projects funded by this program is provided by the DON Accelerated Acquisition Board of Directors (AABoD). Specific projects under this program will be selected and executed in accordance with the DON Accelerated Acquisition Process as described in SECNAVINST 5000.42.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Rapid Prototype Development, Experimentation and Demonstration	21.314	28.596	36.197	0.000	36.197
Articles:	-	-	-	-	-
FY 2019 Plans: Complete SURTASS-E RDT&E activities to support initial fielding of capability in FY2019. Specific FY19 activities include: completion of training of operational personnel; completion of system certifications including TEMPEST, cybersecurity, system safety, and full operation acceptance; transportation of system to operational location; completion of integration and system mobilization on to selected vessel of opportunity (VOO); conduct system-level operational demonstration of SURTASS-E as installed on the selected VOO; and correct deficiencies identified in the operational demonstration prior to operational deployment of the full system capability.					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604030N / *(U)Rapid Prototyping, Experimentation and Dem*	**Project (Number/Name)** 0385 / *Rapid Prototype Development*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Plans and associated resources in this project support the completion of the Standard Missile-6 (SM-6) Block (Blk) 1B Phase 1A Rocket Motor rapid prototyping project. The SM-6 Blk 1B Phase 1A rapid prototyping project was designated by the AABoD in February of 2018 as the initial phase of the SM-6 Blk 1B accelerated acquisition program. SM-6 Blk 1B Phase 1A will provide a prototype rocket motor to support the operational requirements of the SM-6 Blk 1B Phase 1A All Up Round (AUR) accelerated acquisition program. Specific FY19 activities include: complete engineering, design, integration, and static firing of a 21-inch diameter 73-inch length "pathfinder" prototype rocket motor; apply lessons learned from 73-inch prototype to complete engineering, design, integration, and static firing of a 21-inch diameter 96-inch tactical length final prototype rocket motor with flight-weight nozzle to verify system performance; conduct insensitive munitions testing. ***FY 2020 Base Plans:*** Continue to fund RPED projects designated by the AABoD. Potential RPED projects may include, but are not limited to; directed energy weapons, hypersonics, unmanned systems, artificial intelligence, machine learning, and multi-domain operations. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** The funding increase between FY19 and FY20 is due to the Navy's continued emphasis on innovation, speed and agility to meet urgent/emergent priority needs, mitigate current threats, offset future threats, and leverage advances in technology to maintain operational and technological superiority over potential adversaries.					
Accomplishments/Planned Programs Subtotals	21.314	28.596	36.197	0.000	36.197

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Projects identified for execution under this project number are non-acquisition programs. Each project will develop a project plan to support project execution. Project plans will include a project schedule and technical requirements and objectives to measure project performance. The selected technical solutions will be demonstrated in operationally relevant environments to assess their ability to meet warfighter requirements. Project deliverables include actual integrated hardware/software prototype systems, CONOPS, requirements, test reports, technical data, and associated doctrine, organization, training, leadership and education, and personnel aspects

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604030N / *(U)Rapid Prototyping, Experimentation and Dem*	**Project (Number/Name)** 0385 / *Rapid Prototype Development*

necessary to support decision making. These deliverables will be used to support project disposition decisions to include transition of technologies to acquisition, further refinement of the technology, or termination and reinvestment of remaining funds to other technologies that add military value.

E. Performance Metrics

Performance metrics are specific to each of the projects funded. All will include measures identified in the Statement of Objectives (SOO), including completions, successes, terminations, and iterative prototype cycle times reported against schedules and deliverables stated in the requirement documents.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604030N / *(U)Rapid Prototyping, Experimentation and Dem*	Project (Number/Name) 0385 / *Rapid Prototype Development*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
SURTASS-E Mission System HW/SW Engineering	C/CPFF	Adaptive Methods : Centreville, VA	0.000	0.522	Jul 2018	0.000		0.000		-		0.000	0.000	0.522	-
SURTASS-E Mission System HW/SW Integration	SS/CPFF	Johns Hopkins APL : Laurel, MD	0.000	4.848	May 2018	0.000		0.000		-		0.000	0.000	4.848	-
SURTASS-E Mission System HW/SW Engineering	C/CPFF	L3/CSC : Millersville, MD	0.000	0.628	Jul 2018	0.000		0.000		-		0.000	0.000	0.628	-
SURTASS-E Vessel of Opportunity (VOO) Evaluation and Leasing	WR	Military Sealift Command : Norfolk, VA	0.000	2.933	Jul 2018	0.000		0.000		-		0.000	0.000	2.933	-
SURTASS-E Common Support Modules Dev Integration	MIPR	PMS 420 : Washington, DC	0.000	2.651	Jul 2018	0.900	Dec 2018	0.000		-		0.000	5.000	8.551	-
SURTASS-E Winch Design and Procurement	WR	NAVFAC EXWC : Port Hueneme, CA	0.000	0.313	Jul 2018	0.000		0.000		-		0.000	0.000	0.313	-
SURTASS-E Towed Array Test Equipment and VOO Assessment	WR	NSWC : Carderock: Carderock, MD	0.000	0.890	Jul 2018	0.000		0.000		-		0.000	0.000	0.890	-
SURTASS-E Towed Array Towing	C/CPFF	Lockheed Martin : Manassas, Va	0.000	0.843	May 2018	3.700	Dec 2018	0.000		-		0.000	3.700	8.243	-
SURTASS-E C4I Suite Development and Integration	WR	NSWC PCD : Panama City, FL	0.000	2.290	Jul 2018	0.000		0.000		-		0.000	0.000	2.290	-
SURTASS-E Acoustic Processing support	WR	NUWC Keyport : Keyport, WA	0.000	0.218	Jul 2018	0.000		0.000		-		0.000	0.000	0.218	-
SURTASS-E VOO Installation Hardware	C/CPFF	Oceaneering Intl : San Diego, CA	0.000	1.643	Jul 2018	0.000		0.000		-		0.000	0.000	1.643	-
SURTASS-E Towed System Shore Support HW	WR	SSC LANT : Little Creek, VA	0.000	0.479	May 2018	0.000		0.000		-		0.000	0.000	0.479	-
SURTASS-E Towed Array Towing HW	C/CPFF	Lockheed Martin : Manassas, VA	0.000	0.893	Jul 2018	0.000		0.000		-		0.000	0.000	0.893	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604030N / *(U)Rapid Prototyping, Experimentation and Dem*	**Project (Number/Name)** 0385 / *Rapid Prototype Development*

Product Development ($ in Millions)

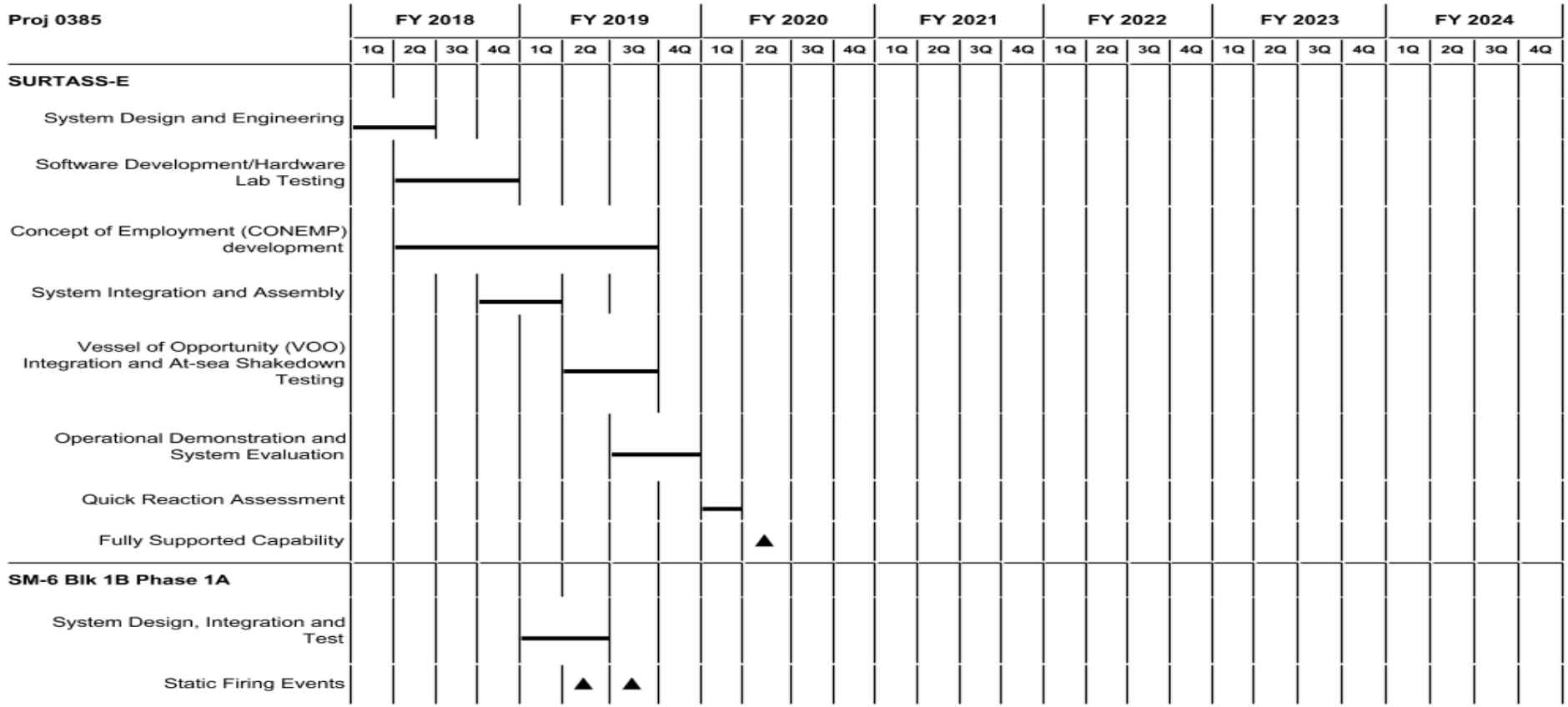
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
SURTASS-E Program Management and Engineering Support	WR	Various : Various	0.000	0.163	Jul 2018	0.000		0.000		-		0.000	0.000	0.163	-
SM6 Rocket Motor Design, Integration, and Test	WR	Naval Air Warefare Center, Weapons Division (NAWCW : China Lake, CA	0.000	2.000	Oct 2018	17.000	Nov 2018	0.000		-		0.000	0.000	19.000	-
SM6 Engineering Support	WR	Naval Surface Warfare Center (NSWC), Indian Head : Indian Head, MD	0.000	0.000		1.000	Nov 2018	0.000		-		0.000	0.000	1.000	-
SM6 Systems Engineering Support	C/FFP	Johns Hopkins University Applied Physics Laborator : Laurel, MD	0.000	0.000		1.000	Dec 2018	0.000		-		0.000	Continuing	Continuing	Continuing
AABoD Direct RPED Projects	Various	Various : Various	0.000	0.000		4.996	Mar 2019	36.197	Jan 2020	-		36.197	0.000	41.193	-
		Subtotal	0.000	21.314		28.596		36.197		-		36.197	Continuing	Continuing	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	21.314		28.596		36.197		-		36.197	Continuing	Continuing	N/A

Remarks

Support and Test and Evaluation costs are directly associated with the delivery of the primary product and included in the product development cost category for rapid prototype development, experimentation and demonstration cost categories.

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604030N / *(U)Rapid Prototyping, Experimentation and Dem*	**Project (Number/Name)** 0385 / *Rapid Prototype Development*



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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604030N / *(U)Rapid Prototyping, Experimentation and Dem*	**Project (Number/Name)** 0385 / *Rapid Prototype Development*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 0385				
SURTASS-E: System Design and Engineering: System Design and Engineering	1	2018	2	2018
SURTASS-E: Software Development/Hardware Lab Testing: Software Development/ Hardware Lab Testing	2	2018	4	2018
SURTASS-E: Concept of Employment (CONEMP) development: Concept of Employment (CONEMP) development	2	2018	3	2019
SURTASS-E: System Integration and Assembly: System Integration and Assembly	4	2018	1	2019
SURTASS-E: Vessel of Opportunity (VOO) Integration and At-sea Shakedown Testing: Vessel of Opportunity (VOO) Integration and At-sea Shakedown Testing	2	2019	3	2019
SURTASS-E: Operational Demonstration and System Evaluation: Operational Demonstration and System Evaluation	3	2019	4	2019
SURTASS-E: Quick Reaction Assessment: Quick Reaction Assessment	1	2020	1	2020
SURTASS-E: Fully Supported Capability: Fully Supported Capability	2	2020	2	2020
SM-6 Blk 1B Phase 1A: System Design, Integration and Test: System Design, Integration and Test	1	2019	2	2019
SM-6 Blk 1B Phase 1A: Static Firing Events: Static Firing Event 1	2	2019	2	2019
SM-6 Blk 1B Phase 1A: Static Firing Events: Static Firing Event 2	3	2019	3	2019

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604030N / *(U)Rapid Prototyping, Experimentation and Dem*	Project (Number/Name) 9999 / *Congressional Adds*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
9999: *Congressional Adds*	0.000	3.911	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	3.911
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

FY18 Congressional Add to support the SURTASS-E RPED project.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019
Congressional Add: Expeditionary SURTASS	3.911	0.000
FY 2018 Accomplishments: This Congressional Add funded Vessel of Opportunity (VOO) evaluation and leasing to support integration of SURTASS-E components and subsystems in preparation for the operational demonstration.		
FY 2019 Plans: N/A		
Congressional Adds Subtotals	3.911	0.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics will include measures identified in the Statement of Objectives (SOO), including completions, successes, and iterative prototype cycle times reported against schedules and deliverables stated in the requirement documents.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604030N / *(U)Rapid Prototyping, Experimentation and Dem*	**Project (Number/Name)** 9999 / *Congressional Adds*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Vessel of Opportunity (VOO) Evaluation and Leasing	WR	Military Sealift Command : Norfolk, VA	0.000	3.911	Jul 2018	0.000		0.000		-		0.000	0.000	3.911	-
		Subtotal	0.000	3.911		0.000		0.000		-		0.000	0.000	3.911	N/A

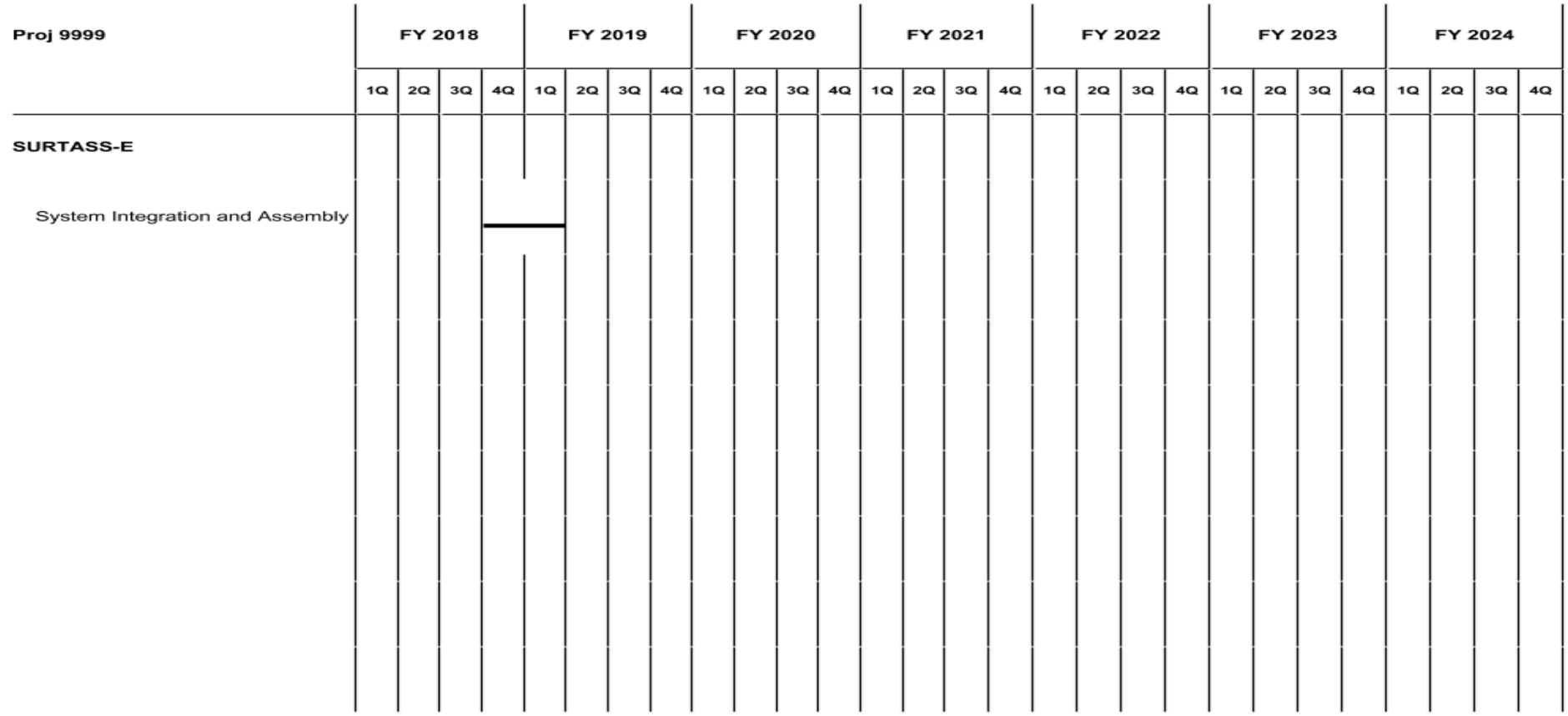
Remarks

Support and Test and Evaluation costs are directly associated with the delivery of the primary product and included in the product development cost category for rapid prototype development, experimentation and demonstration cost categories.

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	3.911		0.000		0.000		-		0.000	0.000	3.911	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604030N / *(U)Rapid Prototyping, Experimentation and Dem*	**Project (Number/Name)** 9999 / *Congressional Adds*



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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604030N / *(U)Rapid Prototyping, Experimentation and Dem*	**Project (Number/Name)** 9999 / *Congressional Adds*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 9999				
SURTASS-E: System Integration and Assembly: System Integration and Assembly	4	2018	1	2019

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0604031N *I (U)Large Unmanned Undersea Vehicles*

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	0.000	23.886	60.304	68.310	-	68.310	81.637	120.436	269.642	129.796	Continuing	Continuing
2094: *Unmanned Underwater Vehicle*	0.000	23.886	60.304	68.310	-	68.310	81.637	120.436	269.642	129.796	Continuing	Continuing

Note

FY 2017 and prior funding in Program Element (PE) 0603502N. Unmanned Underwater Vehicle (UUV) project realigned from PE 0603502N starting in FY 2018.

A. Mission Description and Budget Item Justification

The Snakehead Large Displacement Unmanned Undersea Vehicle (LDUUV) is the Navy's Large Displacement UUV effort as part of the UUV Family of Systems (FoS). It is the number one Submarine-launched UUV priority due to the additional endurance and the capability it will bring to the fleet in support of maintaining the Navy's undersea superiority. In order to accelerate and support steady growth of the fleet's UUV FoS, the Snakehead program will design and build a modular, reconfigurable Unmanned Undersea Vehicle (UUV) with Open Architecture (OA) software (SW) focused on introducing a new class (large displacement) of UUVs to the Navy to provide increased endurance, payload hosting, and delivery capability. The Snakehead LDUUV will be modular in design and include hotel functionality (guidance and control, navigation, autonomy, situational awareness, core communications, and power distribution), high energy capacity and power output, highly capable propulsion and maneuvering, and high accuracy mission sensors and communications links. It is intended that modules will have well defined interfaces for the purposes of implementing cost-effective upgrades in future increments to leverage advances in technology. The Snakehead program is a CNO/ASN(RDA) approved Accelerated Acquisition.

The Snakehead LDUUV program features a phased approach to grow capabilities at a manageable level of risk. Phase 1 is a Government developed prototype with significant Industry involvement to develop Techniques, Tactics, and Procedures (TTPs), Concepts of Operation (CONOPS), and risk reductions for submarine integration. One Phase 1 vehicle, with sufficient test spares, will be fabricated for integration onto Dry Deck Shelter (DDS) equipped submarines. This is a revision to the previous plan to build two Phase 1 vehicles. Phase 2 will be a competitive award to Industry, with increased capabilities and integration onto Modernized DDS and Payload Handling System (PHS) equipped submarines, as well as potential integration onto surface ships (This is a revision to the previous acquisition strategy of a second Government developed variant followed by an Industry vehicle). In order to support this accelerated transition to Industry, the required Technical Data Package and contracting documents will be compiled in FY19 and FY20, culminating with a competitive Request for Proposal (RFP) release in FY20. An Industry award will occur in FY21, five years earlier than originally planned, for a single vendor design with options to fabricate up to four vehicles starting in FY23.

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy					Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*			R-1 Program Element (Number/Name) PE 0604031N *I (U)Large Unmanned Undersea Vehicles*		
B. Program Change Summary ($ in Millions)	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**
Previous President's Budget	0.000	92.613	135.641	-	135.641
Current President's Budget	23.886	60.304	68.310	-	68.310
Total Adjustments	23.886	-32.309	-67.331	-	-67.331
• Congressional General Reductions	-	-0.109			
• Congressional Directed Reductions	-	-32.200			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.714	0.000			
• Program Adjustments	0.000	0.000	-67.331	-	-67.331
• Rate/Misc Adjustments	0.000	0.000	0.000	-	0.000
• Congressional Directed Reductions Adjustments	-35.587	-	-	-	-
• Congressional Add Adjustments	60.187	-	-	-	-

Change Summary Explanation

Program Changes:
FY18 - +$60,187K Congressional realignment establishing new Program Element (PE); -$35,587K LDUUV UUV Program Concurrency; SBIR -$714K
FY19 - -$25,000K Congressional: Transfer to line 94 (XLUUV); -$7,200 Congressional: Accelerate Delta Design; -$109K FFRDC reduction.
FY20 - -$48,435K Orca Dual-vendor Acquisition Strategy; -$18,896K Balance UUV Portfolio

Technical: Not applicable.
Schedule: Not applicable.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604031N / *(U)Large Unmanned Undersea Vehicles*	Project (Number/Name) 2094 / *Unmanned Underwater Vehicle*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
2094: *Unmanned Underwater Vehicle*	0.000	23.886	60.304	68.310	-	68.310	81.637	120.436	269.642	129.796	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Note

FY 2017 and prior funding in Program Element (PE) 0603502N. Unmanned Underwater Vehicle (UUV) project realigned from PE 0603502N starting in FY 2018.

A. Mission Description and Budget Item Justification

The Snakehead Large Displacement Unmanned Undersea Vehicle (LDUUV) is the Navy's Large Displacement UUV effort as part of the UUV Family of Systems (FoS). It is the number one Submarine-launched UUV priority due to the additional endurance and the capability it will bring to the fleet in support of maintaining the Navy's undersea superiority. In order to accelerate and support steady growth of the fleet's UUV FoS, the Snakehead program will design and build a modular, reconfigurable Unmanned Undersea Vehicle (UUV) with Open Architecture (OA) software (SW) focused on introducing a new class (large displacement) of UUVs to the Navy to provide increased endurance, payload hosting, and delivery capability. The Snakehead LDUUV will be modular in design and include hotel functionality (guidance and control, navigation, autonomy, situational awareness, core communications, and power distribution), high energy capacity and power output, highly capable propulsion and maneuvering, and high accuracy mission sensors and communications links. It is intended that modules will have well defined interfaces for the purposes of implementing cost-effective upgrades in future increments to leverage advances in technology. The Snakehead program is a CNO/ASN(RDA) approved Accelerated Acquisition phased approach to build capabilities at a manageable level of risk in the Navy's class of Large Displacement Unmanned Undersea Vehicles.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: LDUUV Product Development	18.561	56.726	63.252	0.000	63.252
Articles:	-	-	-	-	-
FY 2019 Plans: Complete detailed design for Phase I LDUUV and complete Critical Design Review (CDR) in 3QFY19. Procure remaining material and parts and commence fabrication of one Phase I LDUUV. Initiate data products development and analysis for submarine integration. Initiate technical data package for platform integration and technical review. Provide engineering services for initial subsystem testing and risk reduction demos. Initiate delta design efforts to incrementally increase UUV capability from undersea platforms and incorporate lessons learned from Phase 1 (submarine certification efforts, risk reduction and battery integration) and prepare Technical Data Package (TDP) for release of RFP to industry in FY20.					
FY 2020 Base Plans:					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604031N / *(U)Large Unmanned Undersea Vehicles*	**Project (Number/Name)** 2094 / *Unmanned Underwater Vehicle*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Continuation of fabrication of one Phase 1 vehicle and development of data products and analyses. Perform vehicle integration of subsystems, including propulsion, sensors, payload, communications, and control systems. Perform design validation testing concurrent to fabrication. Finalize delta design to incrementally increase UUV capability from undersea platforms and incorporate lessons learned (submarine certification efforts, risk reduction and battery integration) from Phase 1 to prepare TDP for release of RFP to industry in 4QFY20. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increase due to full effort on fabrication of Phase I LDUUV and the commencement of delta design efforts to transition to industry vehicles.					
Title: LDUUV Support	3.653	1.731	2.644	0.000	2.644
Articles:	-	-	-	-	-
FY 2019 Plans: Complete final design documentation and drawings, submarine Interface Control Documents, and subsystem test plans to assemble baseline technical data package for platform integration. Support fabrication and material efforts. Support platform integration efforts. Continue supportability analysis. Support Fleet with demonstration exercises with demo vehicles to develop Tactics, Techniques, and Procedures. ***FY 2020 Base Plans:*** Continue support of fabrication and material efforts. Manage submarine and platform integration products. Continue Fleet demonstration exercises with demo vehicles. Prepare for system certification. Provide support of the completion of delta design efforts to prepare TDP for release of RFP. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increase due to engineering services to support Phase I LDUUV vehicles and effort associated with Delta design work.					
Title: LDUUV Management Services	1.672	1.847	2.414	0.000	2.414
Articles:	-	-	-	-	-
FY 2019 Plans:					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604031N / *(U)Large Unmanned Undersea Vehicles*	**Project (Number/Name)** 2094 / *Unmanned Underwater Vehicle*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Provide program management support and travel for the LDUUV program. Program management plans include overall technical guidance and leadership for the program. Oversight of financial and logistics efforts and coordination with Navy and other DoD organizations and contractors as required to ensure successful execution of the program. ***FY 2020 Base Plans:*** Provide program management support and travel for the LDUUV program. Manage concurrent Phase 1 vehicle fabrication and delta design efforts. Program management plans include overall technical guidance and leadership of the program. Oversight of financial and logistics efforts and coordination with Navy and other DoD organizations and contractors as required to ensure successful execution of the program. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increased management support of new acquisition strategy transitioning development to industry.					
Accomplishments/Planned Programs Subtotals	23.886	60.304	68.310	0.000	68.310

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Utilizing Navy requirements to insert incremental capability, the LDUUV program will design, build, and test a risk-reduction UUV followed by competitive award of design and fabrication contracts to Industry. Phase 1 is a Government developed prototype with significant Industry involvement to develop Techniques, Tactics, and Procedures (TTP) and Concepts of Operation (CONOPS) and reduce risk for submarine integration. The Phase 1 strategy was revised from fabrication of two Phase 1 vehicles to one Phase 1 vehicle with sufficient test spares, and with a focus on submarine integration (potential ship integration is deferred to the Industry variant). The Snakehead program revised its Acquisition Strategy to transition to Industry faster. This new strategy still consists of an initial phase of Government-led development with industry engagement and build. However, the Government Phase 2 has been reduced to a delta-design effort to prepare the required Technical Data Package to support a competitive Request for Proposal (RFP) release in FY20. Industry award will take place in FY21, five years earlier than originally planned, for up to two vendors for design with options to fabricate up to four vehicles starting in FY23.

E. Performance Metrics

LDUUV - Complete Critical Design Review (CDR) 3Q FY 2019.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604031N / *(U)Large Unmanned Undersea Vehicles*	**Project (Number/Name)** 2094 / *Unmanned Underwater Vehicle*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
LDUUV Vehicles, Hardware, & Design	WR	NUWC Newport : Newport, RI	0.000	9.157	Dec 2018	18.411	Dec 2018	20.650	Dec 2019	-		20.650	Continuing	Continuing	Continuing
LDUUV Vehicles, Hardware, & Design	C/CPFF	Various : Various	0.000	0.000		17.589	Dec 2018	18.589	Dec 2019	-		18.589	Continuing	Continuing	Continuing
LDUUV Vehicles, Hardware, & Design	WR	NSWC Carderock : West Bethesda, MD	0.000	2.920	Dec 2018	6.235	Dec 2018	6.535	Dec 2019	-		6.535	Continuing	Continuing	Continuing
LDUUV Vehicles, Hardware,& Design	WR	NSWC Panama City : Panama City, FL	0.000	0.166	Nov 2018	0.000		0.000		-		0.000	0.000	0.166	-
LDUUV Vehicles, Hardware, & Design	SS/CPFF	ARL PSU : State College, PA	0.000	3.410	Feb 2019	8.565	Jan 2019	10.802	Jan 2020	-		10.802	Continuing	Continuing	Continuing
LDUUV Vehicles, Hardware, & Design	WR	SSC Pacific : San Diego, CA	0.000	0.423	Nov 2018	0.306	Dec 2018	0.306	Dec 2019	-		0.306	Continuing	Continuing	Continuing
LDUUV Vehicles, Hardware, & Design	WR	NUWC Keyport : Keyport, WA	0.000	0.856	Dec 2018	5.520	Dec 2018	6.270	Dec 2019	-		6.270	Continuing	Continuing	Continuing
LDUUV Expirimentation and Risk Reduction - Battery Certification	WR	NSWC Crane : Crane, IN	0.000	0.213	Nov 2018	0.100	Dec 2018	0.100	Dec 2019	-		0.100	Continuing	Continuing	Continuing
LDUUV Platform Integration	Various	Various : Various	0.000	0.865	Dec 2018	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
LDUUV Risk Reduction Sonar	SS/CPFF	ARL UT : Austin, TX	0.000	0.551	Dec 2018	0.000		0.000		-		0.000	0.000	0.551	-
		Subtotal	0.000	18.561		56.726		63.252		-		63.252	Continuing	Continuing	N/A

Remarks

FY 2017 and prior funding in Program Element (PE) 0603502N.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604031N / *(U)Large Unmanned Undersea Vehicles*	Project (Number/Name) 2094 / *Unmanned Underwater Vehicle*	

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
LDUUV Engineering Support	WR	NUWC Newport : Newport, RI	0.000	1.693	Dec 2018	0.198	Dec 2018	0.345	Dec 2019	-		0.345	Continuing	Continuing	Continuing
LDUUV Launch and Recovery Engineering Support	WR	NSWC Panama City : Panama City, FL	0.000	0.306	Dec 2018	0.000		0.000		-		0.000	0.000	0.306	-
LDUUV Hydrodynamics and Propulsion Engineering Support	C/CPFF	Various : Various	0.000	0.450	Feb 2019	0.132	Dec 2018	0.132	Dec 2019	-		0.132	Continuing	Continuing	Continuing
LDUUV Hull and Propultion Engineering Support	WR	NSWC Carderock : West Bethsda, MD	0.000	0.286	Nov 2018	0.892	Dec 2018	0.971	Dec 2019	-		0.971	Continuing	Continuing	Continuing
LDUUV Command and Control Engineering Support	WR	SSC Pacific : San Diego, CA	0.000	0.208	Dec 2018	0.361	Dec 2018	0.361	Dec 2019	-		0.361	Continuing	Continuing	Continuing
LDUUV Engineering Support	SS/CPFF	APL/JHU : Laurel, MD	0.000	0.335	Jan 2019	0.100	Jan 2019	0.600	Jan 2020	-		0.600	Continuing	Continuing	Continuing
LDUUV ILS and Engineering Support	WR	NUWC Keyport : Keyport, WA	0.000	0.125	Nov 2018	0.048	Dec 2018	0.235	Dec 2019	-		0.235	Continuing	Continuing	Continuing
LDUUV ILS and Engineering Support	SS/CPFF	Various : Various	0.000	0.250	Nov 2018	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
		Subtotal	0.000	3.653		1.731		2.644		-		2.644	Continuing	Continuing	N/A

Remarks

FY 2017 and prior funding in Program Element (PE) 0603502N.

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
FLEET Experimentation	Various	Various : Various	0.000	0.000		0.000		0.000		-		0.000	0.000	0.000	-
		Subtotal	0.000	0.000		0.000		0.000		-		0.000	0.000	0.000	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604031N / *(U)Large Unmanned Undersea Vehicles*	Project (Number/Name) 2094 / *Unmanned Underwater Vehicle*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
LDUUV Program Management	WR	NUWC Newport : Newport, RI	0.000	0.380	Dec 2018	0.247	Dec 2018	0.579	Dec 2019	-		0.579	Continuing	Continuing	Continuing
LDUUV Program Management	Various	Various : Various	0.000	1.130	Dec 2018	1.500	Dec 2018	1.720	Dec 2019	-		1.720	Continuing	Continuing	Continuing
LDUUV Travel	Various	NAVSEA : Washington, DC	0.000	0.162	Dec 2018	0.100	Dec 2018	0.115	Dec 2019	-		0.115	Continuing	Continuing	Continuing
		Subtotal	0.000	1.672		1.847		2.414		-		2.414	Continuing	Continuing	N/A

Remarks

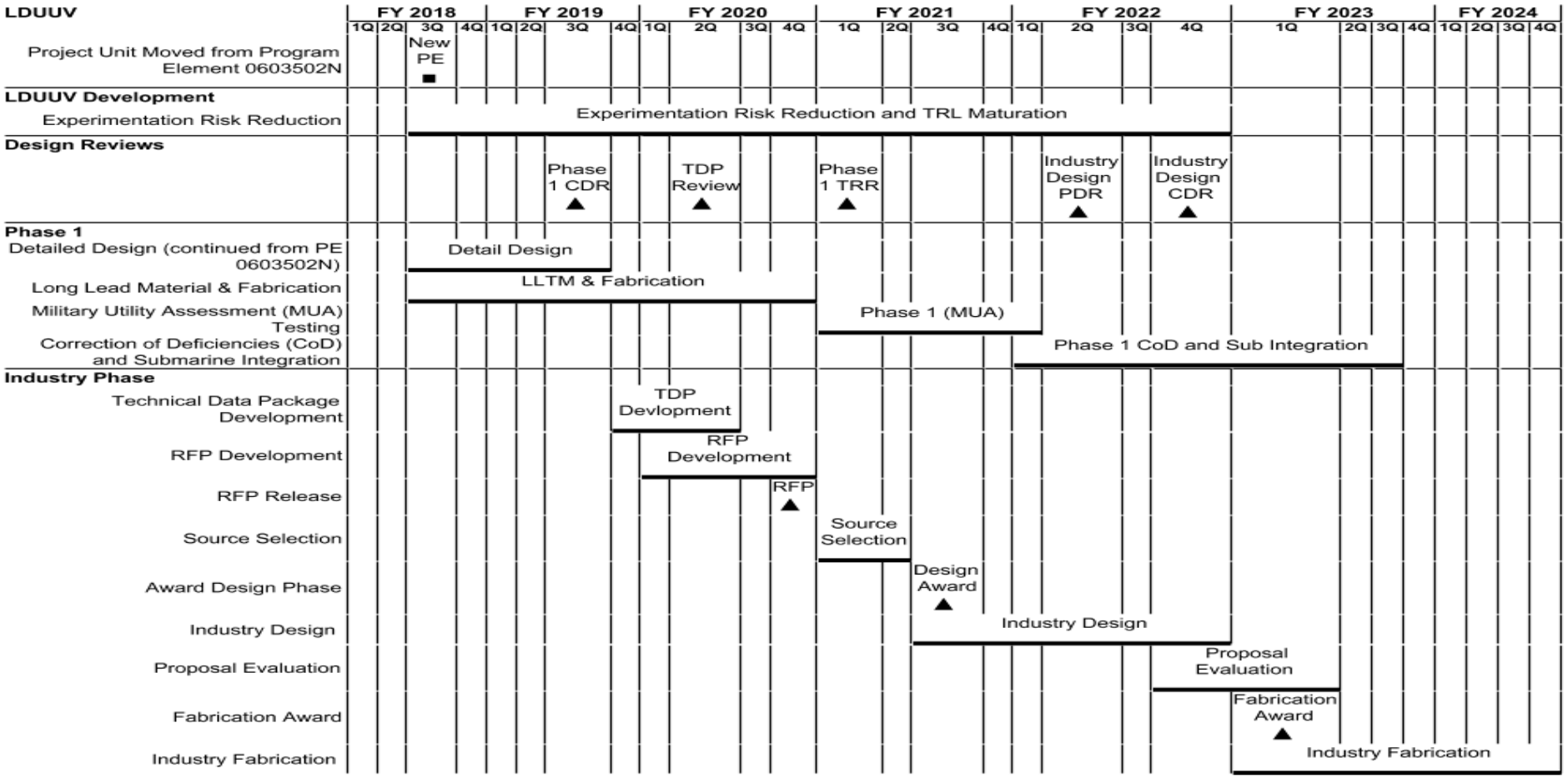
FY 2017 and prior funding in Program Element (PE) 0603502N.

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	23.886		60.304		68.310		-		68.310	Continuing	Continuing	N/A

Remarks

FY 2017 and prior funding in Program Element (PE) 0603502N.

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604031N / *(U)Large Unmanned Undersea Vehicles*	**Project (Number/Name)** 2094 / *Unmanned Underwater Vehicle*



2020PB - 0604031N - 2094

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604031N / *(U)Large Unmanned Undersea Vehicles*	**Project (Number/Name)** 2094 / *Unmanned Underwater Vehicle*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
LDUUV				
Project Unit Moved from Program Element 0603502N:	3	2018	3	2018
LDUUV Development: Experimentation Risk Reduction:	3	2018	4	2022
Design Reviews: Phase 1 CDR	3	2019	3	2019
Design Reviews: Phase 1 Test Readiness Review	1	2021	1	2021
Design Reviews: TDP Review	2	2020	2	2020
Design Reviews: Industry Design PDR	2	2022	2	2022
Design Reviews: Industry Design CDR	4	2022	4	2022
Phase 1: Detailed Design (continued from PE 0603502N):	3	2018	3	2019
Phase 1: Long Lead Material & Fabrication:	3	2018	4	2020
Phase 1: Military Utility Assessment (MUA) Testing:	1	2021	1	2022
Phase 1: Correction of Deficiencies (CoD) and Submarine Integration:	1	2022	3	2023
Industry Phase: Technical Data Package Development:	4	2019	2	2020
Industry Phase: RFP Development:	1	2020	4	2020
Industry Phase: RFP Release:	4	2020	4	2020
Industry Phase: Source Selection:	1	2021	2	2021
Industry Phase: Award Design Phase:	3	2021	3	2021
Industry Phase: Industry Design:	3	2021	4	2022
Industry Phase: Proposal Evaluation:	4	2022	1	2023
Industry Phase: Fabrication Award:	1	2023	1	2023
Industry Phase: Industry Fabrication:	1	2023	4	2024

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0604112N *I (U)Gerald R Ford Cl Nuc Aircraft Carrier CVN 78-80*

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	226.160	82.549	83.121	121.310	-	121.310	99.418	72.213	69.704	54.440	Continuing	Continuing
2208: *CVN 21*	165.862	57.302	25.029	103.830	-	103.830	95.279	72.213	69.704	54.440	Continuing	Continuing
4004: *EMALS*	60.298	25.247	33.092	17.480	-	17.480	4.139	0.000	0.000	0.000	0.000	140.256
9999: *Congressional Adds*	0.000	0.000	25.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	25.000

Program MDAP/MAIS Code:
Project MDAP/MAIS Code(s): 223

A. Mission Description and Budget Item Justification

This Navy program addresses unique technologies on Ford Class carriers. The program includes:

- (2208) - Development of ship hull, mechanical, propulsion, electrical, aviation, and combat support systems, subsystems and components to significantly improve aircraft carrier affordability, manpower requirements, survivability, and operational capabilities, and to meet the requirements of existing and pending regulations and statutes critical to the operation of existing and future aircraft carriers.

- (4004) - Development of an advanced technology aircraft launch system in support of the CVN 78 Class design and construction schedule. The Electro Magnetic Aircraft Launch System (EMALS) will replace the current steam catapult on CVN 78 Class ships. EMALS provides better control of applied forces, both peak and transient dynamic, improved
reliability and maintainability, increased operational availability and reduced operator and maintainer workload.

This Program Element (PE) and associated projects represent a continuation of efforts previously funded under PE 0603512N projects 2208 and 4004 in FY 2014 and earlier.

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0604112N *I (U)Gerald R Ford Cl Nuc Aircraft Carrier CVN 78-80*

B. Program Change Summary ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	83.935	58.121	57.236	-	57.236
Current President's Budget	82.549	83.121	121.310	-	121.310
Total Adjustments	-1.386	25.000	64.074	-	64.074
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	25.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-1.386	0.000			
• Program Adjustments	0.000	0.000	64.318	-	64.318
• Rate/Misc Adjustments	0.000	0.000	-0.244	-	-0.244

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2018	FY 2019
Project: 9999: *Congressional Adds*		
Congressional Add: *CVN 78 Full Ship Shock Trial*	0.000	25.000
Congressional Add Subtotals for Project: 9999	0.000	25.000
Congressional Add Totals for all Projects	0.000	25.000

Change Summary Explanation

FY20 - PROJ 2208 CVN 21: Addition of CVN 78 Full Ship Shock Trials funding (+$17.5M)
FY20 - PROJ 2208 CVN 21: Addition of Integrated Digital Shipbuilding (iDS) funding (+$49.0M)
Schedule: EMALS Depot Planning End Date shifted from 1Q FY 2022 to 4Q FY 2021.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604112N / *(U)Gerald R Ford Cl Nuc Aircraft Carrier CVN 78-80*	Project (Number/Name) 2208 / *CVN 21*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
2208: *CVN 21*	165.862	57.302	25.029	103.830	-	103.830	95.279	72.213	69.704	54.440	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Project MDAP/MAIS Code: 223

A. Mission Description and Budget Item Justification

This project provides for the development of aircraft carrier specific technologies, the infusion of the ship technology base into existing and future aircraft carriers, and the potential realization of subsystem design capabilities not currently feasible. This project transitions the most promising technologies from the Navy technology base, other government laboratories, and the private sector into specific advanced development efforts. All systems developed in this project have the potential to support emerging requirements and other promising systems technologies for insertion into new aircraft carrier designs. The emphasis is directed toward developing ship hull, mechanical, propulsion, electrical, aviation, warfare systems, and combat support systems, sub-systems and components to significantly improve aircraft carrier affordability, manpower requirements, survivability, and operational
capabilities and to meet the requirements of existing and pending regulations and statutes critical to the operation of future aircraft carriers. This project also encompasses those tasks required to support CVN 78 procurement, including, but not limited to engineering support, programmatic and program support, logistics support, modeling and simulation, test and evaluation, manpower and program related studies, and design support systems, such as the Integrated Digital Environment (IDE).

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: CVN 78 Class Advanced Technology Design & Development	36.004	11.597	14.767	0.000	14.767
Articles:	-	-	-	-	-
Description: CVN 78 Class Advanced Technology Design & Development - Continue development and transition of technologies to support CVN 78 Class Key Performance Parameters (KPPs): maintain sortie generation rate, reductions in manpower, and further recovery of weight and stability service life margins. Continue design activities to integrate the new technologies, such as the new propulsion plant and Electromagnetic Aircraft Launch System into the ship. Complete shock qualification for components of all CVN 78 systems.					
FY 2019 Plans: Continue providing support to resolve issues identified during Post Shakedown Availability (PSA) on CVN 78 developmental systems.					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604112N / *(U)Gerald R Ford Cl Nuc Aircraft Carrier CVN 78-80*	**Project (Number/Name)** 2208 / *CVN 21*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Cyber-security: Continue developing CVN 78 cyber-security processes, requirements and solutions. Establish boundary defense for tactical, wire-free communication and video systems. Develop and maintain certification and accreditation packages for system support. Develop land-based test sites to conduct testing. Continue to implement WIN10 upgrades, development of connect / disconnect procedures as well as continue to develop Security Technical Implementation Guides and Information Assurance Technical Authority Board in time for installation during the FY 2020 Planned Incremental Availability. Component Shock: Complete CVN 78 GFE component / system shock qualification requirements. This effort will allow necessary NAVSEA post-delivery shock hardening certification of CVN 78 prior to its operational deployment. Requirements in FY19 are for Raytheon to prepare and perform component shock testing of DBR elements, to include AN/SPY-4, AN/SPY-3, Receiver Exciter (REX), and processing rooms. NSWC Philadelphia will complete review of GFE shock test reports carried over from 4Q 2018 shock testing, provide guidance and approval for DBR test procedures, and review resulting DBR shock test reports. ***FY 2020 Base Plans:*** Cyber-security: Continue developing CVN 78 cyber-security processes, requirements and solutions. Continue development efforts necessary to implement the Defense in Depth Functional Implementation Architecture standard, increasing CVN 78's survivability in a cyber-contested environment. Develop and maintain certification and accreditation packages for system support. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increase is due to additional Cyber test requirements.					
Title: CVN 21 - Test & Evaluation (T&E)	4.872	13.432	22.563	0.000	22.563
Articles:	-	-	-	-	-
FY 2019 Plans: Complete PSA and achieve Initial Operational Capability (IOC). Continue PDT&T, DTWG and CITT efforts in support of DT/IT-5 integration testing. Continue DT/IT-5. The test events scheduled for DT/IT-5 in FY 19 include continuing DBR shipboard engineering and developmental testing; platform-level combat systems interoperability testing; platform-level C4I interoperability testing; CSSQT; structural test firings of Evolved Sea					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604112N / *(U)Gerald R Ford Cl Nuc Aircraft Carrier CVN 78-80*	**Project (Number/Name)** 2208 / *CVN 21*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Sparrow Missile (ESSM) and Rolling Airframe Missile (RAM); Radar Cross Section (RCS) and Infrared (IR) measurements; degaussing and de-perming; cyber-security inspection; platform-level Hull, Mechanical and Electrical (HM&E) interoperability testing; platform-level aviation systems interoperability testing; and aircraft compatibility testing. Continue planning of Operational Testing, to include Operational Test Phase C1 (OT-C1) planned testing and begin detailed planning of scheduled OT-C2 test events. ***FY 2020 Base Plans:*** Continue PDT&T, CTWG and CITT efforts in support of DT/IT-5 testing. The test events scheduled for DT/IT-5 in FY20 include continuing Dual Band Radar (DBR) shipboard engineering and developmental testing; platform-level combat systems interoperability testing; platform-level C4I interoperability testing; CSSQT; structural test firings of Evolved Sea Sparrow Missile and Rolling Airframe Missile; Radar Cross Section and infrared measurements; degaussing and de-perming; cyber-security inspection; platform-level Hull, Mechanical and Electrical interoperability testing; platform-level aviation systems interoperability testing; and aircraft compatibility testing. Continue planning of Operational Testing, to include Operational Test Phase C1 (OT-C1) and OT-C2 test events. Continue to collect reliability data on new and legacy systems. Continue to monitor corrective actions and track installation and performance on ship. Conduct system cyber vulnerability analysis; develop mitigations and solutions to address discovered vulnerabilities and known cyber-security risks. Conduct development and planning to support cyber-survivability testing during Initial Operational Test & Evaluation. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increased to fund CVN 78 test efforts in support of DT/IT testing.					
Title: Integrated Digital Shipbuilding (iDS)	6.965	0.000	49.000	0.000	49.000
Articles:	-	-	-	-	-
Description: Transformation to Integrated Digital Shipbuilding (iDS). ***FY 2019 Plans:*** N/A ***FY 2020 Base Plans:*** Integrated Digital Shipbuilding (iDS): Begin iDS transformation, which is a critical affordability initiative to upgrade the shipbuilder's Ford Class Digital Data Environment to include development of applicable interfaces,					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604112N / *(U)Gerald R Ford Cl Nuc Aircraft Carrier CVN 78-80*	**Project (Number/Name)** 2208 / *CVN 21*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
business processes, supporting systems, and tools to support the construction of FORD Class Aircraft Carriers in a digital environment. The new process for CVN 80 and follow-on ships is to use the Digital Data Environment to develop three-dimensional work instructions which export out of the digital environment to be given to the craftsmen to build the ship. This process would render the overwhelming majority of paper drawings to be obsolete, and result in recurring savings for future FORD Class Aircraft Carriers. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increased for iDS efforts, a critical affordability initiative to upgrade the shipbuilder's Ford Class Digital Data Environment.					
Title: CVN 78 Full Ship Shock Trial (FSST) ***Articles:*** ***FY 2019 Plans:*** N/A ***FY 2020 Base Plans:*** Finalize environmental, explosive operations, instrumentation, electrical power monitoring, and logistics planning in support of FSST execution. Finalize all planning documents (e.g., Shock Trial Plan, Shock Trial Procedure). Complete all technical and environmental risk mitigation activities. Secure all necessary support vessels (e.g., fleet assets, environmental monitoring and explosive operations). Complete all pre-trial activities including, but not limited to: explosive charge dry run, installing instrumentation cabling, removal and storage of non-shock qualified items, and conducting ship equipment baseline assessments. Execute the FSST. Begin any needed repairs in the FY20 Planned Incremental Availability (PIA). Begin data reduction and analysis. Begin development of the CVN 78 FSST report. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:***	9.461 -	0.000 -	17.500 -	0.000 -	17.500 -

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604112N / *(U)Gerald R Ford Cl Nuc Aircraft Carrier CVN 78-80*	**Project (Number/Name)** 2208 / *CVN 21*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Increased to fund CVN 78 test efforts in support of the planning/conduct of FSST.					
Accomplishments/Planned Programs Subtotals	57.302	25.029	103.830	0.000	103.830

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• RDTEN / 0604567N: *Project Units 3108, 3179, 4007, C295*	52.477	50.110	42.559	-	42.559	44.052	45.126	46.024	46.949	Continuing	Continuing
• SCN / 2001: *Carrier Replacement Program*	4,130.704	1,573.181	2,347.000	-	2,347.000	2,644.700	2,323.613	1,929.000	1,718.000	Continuing	Continuing
• SCN / 5300: *Completion of Prior Year Shipbuilding Programs*	20.000	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	1,394.860
• OMN / 1B2B: *CVN 78 Ford Class Training and Sustainment (12BJ0)*	20.748	8.971	7.264	-	7.264	5.317	5.612	5.742	5.866	Continuing	Continuing
• OPN / 5664: *Surface Training Equipment*	12.010	7.942	1.412	-	1.412	4.715	2.796	2.773	2.834	Continuing	Continuing
• OPN / 0981: *Equipment Modernization*	0.000	32.900	8.561	-	8.561	5.849	10.699	5.210	0.883	0.000	64.102
• OMN / 1B5B: *CVN 78 Modernization*	0.000	0.000	6.440	-	6.440	1.784	5.366	17.578	32.224	Continuing	Continuing

Remarks

D. Acquisition Strategy

The CVN 78 is the first ship of the CVN 78 Class of aircraft carriers designed to replace USS ENTERPRISE and the ships of the NIMITZ Class. The CVN 78 will feature a new nuclear propulsion and electrical generation/distribution system, EMALS, advanced arresting gear (AAG) system, all electric auxiliaries, warfare system improvements, survivability
enhancements, improved weapons handling, and improved aircraft servicing. These design features will result in lower manpower and total ownership costs as compared to the NIMITZ Class. Additionally, the following war fighting benefits will be realized: increased sortie generation rate, improved ship self-defense capability, increased launch and recovery
capability/flexibility, increased operational availability, and increased flexibility to support future upgrades.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604112N / *(U)Gerald R Ford Cl Nuc Aircraft Carrier CVN 78-80*	**Project (Number/Name)** 2208 / *CVN 21*

E. Performance Metrics

Successfully complete development of TEMP 1610, Rev C and route for signature. Successfully complete all PEO C4I Test Integration Facility (TIF) testing. Successfully execute Sortie Generation Rate Assessment (SGRA) 12 and SGRA 13. Successfully conduct and support feasibility and tradeoff studies and data packages on new and modified shipboard systems, technologies and proposed modification. Data packages shall include information to support program decisions to integrate these efforts into the whole ship design efforts. Successfully conduct IDC shock testing and reporting in order to finalize IDC R&D efforts. Successfully complete Advanced Weapons Elevator Shock and Electromagnetic Interference (EMI) Test qualifications. Successfully complete Plasma Arc Waste Destruction System (PAWDS) Land-Based Test. Successfully create and deliver 21 Decision Memorandums (DM) for Bents/Bays 1-21 on the 03 Level (Gallery Deck) with Layer 31 information. Successfully develop the baseline Technical Data Packages for 39 systems and mature packages in preparation for final GFI arrival. Successfully complete component shock testing.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604112N / *(U)Gerald R Ford Cl Nuc Aircraft Carrier CVN 78-80*	Project (Number/Name) 2208 / *CVN 21*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Advanced Design & Development	C/CPAF	HII : VA	18.596	11.751	Nov 2017	0.000		1.919	Oct 2019	-		1.919	Continuing	Continuing	Continuing
Advanced Design & Development	WR	NSWC CARDEROCK : MD	3.682	0.769	Nov 2017	0.500	Oct 2018	0.000		-		0.000	Continuing	Continuing	Continuing
Advanced Design & Development	WR	NAWC PATUXENT RIVER : MD	5.106	0.569	Nov 2017	0.250	Oct 2018	0.000		-		0.000	Continuing	Continuing	Continuing
Advanced Design & Development	WR	NSWC DAHLGREN : VA	5.186	2.095	Nov 2017	0.500	Oct 2018	0.000		-		0.000	Continuing	Continuing	Continuing
Advanced Design & Development	C/CPAF	RAYTHEON : VA	9.095	3.674	Mar 2018	9.479	Oct 2018	7.064	Oct 2019	-		7.064	Continuing	Continuing	Continuing
Advanced Design & Development	C/CPFF	NAVSEA SEAPORT : VARIOUS	21.087	2.862	Nov 2017	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Advanced Design & Development	Various	MISCELLANEOUS : VARIOUS	1.944	0.683	Nov 2017	0.250	Nov 2018	0.740	Nov 2019	-		0.740	Continuing	Continuing	Continuing
Advanced Design & Development	WR	NSWC PHILADELPHIA : PA	13.825	2.235	Nov 2017	0.618	Oct 2018	5.044	Oct 2019	-		5.044	Continuing	Continuing	Continuing
Advanced Design & Development	WR	SPAWAR : VARIOUS	2.640	4.000	Nov 2017	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Advanced Design & Development	WR	NSWC CORONA : CA	1.367	0.235	Nov 2017	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Advanced Design & Development	WR	NAWC LAKEHURST : NJ	1.239	0.099	Nov 2017	0.000		0.000		-		0.000	0.000	1.338	-
Advanced Design & Development	WR	NSWC PORT HUENEME : CA	0.372	0.483	Nov 2017	0.000		0.000		-		0.000	0.000	0.855	-
Advanced Design & Development	C/CPFF	BECHTEL : PA	0.000	6.400	Nov 2017	0.000		0.000		-		0.000	0.000	6.400	-
Integrated Digital Shipbuilding	C/CPAF	HII : VA	0.000	6.965	Aug 2018	0.000		49.000	Oct 2019	-		49.000	0.000	55.965	-
Advanced Design & Development	C/CPFF	GRYPHON (SEI&T) : IN	0.203	0.149	Jun 2018	0.000		0.000		-		0.000	0.000	0.352	-
		Subtotal	84.342	42.969		11.597		63.767		-		63.767	Continuing	Continuing	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604112N / *(U)Gerald R Ford Cl Nuc Aircraft Carrier CVN 78-80*	Project (Number/Name) 2208 / *CVN 21*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract

Remarks

- Increases for HII, miscellaneous performing activities and NSWC Philadelphia due to increased CVN 78 cybersecurity efforts.
- HII increased for iDS efforts, a critical affordability initiative to upgrade the shipbuilder's Ford Class Digital Data Environment.

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Development Test & Evaluation	C/CPAF	HII : VA	10.267	0.000		0.165	Nov 2018	0.882	Nov 2019	-		0.882	Continuing	Continuing	Continuing
Development Test & Evaluation	WR	NAWC PATUXENT RIVER : MD	2.941	0.155	Nov 2017	0.403	Nov 2018	0.893	Oct 2019	-		0.893	Continuing	Continuing	Continuing
Development Test & Evaluation	WR	NSWC DAHLGREN : VA	9.363	0.891	Dec 2017	1.648	Nov 2018	3.132	Oct 2019	-		3.132	Continuing	Continuing	Continuing
Development Test & Evaluation	WR	NSWC CARDEROCK : MD	0.436	0.138	Nov 2017	0.533	Nov 2018	1.367	Oct 2019	-		1.367	Continuing	Continuing	Continuing
Development Test & Evaluation	WR	SPAWAR : VARIOUS	8.381	0.000		0.040	Nov 2018	0.000		-		0.000	Continuing	Continuing	Continuing
Development Test & Evaluation	C/CPAF	RAYTHEON : VARIOUS	5.643	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Development Test & Evaluation	Various	MISCELLANEOUS : VARIOUS	1.062	0.078	Nov 2017	1.366	Oct 2018	4.235	Oct 2019	-		4.235	Continuing	Continuing	Continuing
Development Test & Evaluation	C/CPFF	NAVSEA SEAPORT : VARIOUS	1.269	0.477	Jan 2018	1.469	Nov 2018	1.200	Nov 2019	-		1.200	Continuing	Continuing	Continuing
Development Test & Evaluation	C/BA	NSWC PORT HUENEME : CA	0.086	0.000		0.799	Oct 2018	2.500	Oct 2019	-		2.500	Continuing	Continuing	Continuing
Development Test & Evaluation	C/BA	NSWC CORONA : CA	0.263	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Development Test & Evaluation	WR	NAWC LAKEHURST : NJ	9.771	0.910	Nov 2017	0.200	Nov 2018	1.300	Nov 2019	-		1.300	Continuing	Continuing	Continuing

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604112N / *(U)Gerald R Ford Cl Nuc Aircraft Carrier CVN 78-80*	Project (Number/Name) 2208 / *CVN 21*	

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Development Test & Evaluation	WR	NSWC PHILADELPHIA : PA	1.670	0.000		3.124	Nov 2018	3.880	Nov 2019	-		3.880	Continuing	Continuing	Continuing
Operational Test & Evaluation	WR	COMOPTEVFOR : VA	6.148	2.223	Dec 2017	2.904	Nov 2018	3.174	Nov 2019	-		3.174	Continuing	Continuing	Continuing
Operational Test & Evaluation	WR	NAWC PATUXENT RIVER : MD	0.063	0.000		0.150	Oct 2018	0.000		-		0.000	Continuing	Continuing	Continuing
Development Test & Evaluation	C/CPFF	GRYPHON (SEI&T) : IN	0.533	0.000		0.631	Dec 2018	0.000		-		0.000	0.000	1.164	-
Development Test & Evaluation	C/CPFF	GENERAL ATOMICS : CA	11.708	0.000		0.000		0.000		-		0.000	0.000	11.708	-
Full Ship Shock Trial	C/CPFF	BECHTEL : PA	4.600	1.900	Nov 2017	0.000		1.132	Oct 2019	-		1.132	0.000	7.632	-
Full Ship Shock Trial	WR	NAWC PATUXENT RIVER : MD	0.208	0.427	Nov 2017	0.000		1.445	Oct 2019	-		1.445	0.000	2.080	-
Full Ship Shock Trial	WR	NSWC DAHLGREN : VA	0.299	0.152	Dec 2017	0.000		0.887	Oct 2019	-		0.887	0.000	1.338	-
Full Ship Shock Trial	WR	NSWC CARDEROCK : MD	6.711	4.981	Nov 2017	0.000		9.534	Oct 2019	-		9.534	0.000	21.226	-
Full Ship Shock Trial	WR	NSWC PHILADELPHIA : PA	0.098	1.161	Nov 2017	0.000		4.502	Oct 2019	-		4.502	0.000	5.761	-
Full Ship Shock Trial	C/CPAF	HII : VA	0.000	0.600	Aug 2018	0.000		0.000		-		0.000	0.000	0.600	-
Full Ship Shock Trial	WR	SPAWAR : VARIOUS	0.000	0.240	Aug 2018	0.000		0.000		-		0.000	0.000	0.240	-
		Subtotal	81.520	14.333		13.432		40.063		-		40.063	Continuing	Continuing	N/A

Remarks

- NSWC Port Hueneme is expected to be the lead in the planning and performance of the Combat Systems test. The Combat Systems test will test the operational impacts of configuration changes that will occur between the conduct of CSSQT and the beginning of OT-C2. These funds will be needed for FY20 planning activities, such as finalizing test scenarios, test plan development, ammo/target/range allocation, and development of the Data Management Analysis Plan.
- NAWC Lakehurst is the lead in developing the Seastrike Seabasing Aviation Model (SSAM). Originally intended for use in making a DT assessment of the CVN 78's Sortie Generation Rate (SGR), the model also has potential for use in OT assessments of SGR. The additional funds will go toward collecting operational data post-PSA for use in validating the SSAM model.
- The FSST event will occur in FY20. All performing activities will be engaged in completing planning efforts and supporting the execution of this event.
- NSWC Dahlgren will conduct additional test scheduling, planning, and results analyses which will take place during the post-PSA test and trials period.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604112N / *(U)Gerald R Ford Cl Nuc Aircraft Carrier CVN 78-80*	**Project (Number/Name)** 2208 / *CVN 21*

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
- MISC activities will perform the planning and conduct of live integrated testing to assess the CVN 21 ORD Probability of Mission Kill (PMK) requirement on low-slow flyers and small boats, currently scheduled for FY20. Additional funding is required to cover such costs as: missile/gunnery range time, low-slow flyer and small boat targets, ammo, test execution, data analysis, and report writing.															

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	165.862	57.302		25.029		103.830		-		103.830	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604112N / *(U)Gerald R Ford Cl Nuc Aircraft Carrier CVN 78-80*	**Project (Number/Name)** 2208 / *CVN 21*

Gerald R. Ford Class Carriers

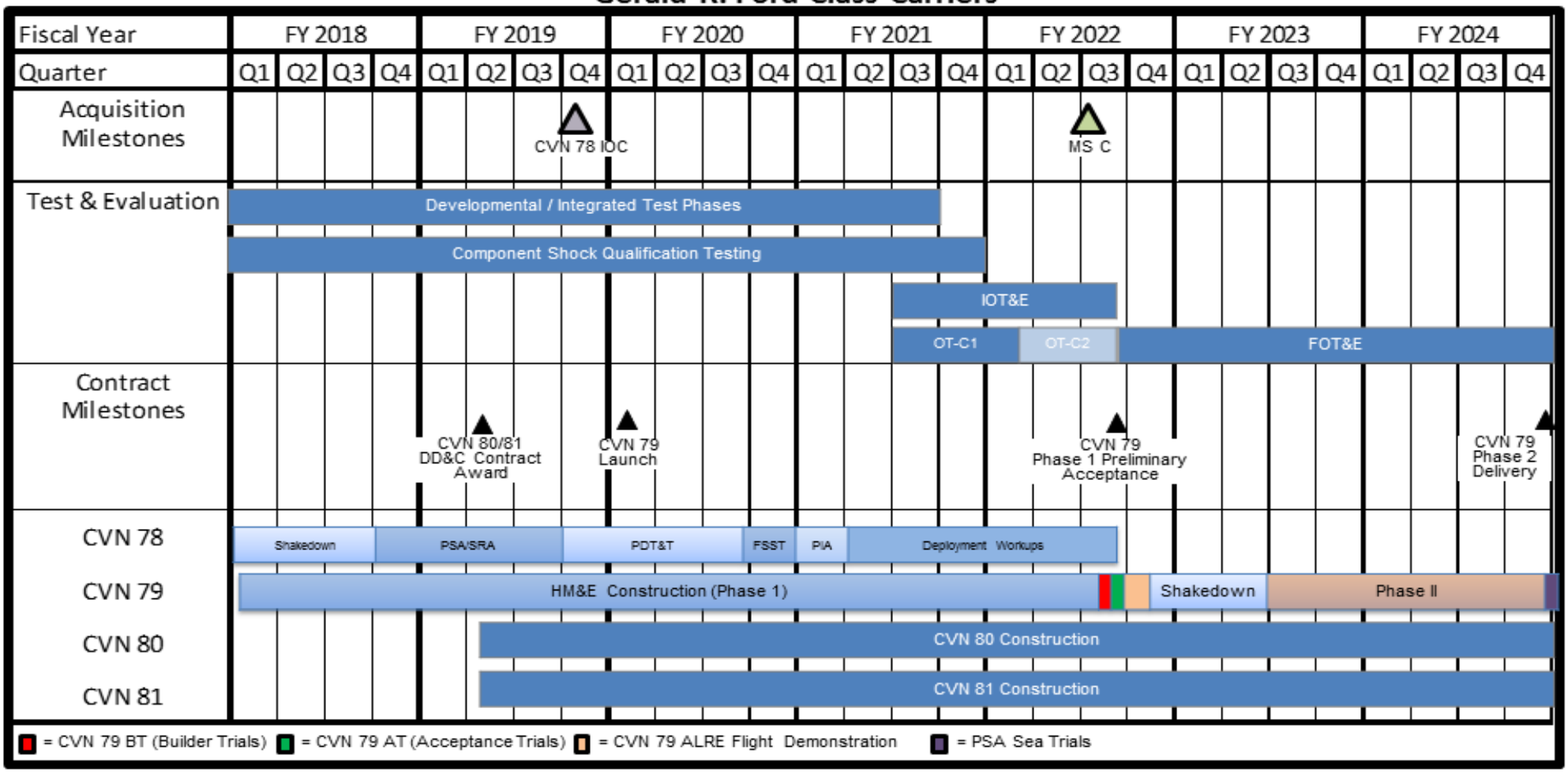


Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604112N / *(U)Gerald R Ford Cl Nuc Aircraft Carrier CVN 78-80*	**Project (Number/Name)** 2208 / *CVN 21*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 2208				
CVN 21	1	2018	4	2024

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604112N / *(U)Gerald R Ford Cl Nuc Aircraft Carrier CVN 78-80*	Project (Number/Name) 4004 / *EMALS*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
4004: *EMALS*	60.298	25.247	33.092	17.480	-	17.480	4.139	0.000	0.000	0.000	0.000	140.256
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Project MDAP/MAIS Code: 223

A. Mission Description and Budget Item Justification

This project provides for the development of an advanced technology aircraft launch system in support of the CVN 78 design and construction schedule, as well as Engineering and Life Cycle System (E&LCS) design. The Electromagnetic Aircraft Launch System (EMALS) will be the aircraft catapult for CVN 78 Class ships. EMALS provides better control of applied forces, both peak and transient dynamic, improved reliability and maintainability, increased operational availability, and reduced operator and maintainer workload.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: EMALS	25.247	33.092	17.480	0.000	17.480
Articles:	-	-	-	-	-
Description: EMALS					
FY 2019 Plans: Continue EMALS Integrated Test & Evaluation (IT&E) land-based testing using deadloads for the correction of deficiencies. Complete Environmental Qualification Testing (EQT) for Launch Control Subsystem (LCS) components deferred from System Development & Demonstration (SDD) and EMALS component shock testing. Maintain EMALS shore-based test site to support: engineering investigations, software integration, deficiency resolution, component obsolescence regression test, and cyber security assessment/mitigation. Complete the development of schoolhouse training systems for Ford Class Aircraft Carrier personnel. Provide interim training for crews until formal schoolhouse training is established. Begin the development of the required processes and procedures to plan for Depot Level activities. Initiate the planning and analysis necessary to standup EMALS Depot Level maintenance, overhaul and repair facility/facilities for EMALS components.					
FY 2020 Base Plans: Complete EMALS Integrated Test & Evaluation (IT&E) land-based testing using deadloads for the correction of deficiencies. Provide interim training for crews until formal schoolhouse training is established. Stand up training facility and achieve Ready For Training. Continue development of the required processes and procedures to					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604112N / *(U)Gerald R Ford Cl Nuc Aircraft Carrier CVN 78-80*	**Project (Number/Name)** 4004 / *EMALS*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
plan for Depot Level activities. Continue the planning and analysis necessary to standup EMALS Depot Level maintenance, overhaul and repair facility/facilities for EMALS components. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** The decrease from FY 2019 to FY 2020 is due to the completion of the EMALS Integrated Test & Evaluation (IT&E) land-based testing.					
Accomplishments/Planned Programs Subtotals	25.247	33.092	17.480	0.000	17.480

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• RDTEN / 0604567N: *Project Units 3108, 3179, 4007, C295*	52.477	50.110	42.559	-	42.559	44.052	45.126	46.024	46.949	Continuing	Continuing
• SCN / 2001: *Carrier Replacement Program*	4,130.704	1,573.181	2,347.000	-	2,347.000	2,644.700	2,323.613	1,929.000	1,718.000	8,634.858	47,989.632
• SCN / 5300: *Completion of Prior Year Shipbuilding Programs*	20.000	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	1,394.860
• OMN / 1B2B: *CVN 78 Ford Class Training and Sustainment (12BJ0)*	20.748	8.971	7.264	-	7.264	5.317	5.612	5.742	5.866	0.000	103.953
• OPN / 5664: *Surface Training Equipment*	12.010	7.942	1.412	-	1.412	4.715	2.796	2.773	2.834	Continuing	Continuing
• OPN / 4213: *Aircraft Support Equipment*	103.340	105.943	145.601	13.420	159.021	119.366	120.849	143.300	134.933	Continuing	Continuing

Remarks

OPN 4213 includes a portion of line item funding for Electro Magnetic Aircraft Launch System (EMALS).

D. Acquisition Strategy

The CVN 78 is the first ship of the CVN 78 Class of aircraft carriers designed to replace the ships of the NIMITZ Class. The CVN 78 will feature a new nuclear propulsion and electrical generation/distribution system, new electromagnetic aircraft launching system (EMALS), advanced arresting gear (AAG) system, all electric auxiliaries, warfare system improvements, survivability enhancements, improved weapons handling, and improved aircraft servicing. These design features will result

in lower manpower and total ownership costs as compared to the NIMITZ Class. Additionally, the following war fighting benefits will be realized: increased sortie generation rate, improved ship self-defense capability, increased launch and recovery capability/flexibility, increased operational availability, and increased flexibility to support future upgrades.

E. Performance Metrics

Successfully complete System Functional Demonstration (SFD) testing. Successfully complete Environmental Qualification Testing (EQT). Successfully complete Shipset Controls Lab testing. Successfully complete Integrated Test and Evaluation (IT&E) including Environmental Qualification Testing (EQT), correction of deficiencies, reliability growth and shock testing.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604112N / *(U)Gerald R Ford Cl Nuc Aircraft Carrier CVN 78-80*	Project (Number/Name) 4004 / *EMALS*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Primary HW Development - SDD	C/CPFF	General Atomics : San Diego, CA	22.746	9.200	Nov 2017	0.000		0.000		-		0.000	0.000	31.946	31.946
Training Development	C/FFP	Pro-Active Technologies, Inc : Oviedo, FL	5.200	1.865	Jul 2018	0.000		0.000		-		0.000	0.000	7.065	7.065
Primary HW Development	WR	NAWCAD Lakehurst : Lakehurst, NJ	3.220	2.110	Nov 2017	1.264	Dec 2018	0.000		-		0.000	0.000	6.594	-
Prior Year Cost No Longer Funded in FYDP	Various	Various : Various	19.020	0.000		0.000		0.000		-		0.000	0.000	19.020	-
		Subtotal	50.186	13.175		1.264		0.000		-		0.000	0.000	64.625	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Government Engineering Support	WR	Various : Various	0.144	0.115	Nov 2017	0.000		0.000		-		0.000	0.000	0.259	-
Training Support	WR	NAWCAD TSD : Orlando, FL	0.296	0.355	Nov 2017	0.295	Dec 2018	0.000		-		0.000	0.000	0.946	-
Training Support	WR	NAWCAD Lakehurst : Lakehurst, NJ	0.000	1.749	Nov 2017	0.695	Nov 2018	0.000		-		0.000	0.000	2.444	-
Depot Logistics Development	C/CPFF	General Atomics : San Diego, CA	0.000	0.000		15.936	Jan 2019	16.369	Jan 2020	-		16.369	3.015	35.320	35.325
Government Eng Support	WR	NAWCAD Lakehurst : Lakehurst, NJ	0.000	0.000		1.116	Dec 2018	1.111	Nov 2019	-		1.111	1.157	3.384	-
		Subtotal	0.440	2.219		18.042		17.480		-		17.480	4.172	42.353	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604112N / *(U)Gerald R Ford Cl Nuc Aircraft Carrier CVN 78-80*	**Project (Number/Name)** 4004 / *EMALS*

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Integrated Test & Evaluation	WR	NAWC Lakehurst : Lakehurst, NJ	3.232	5.919	Nov 2017	1.699	Dec 2018	0.000		-		0.000	0.000	10.850	-
Integrated Test & Evaluation	C/CPFF	General Atomics : San Diego, CA	0.000	3.934	Sep 2018	12.087	Jan 2019	0.000		-		0.000	0.000	16.021	16.021
Prior Year Cost No Longer Funded in FYDP	Various	Various : Various	6.440	0.000		0.000		0.000		-		0.000	0.000	6.440	-
		Subtotal	9.672	9.853		13.786		0.000		-		0.000	0.000	33.311	N/A

Remarks

FY18 updated for actuals. The decrease from FY 2019 to FY 2020 is due to the completion of the EMALS Integrated Test & Evaluation (IT&E) land-based testing.

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	60.298	25.247		33.092		17.480		-		17.480	4.172	140.289	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604112N / *(U)Gerald R Ford Cl Nuc Aircraft Carrier CVN 78-80*	**Project (Number/Name)** 4004 / *EMALS*

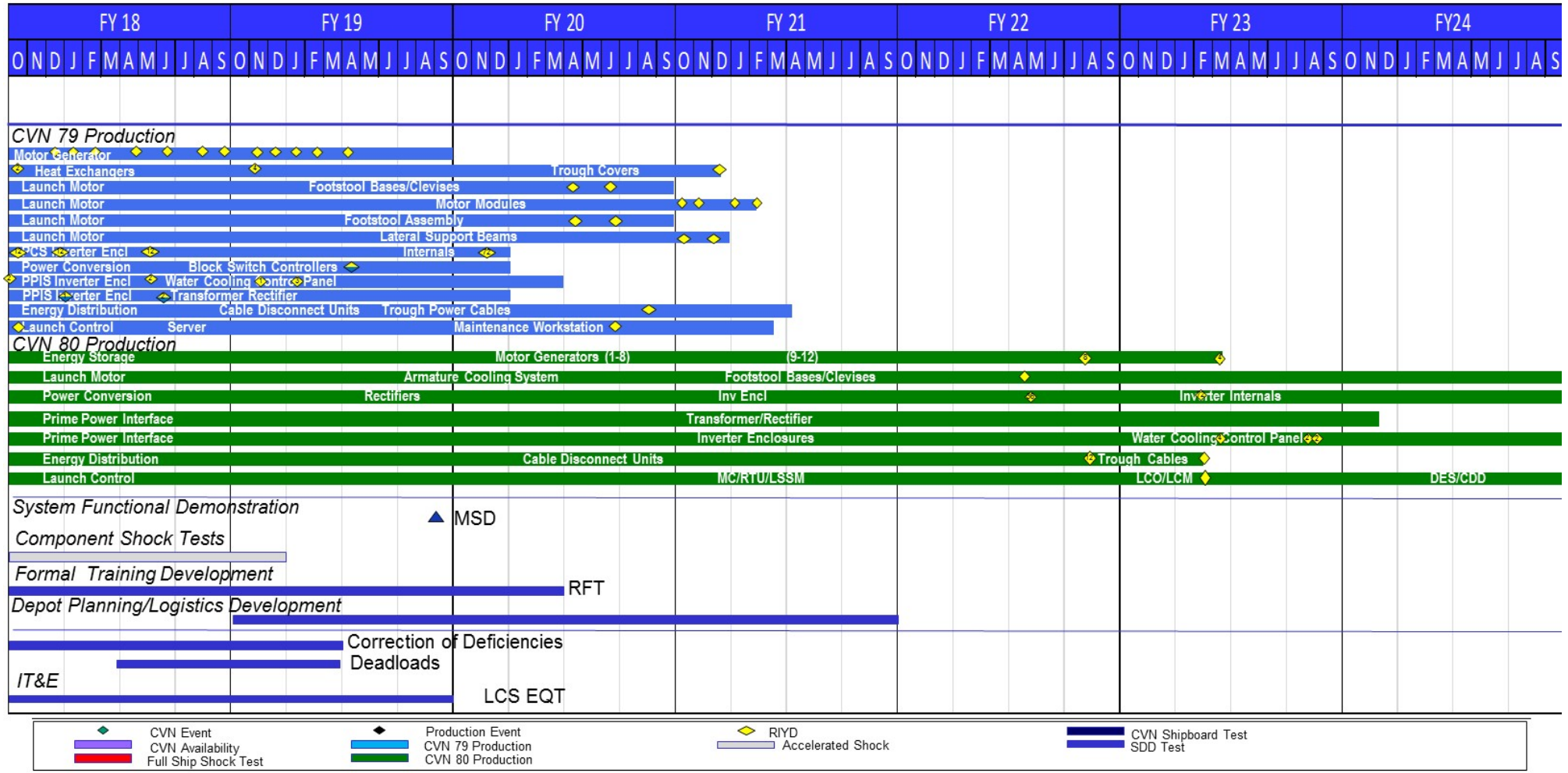


Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604112N / *(U)Gerald R Ford Cl Nuc Aircraft Carrier CVN 78-80*	**Project (Number/Name)** 4004 / *EMALS*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 4004				
EMALS Integrated Test & Evaluation (IT&E)	1	2018	1	2020
EMALS Component Shock Test	1	2018	1	2019
EMALS Training Development	1	2018	2	2020
EMALS Launch Control Subsystem (LCS) Environmental Qualification Testing (EQT)	1	2018	4	2019
EMALS Depot Level Planning	1	2019	1	2022

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604112N / *(U)Gerald R Ford Cl Nuc Aircraft Carrier CVN 78-80*	Project (Number/Name) 9999 / *Congressional Adds*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
9999: *Congressional Adds*	0.000	0.000	25.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	25.000
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This project provides for planning for the Full Ship Shock Trial (FSST) for the USS Gerald Ford (CVN 78).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019
Congressional Add: CVN 78 Full Ship Shock Trial	0.000	25.000
FY 2018 Accomplishments: N/A		
FY 2019 Plans: Full Ship Shock Trial (FSST) - Continue planning for a CVN 78 FSST to be conducted in FY20. Continue developing the DRAFT CVN 78 FSST Plan and provide to stakeholders for review and comment. Continue the Modeling & Simulation effort supporting the CVN 78 FSST pre-trial predictions. Continue planning to mitigate potential environmental impacts. Continue working with support activities to coordinate transport and storage of explosive charges. Continue modeling effort to characterize the charge behavior while being towed by the explosive ops vessel. Develop explosive operations procedures and conduct explosive operations rehearsal. Begin logistics planning to develop FSST spares strategy and storage of planned offloaded equipment. Develop list of post-shock check-out procedures and integrate into a single timeline for system checks between shots. Develop risk mitigation strategies for all identified equipment / systems risks. Component Shock Qualification - Continue component shock qualification of CVN 78 Government-Furnished Equipment components / systems. Successful component shock qualification will support the required NAVSEA post-delivery shock certification of CVN 78 prior to the operational deployment ready date of 3QFY22. Major systems scheduled for component shock testing in FY19 include Electromagnetic Aircraft Launch System, Advanced Arresting Gear, AN/SLQ-25C - Dual Surface Ship Torpedo Defense System (NIXIE), and Ship Self Defense System. Procurement of long-lead Dual Band Radar components to support shock qualification testing is also planned for FY19.		
Congressional Adds Subtotals	0.000	25.000

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604112N / *(U)Gerald R Ford Cl Nuc Aircraft Carrier CVN 78-80*	**Project (Number/Name)** 9999 / *Congressional Adds*

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• RDTEN / 0604567N: *Project Units 3108, 3179, 4007, C295*	52.477	50.110	42.559	-	42.559	44.052	45.126	46.024	46.949	Continuing	Continuing
• SCN / 2001: *Carrier Replacement Program*	4,130.704	1,573.181	2,347.000	-	2,347.000	2,644.700	2,323.613	1,929.000	1,718.000	Continuing	Continuing
• SCN / 5300: *Completion of Prior Year Shipbuilding Programs*	20.000	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	1,394.860
• OMN / 1B2B: *CVN 78 Ford Class Training and Sustainment (12BJ0)*	20.748	8.971	7.264	-	7.264	5.317	5.612	5.742	5.866	Continuing	Continuing
• OPN / 5664: *Surface Training Equipment*	12.010	7.942	1.412	-	1.412	4.715	2.796	2.773	2.834	Continuing	Continuing
• OPN / 0981: *Equipment Modernization*	0.000	32.900	8.561	-	8.561	5.849	10.699	5.210	0.883	Continuing	Continuing
• OMN / 1B5B: *CVN 78 Modernization*	0.000	0.000	6.440	-	6.440	1.784	5.366	17.578	32.224	Continuing	Continuing

Remarks

D. Acquisition Strategy

The CVN 78 is the first ship of the CVN 78 Class of aircraft carriers designed to replace USS ENTERPRISE and the ships of the NIMITZ Class. The CVN 78 will feature a new nuclear propulsion and electrical generation / distribution system, new electromagnetic aircraft launch system (EMALS), advanced arresting gear (AAG) system, all electric auxiliaries,
warfare system improvements, survivability enhancements, improved weapons handling, and improved aircraft servicing. These design features will result in lower manpower and total ownership costs as compared to the NIMITZ Class. Additionally, the following war fighting benefits will be realized: increased sortie generation rate, improved ship self-defense capability, increased launch and recovery capability / flexibility, increased operational availability, and increased flexibility to support future upgrades.

E. Performance Metrics

Successfully accomplish pre-shock trial planning and preparations in support of the CVN 78 Class FSST scheduled for FY20. Conduct shock qualification testing on unqualified components not scheduled for removal prior to deployment. Complete procurement of Dual Band Radar components for shock testing in FY20/21.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604112N / *(U)Gerald R Ford Cl Nuc Aircraft Carrier CVN 78-80*	Project (Number/Name) 9999 / *Congressional Adds*	

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Component Shock	WR	NSWC PHILADELPHIA : PA	0.000	0.000		0.890	Dec 2018	0.000		-		0.000	0.000	0.890	-
Component Shock	WR	NUWC NEWPORT : RI	0.000	0.000		0.859	Dec 2018	0.000		-		0.000	0.000	0.859	-
Component Shock	Various	SPAWAR SAN DIEGO : CA	0.000	0.000		1.372	Nov 2018	0.000		-		0.000	0.000	1.372	-
Component Shock	C/CPAF	RAYTHEON : MA	0.000	0.000		11.853	Mar 2019	0.000		-		0.000	0.000	11.853	-
Component Shock	Various	NAWC LAKEHURST : NJ	0.000	0.000		0.530	Dec 2018	0.000		-		0.000	0.000	0.530	-
Component Shock	WR	NSWC CARDEROCK : MD	0.000	0.000		0.260	Dec 2018	0.000		-		0.000	0.000	0.260	-
Full Ship Shock Trial	WR	NSWC CARDEROCK : MD	0.000	0.000		4.260	Jan 2019	0.000		-		0.000	0.000	4.260	-
Full Ship Shock Trial	WR	NSWC DAHLGREN : VA	0.000	0.000		0.270	Nov 2018	0.000		-		0.000	0.000	0.270	-
Full Ship Shock Trial	WR	NSWC PHILADELPHIA : PA	0.000	0.000		2.167	Dec 2018	0.000		-		0.000	0.000	2.167	-
Full Ship Shock Trial	WR	NAWC PATUXENT RIVER : MD	0.000	0.000		0.308	Jan 2019	0.000		-		0.000	0.000	0.308	-
Full Ship Shock Trial	C/CPAF	HII-NNS : VA	0.000	0.000		0.031	Jan 2019	0.000		-		0.000	0.000	0.031	-
Full Ship Shock Trial	C/BA	FLUOR MARINE PROPULSION : PA	0.000	0.000		2.200	Jan 2019	0.000		-		0.000	0.000	2.200	-
		Subtotal	0.000	0.000		25.000		0.000		-		0.000	0.000	25.000	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	0.000		25.000		0.000		-		0.000	0.000	25.000	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604112N / *(U)Gerald R Ford Cl Nuc Aircraft Carrier CVN 78-80*	**Project (Number/Name)** 9999 / *Congressional Adds*

Gerald R. Ford Class Carriers

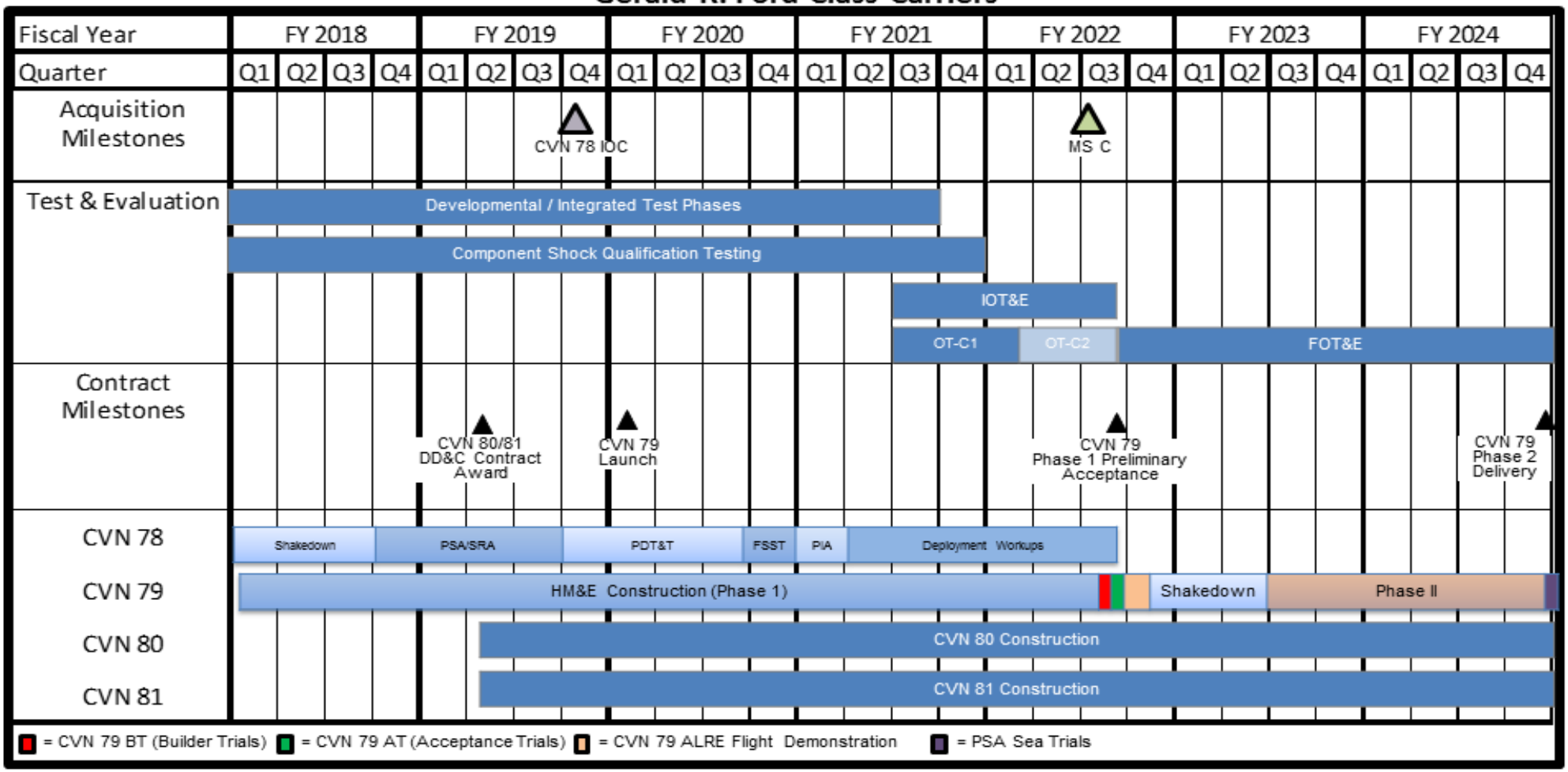


Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604112N / *(U)Gerald R Ford Cl Nuc Aircraft Carrier CVN 78-80*	**Project (Number/Name)** 9999 / *Congressional Adds*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 9999				
CVN 21	1	2018	4	2024

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0604126N *I (U)Littoral Airborne MCM*

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	0.000	11.314	14.625	17.248	-	17.248	18.901	18.639	17.761	18.116	Continuing	Continuing
2131: *Assault Breaching System*	0.000	11.314	14.625	17.248	-	17.248	18.901	18.639	17.761	18.116	Continuing	Continuing

A. Mission Description and Budget Item Justification

This program provides a combination of U.S. Navy systems to counter the threat to amphibious forces from obstacles and anti-landing/sea mines in the Beach Zone and Surf Zone (0-10 ft water). The Assault Breaching Systems (ABS) consist of a system of systems approach that includes the following programs: Joint Direct Attack Munition (JDAM) Assault Breaching System (JABS); Coastal Battlefield Reconnaissance and Analysis (COBRA); Precision Navigation and Marking System (PNMS); Command, Control, Computers, Communications, and Intelligence (C4I). The Assault Breaching Systems enable the Navy-Marine Corps team to conduct Joint Forcible Entry Operations (JFEO), Ship-To-Objective Maneuver (STOM), and other combat operations to project power ashore.

JABS is a currently fielded system that neutralizes surface mines and obstacles in the Beach Zone and Surf Zone. The ABS Tactical Decision Aid optimizes the Desired Points of Impact (DPI) for JDAM munitions to effectively neutralize mines and obstacles while minimizing the required number of munitions and friendly aircraft sorties. Continued testing is required to optimize the ABS Tactical Decision Aid database for the most common enemy mines and obstacles.

COBRA conducts Intelligence Surveillance Reconnaissance and Targeting (ISR/T). This system which consists of two Airborne Payloads and one Post Mission Analysis station, provides Airborne Mine Countermeasures (AMCM) capability. Block I is a multispectral sensor capable of daytime detection of surface-laid minefields and obstacles in the Beach Zone and adds on-board near real-time processing. Block II capability adds a 3D Light Detection and Ranging (LIDAR) sensor that enables nighttime detection of mines and obstacles in the Beach Zone and the Surf Zone (0-10 ft of water). Block II also adds on-board real-time processing of multispectral imagery data. COBRA consists of a modular payload architecture that can be integrated onto the MQ-8B Fire Scout or USN manned helicopters like the MH-60. COBRA will serve in the "detect" mission module for the Surf Zone and Beach Zone in the Littoral Combat Ship (LCS) Mine Countermeasures (MCM) mission package.

PNMS provides navigational upgrades for the Landing Craft, Air Cushion (LCAC); Landing Craft, Utility (LCU); and Amphibious Assault Vehicle (AAV). A system of virtual lane marking improves the navigation ability of these three assault craft which enables them to navigate safely through the neutralized assault lanes provided by JABS. OPN funds the CRAFTALTS to upgrade the navigation systems. LCU Navigation Upgrade: Modernized the navigation system to enable safe transit through the breach lane. LCAC Autopilot Upgrade: An integrated improvement to the LCAC Service Life Extension Program (SLEP) navigation system for craft control that allows precise navigation and hovering within the breach lane. These software upgrades and backfits occur during scheduled LCAC SLEPs. AAV Navigation Upgrade : Modernize the navigation system to enable precise transit through the breach lane.

C4I system will tie all of the above systems together under an integrated ABS architecture that is compatible with the existing Mine Warfare architecture.

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy					Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*			R-1 Program Element (Number/Name) PE 0604126N *I (U)Littoral Airborne MCM*		
B. Program Change Summary ($ in Millions)	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**
Previous President's Budget	0.000	17.622	20.348	-	20.348
Current President's Budget	11.314	14.625	17.248	-	17.248
Total Adjustments	11.314	-2.997	-3.100	-	-3.100
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-2.997			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.309	0.000			
• Program Adjustments	0.000	0.000	-3.100	-	-3.100
• Rate/Misc Adjustments	0.000	0.000	0.000	-	0.000
• Congressional Add Adjustments	11.623	-	-	-	-

Change Summary Explanation

Program Changes:

The FY 2020 funding request was reduced by $3.100 million to account for the availability of prior year execution balances.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy											Date: March 2019	
Appropriation/Budget Activity 1319 / 4					R-1 Program Element (Number/Name) PE 0604126N / *(U)Littoral Airborne MCM*				Project (Number/Name) 2131 / *Assault Breaching System*			
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
2131: *Assault Breaching System*	0.000	11.314	14.625	17.248	-	17.248	18.901	18.639	17.761	18.116	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This program provides a combination of U.S. Navy systems to counter the threat to amphibious forces from obstacles and anti-landing/sea mines in the Beach Zone and Surf Zone (0-10 ft water). The Assault Breaching Systems (ABS) consist of a system of systems approach that includes the following programs: Joint Direct Attack Munition (JDAM) Assault Breaching System (JABS); Coastal Battlefield Reconnaissance and Analysis (COBRA); Precision Navigation and Marking System (PNMS); Command, Control, Computers, Communications, and Intelligence (C4I). The Assault Breaching Systems enable the Navy-Marine Corps team to conduct Joint Forcible Entry Operations (JFEO), Ship-To-Objective Maneuver (STOM), and other combat operations to project power ashore.

JABS is a currently fielded system that neutralizes surface mines and obstacles in the Beach Zone and Surf Zone. The ABS Tactical Decision Aid optimizes the Desired Points of Impact (DPI) for JDAM munitions to effectively neutralize mines and obstacles while minimizing the required number of munitions and friendly aircraft sorties. Continued testing is required to optimize the ABS Tactical Decision Aid database for the most common enemy mines and obstacles.

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C4I system will tie all of the above systems together under an integrated ABS architecture that is compatible with the existing Mine Warfare architecture.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**
Title: Product Development:	7.359	9.668	10.463	0.000	10.463
Articles:	-	-	-	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604126N / *(U)Littoral Airborne MCM*	**Project (Number/Name)** 2131 / *Assault Breaching System*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
FY 2019 Plans: COBRA - Continue design and development of COBRA hardware and continue integration test planning of additional surf zone capabilities. JABS - Continued design engineering of weapon effectiveness for beach and surf zones. ***FY 2020 Base Plans:*** COBRA - Continue design and development of COBRA hardware and integration test planning of additional surf zone capabilities. Conduct Block II Milestone B in 3Q FY20. JABS - Continue design and engineering of weapon effectiveness for beach and surf zones ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** FY2020 funding increase supports technical efforts necessary to achieve additional surf zone capabilities.					
Title: Technical Support: ***Articles:*** ***FY 2019 Plans:*** COBRA - Continue to provide management and shipping, contract and test/studies, C4I Data Fusion. Provide technical /acquisition support and documentation. ***FY 2020 Base Plans:*** COBRA - Continue to provide management and shipping, contract and test/studies, C4I Data Fusion. Provide technical /acquisition support and documentation (ILS, training, data, drawings). ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** No significant change.	0.942 -	1.447 -	1.307 -	0.000 -	1.307 -
Title: Test and Evaluation: ***Articles:*** ***FY 2019 Plans:*** COBRA - Continue advance surf zone component/capability design and test.	2.209 -	2.382 -	4.336 -	0.000 -	4.336 -

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604126N / *(U)Littoral Airborne MCM*	**Project (Number/Name)** 2131 / *Assault Breaching System*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
JABS - Surf Zone (SZ) and Beach Zone (BZ) characterization testing. ***FY 2020 Base Plans:*** COBRA - Continue advance surf zone component/capability design and test. Conduct Block I - 3A and 4 Flight Testing. JABS - Surf Zone (SZ) and Beach Zone (BZ) characterization testing. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** FY2020 funding increase supports technical efforts necessary to meet Block I requirements and JABS characterization testing.					
Title: Management: ***Articles:*** ***FY 2019 Plans:*** COBRA - Continue contract and financial management support. JABS - Continue to manage Mine magazine inventory management and shipping, contract management and tests/studies, C4I/Data fusion. ***FY 2020 Base Plans:*** COBRA - Continue contract and financial management support. JABS - Continue to manage Mine magazine inventory management and shipping, contract management and tests/studies, C4I/Data fusion. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** No significant change.	0.804 -	1.128 -	1.142 -	0.000 -	1.142 -
Accomplishments/Planned Programs Subtotals	11.314	14.625	17.248	0.000	17.248

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604126N / *(U)Littoral Airborne MCM*	**Project (Number/Name)** 2131 / *Assault Breaching System*

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• OPN/2624: *SHALLOW WATER Mine CM SHIP*	8.796	8.616	8.730	-	8.730	5.595	5.703	5.811	5.927	0.000	106.526

Remarks

D. Acquisition Strategy

Countermine/Counter Obstacle (CM/CO) JDAM Assault Breaching System (JABS) and ABS Tactical Decision Aid testing is ongoing.
Intelligence/Surveillance/Reconnaissance/Targeting (ISR/T) - COBRA Block I achieved MS C in 3rd QTR FY 2009.
Precision Navigation & Marking System (PNMS) - The navigation upgrades for the Landing Craft, Air Cushion (LCAC) and Landing Craft, Utility (LCU) are complete.
AAV enhancements will be achieved through an ECP (PMA AAV (Marine Corps)) in 1st QTR FY 2019.

E. Performance Metrics

Successful COBRA integration, flight tests: Operational Assessment (OA) and Development Testing (DT) into the MQ-8B Fire Scout. COBRA achieved IOC in FY 2017.
The above systems continue to meet or exceed their Key Performance Parameters.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604126N / *(U)Littoral Airborne MCM*	Project (Number/Name) 2131 / *Assault Breaching System*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Primary Hardware Dev, COBRA	C/CPAF	Arete : Tucson, AZ	0.000	5.038	Nov 2017	6.813	Jan 2019	8.438	Dec 2019	-		8.438	Continuing	Continuing	Continuing
Systems Engineering, COBRA	WR	NSWC, PC : PANAMA CITY, FL	0.000	0.781	Oct 2017	1.090	Nov 2018	1.688	Nov 2019	-		1.688	Continuing	Continuing	Continuing
JABS	WR	NSWC PC : NSWC IH	0.000	0.799	Oct 2017	0.927	Jan 2019	0.000	Nov 2019	-		0.000	Continuing	Continuing	Continuing
Training Dev, COBRA	WR	NSWC, PC : PANAMA CITY, FL	0.000	0.559	Oct 2017	0.659	Jan 2019	0.000	Dec 2019	-		0.000	Continuing	Continuing	Continuing
ABS IPT/Test Assets/Proj Eng	WR	NSWC, PC : PANAMA CITY, FL	0.000	0.182	Oct 2017	0.179	Dec 2018	0.337	Dec 2019	-		0.337	Continuing	Continuing	Continuing
		Subtotal	0.000	7.359		9.668		10.463		-		10.463	Continuing	Continuing	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Development Support Equipment	WR	NSWC, PC : PANAMA CITY, FL	0.000	0.613	Nov 2017	0.942	Dec 2018	0.908	Dec 2019	-		0.908	Continuing	Continuing	Continuing
Integrated Logistics Support	WR	NSWC PC : PANAMA CITY, FL	0.000	0.072	Nov 2017	0.111	Nov 2018	0.060	Nov 2019	-		0.060	Continuing	Continuing	Continuing
Configuration Management	WR	NSWC, PC : PANAMA CITY, FL	0.000	0.072	Nov 2017	0.111	Nov 2018	0.061	Nov 2019	-		0.061	Continuing	Continuing	Continuing
Studies & Analysis	WR	NSWC IH : INDIAN HEAD, MD	0.000	0.185	Oct 2017	0.283	Dec 2018	0.278	Nov 2019	-		0.278	Continuing	Continuing	Continuing
		Subtotal	0.000	0.942		1.447		1.307		-		1.307	Continuing	Continuing	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Development Test & Evaluation	WR	NSWC, IH : INDIAN HEAD, MD	0.000	1.126	Oct 2017	1.229	Nov 2018	3.201	Nov 2019	-		3.201	Continuing	Continuing	Continuing

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604126N / *(U)Littoral Airborne MCM*	Project (Number/Name) 2131 / *Assault Breaching System*	

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Operational Test & Evaluation	WR	NSWC/ IH, PC : INDIAN HEAD, PANAMA CITY	0.000	0.361	Nov 2017	0.405	Dec 2018	1.135	Nov 2019	-		1.135	Continuing	Continuing	Continuing
Development Test	WR	NSWC PC : Panama City, FL	0.000	0.722	Nov 2017	0.748	Nov 2018	0.000	Nov 2019	-		0.000	Continuing	Continuing	Continuing
		Subtotal	0.000	2.209		2.382		4.336		-		4.336	Continuing	Continuing	N/A

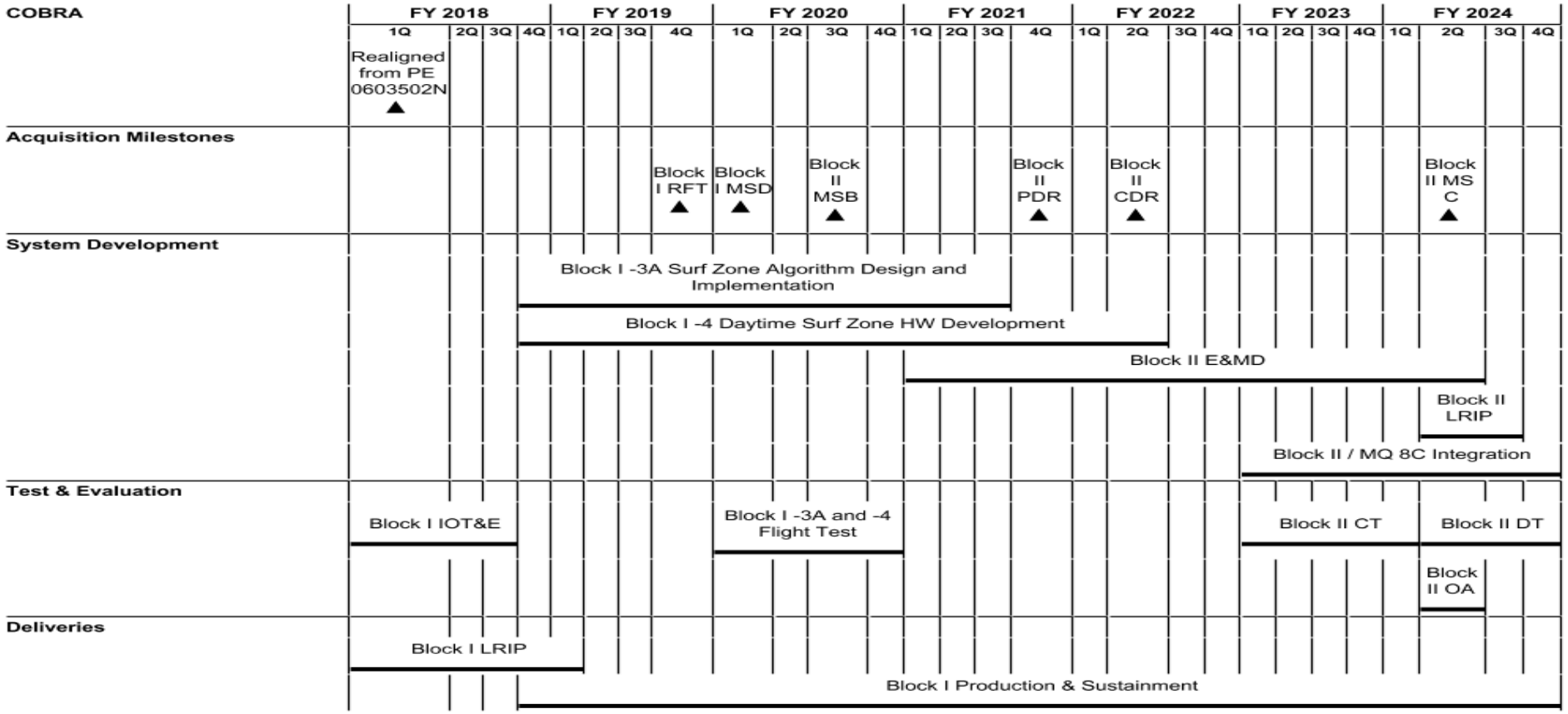
Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Contractor Engineering Support	C/CPFF	BAH, Northrop Grumman : DC, FL	0.000	0.090	Dec 2017	0.131	Dec 2018	0.140	Dec 2019	-		0.140	Continuing	Continuing	Continuing
Government Engineering Support	WR	NSWC, IH : INDIAN HEAD, MD	0.000	0.359	Nov 2017	0.501	Nov 2018	0.505	Nov 2019	-		0.505	Continuing	Continuing	Continuing
Program Management Support	WR	NSWC/ IH, PC : INDIAN HEAD, PANAMA CITY	0.000	0.318	Nov 2017	0.438	Oct 2018	0.440	Oct 2019	-		0.440	Continuing	Continuing	Continuing
Travel	WR	NAVSEA : WNY, DC	0.000	0.037	Oct 2017	0.058	Dec 2018	0.057	Dec 2019	-		0.057	Continuing	Continuing	Continuing
		Subtotal	0.000	0.804		1.128		1.142		-		1.142	Continuing	Continuing	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	11.314		14.625		17.248		-		17.248	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604126N / *(U)Littoral Airborne MCM*	**Project (Number/Name)** 2131 / *Assault Breaching System*



2020OSD - 0604126N - 2131

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604126N / *(U)Littoral Airborne MCM*	**Project (Number/Name)** 2131 / *Assault Breaching System*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
COBRA				
Realigned from PE 0603502N	1	2018	1	2018
Acquisition Milestones: Block I Ready for Training	4	2019	4	2019
Acquisition Milestones: Block I Milestone Decision	1	2020	1	2020
Acquisition Milestones: Block II Milestone B	3	2020	3	2020
Acquisition Milestones: Block II Preliminary Design Review	4	2021	4	2021
Acquisition Milestones: Block II Critical Design Review	2	2022	2	2022
Acquisition Milestones: Block II Milestone C	2	2024	2	2024
System Development: Block I Algorithm Design & Implementation	4	2018	3	2021
System Development: Block I Hardware Development	4	2018	2	2022
System Development: Block II Engineering & Manufacturing Development	1	2021	2	2024
System Development: Block II Low Rate Production	2	2024	3	2024
System Development: Block II / MQ 8C Integration	1	2023	4	2024
Test & Evaluation: Block I IOT&E	1	2018	3	2018
Test & Evaluation: Block I -3A and -4 Flight Test	1	2020	4	2020
Test & Evaluation: Block II Contractor Testing	1	2023	1	2024
Test & Evaluation: Block II Development Test	2	2024	4	2024
Test & Evaluation: Block II Operational Assessment	2	2024	2	2024
Deliveries: Block I Low Rate Production	1	2018	1	2019
Deliveries: Block I Production and Sustainment	4	2018	4	2024

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy											Date: March 2019	
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0604127N *I (U)Surface Mine Countermeasures*							
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
Total Program Element	160.299	12.525	15.527	18.735	-	18.735	18.700	15.020	14.530	14.821	Continuing	Continuing
0530: *Mine Hunt Systems*	0.000	9.483	7.579	6.961	-	6.961	8.374	5.207	4.548	4.639	Continuing	Continuing
1233: *Surface MCM Mid-life Upgrade*	160.299	0.000	0.000	1.011	-	1.011	1.031	1.054	1.075	1.097	Continuing	Continuing
1235: *Mine Warfare Planning and Analysis*	0.000	3.042	7.948	10.763	-	10.763	9.295	8.759	8.907	9.085	Continuing	Continuing

A. Mission Description and Budget Item Justification

This program element provides resources in support of development of mine countermeasures systems to provide minehunting, minesweeping, and neutralization to counter known and projected mine threats. The mine countermeasures systems provide mobile, quick reaction forces capable of land or sea-based minehunting and minesweeping operations worldwide. Resources are for developing and deploying advanced minehunting and minesweeping systems and the intelligence and oceanographic capabilities that will enable mine warfare superiority. Tactics and techniques used vary across a diversity of environments and a diversity of threats, including both asymmetric and emerging. Resources provide for systems and support of mine warfare systems, maritime systems, and expeditionary systems to allow for continuous operations of the Navy's warships and support vessels, other military vessels, and commercial vessels. Increased capability includes conducting minefield reconnaissance (mine density and location) at high area search rates, improving detection capability, decreasing sensor false alarm rates, reducing or eliminating post-mission analysis detect, classify, identify, decide time, improving neutralization time, improving network communications, automatic target recognition, and achieving in-stride detect-to-engage capability. The Surface Mine Countermeasures programs are in general platform independent and will provide detection, classification, localization, identification, neutralization, and influence clearance capabilities. Programs develop: (1) Unmanned minehunting capability for surface platforms; (2) the integration and improvement of new and existing systems (3) support for systems which detect, localize, classify, identify, and neutralize all mine types across MCM Avenger Class and other platforms.

1)The AN/AQS-20 is a minehunting and identification system with sensors housed in an underwater towed body. The sensors are designed for the detection, classification and localization of bottom, close-tethered, and volume targets, and also for the identification of bottom targets. The system will be deployed from the Littoral Combat Ship (LCS) as part of the MCM Mission Package or can be deployed from other Vessels of Opportunity (VOO). The MCM USV is the tow platform for the AN/AQS-20.
2) AN/SQQ-32(V)4 High-Frequency, Wide Band (HFWB) is a technology upgrade to the AN/SQQ-32 Towed Body which will incorporate HFWB technology into the detection sonar to address performance deficiencies against new mine threats in the littorals. This upgrade will be installed on MCM-1 Class ships with the AN/SQQ-32(V)3 and will develop new transducer modules, fiber optic cable and modify topside processing and display software.
3)Mine Warfare and Environmental Decision Aids Library (MEDAL) is the U.S. Navy's single Mine Warfare tactical decision support system for integrated mission planning, evaluation, and situational awareness. MEDAL provides mine and mine warfare planning and evaluation tools and databases to the MCM Commander and to individual MCM units.
4) AN/SLQ-60 Mine Neutralization System (MNS) Seafox on the MCM Class ships. MNS is the replacement to the existing AN/SLQ-48 Mine Neutralization System.

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0604127N *I (U)Surface Mine Countermeasures*

5) SSQ-94 MCM Trainer upgrade will incorporate the AN/SQQ-32 (V)4 sonar, SSN2(V)5 PINS and Mine Neutralization System Team Trainer.

B. Program Change Summary ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	0.000	18.154	20.635	-	20.635
Current President's Budget	12.525	15.527	18.735	-	18.735
Total Adjustments	12.525	-2.627	-1.900	-	-1.900
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-2.627			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.375	0.000			
• Program Adjustments	0.000	0.000	-1.900	-	-1.900
• Congressional Directed Transfer Adjustments	12.900	-	-	-	-

Change Summary Explanation

Program Changes:
FY18: +$12,525K Total adjustments; +$12,900K Congressional transfer from PE 0603502N; -$375K SBIR reduction
FY19: -$2,627K for Excess Growth [MEDAL]
FY20: -$1,900K to account for availability of prior year funding
Technical: Not applicable
Schedule: Not applicable

The FY 2020 funding request was reduced by $1.900 million to account for the availability of prior year execution balances.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy											Date: March 2019	
Appropriation/Budget Activity 1319 / 4					R-1 Program Element (Number/Name) PE 0604127N / *(U)Surface Mine Countermeasures*				Project (Number/Name) 0530 / *Mine Hunt Systems*			
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
0530: *Mine Hunt Systems*	0.000	9.483	7.579	6.961	-	6.961	8.374	5.207	4.548	4.639	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Note

FY 2017 and prior funding in Program Element (PE) 0603502N. Projects moved from PE 0603502N starting in FY 2018.

The FY 2020 funding request was reduced by $1.900 million to account for the availability of prior year execution balances.

A. Mission Description and Budget Item Justification

This project contains resources for systems, subsystems, and sensors integrated for use with the MCM Unmanned Surface Vehicle (MCM USV) for mine detection, classification, localization, identification, neutralization, and influence sweep clearance capabilities. Research, development, test, and evaluation efforts are for increasing capability by decreasing time required to conduct Mine Countermeasures (MCM) operations, ensuring low risk to naval and commercial vessels, and removing the man from the minefield. Increased capability includes conducting minefield reconnaissance (mine density and location) at high area search rates, improving detection capability, decreasing sensor false alarm rates, and reducing post-mission analysis time for detection, classification, and identification.

The AN/AQS-20 is a minehunting and identification system with sensors housed in an underwater towed body. The sensors are designed for the detection, classification and localization of bottom, close-tethered, and volume targets, and also for the identification of bottom targets. The system will be deployed from the Littoral Combat Ship (LCS) as part of the MCM Mission Package or can be deployed from other Vessels of Opportunity (VOO). The MCM USV is the tow platform for the AN/AQS-20. The AN/AQS-20 Block 1 (the AQS-20A) underwent a Pre-Planned Product Improvement (P3I) program to upgrade the Forward Looking Sonar (FLS) and Side-Looking Sonars (SLS) to improve Probability of Classifying a Mine-like object as a Mine, reduce False Classification, and improve Depth Localization performance to meet Block 2 (the AQS-20C) performance. The Forward Looking Sonar is replaced with a new High Frequency Wideband Forward Looking Sonar (WBFLS) design. The SLS is replaced with a new Multifunction SLS with Synthetic Aperture Sonar (SAS) capability, as well as, improved signal processing and Signal to Noise Ratio. The Block 1 P3I program began in FY 2012 and completed in FY 2017. Award and management for Block 2 production units began in FY 2014 (the AQS-20C). Materiel Reliability, obsolescence, and performance Engineering Change Proposal (ECP) efforts continue beyond FY2024.

In FY 2018, the AN/AQS-20 Block 2 program (AQS-20C) initiated Developmental Testing (DT) (originally scheduled to start at end of FY17), initiated MCM USV integration, and initiated MCM improvements for post mission analysis tools in support of Net-centric Sensor Analysis for Mine Warfare (NSAM) integration for the Fleet Operators. The net effect of these tools combined with the more powerful AN/AQS-20 Block 2 sensors will be improved classification of mines, more accurate vertical localization, reduced false calls, and improved area coverage rate sustained. Improvements also include the collection and ingestion of in-situ environmental data used for mission planning to configure the sensor which optimizes sensor performance during missions. Development of these tools began in FY 2018 and will continue through FY 2021.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604127N / *(U)Surface Mine Countermeasures*	**Project (Number/Name)** 0530 / *Mine Hunt Systems*

In FY 2019, the AN/AQS-20 Block 2 program will complete DT, continue MCM USV integration efforts and support NSAM initial integration. The AN/AQS-20A Block 2 P3I program SAS acoustic mine recognition development will continue to support the potential for automated in-situ mine identification. Additional P3I efforts to include Automated Target Recognition will continue beyond FY 2024. Efforts will include defining and developing necessary improvements for AN/AQS-20 Block 2 integration with the MCM USV.

In FY 2020, the AN/AQS-20 Block 2 program will conduct DT with the MCM USV, support the MCM USV User Operational Evaluation System (UOES), and support workups for the LCS Mission Package (MP) testing.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: AN/AQS-20 Product Development	3.036	3.000	2.100	0.000	2.100
Articles:	-	-	-	-	-
FY 2019 Plans: - Initiate SAS Acoustic mine recognition development. - Initiate SAS Acoustic mine recognition ECP. - Continue algorithm development for AN/AQS-20 Block 2 PMA Improvements including NSAM integration. - Continue AN/AQS-20 Block 2 improvements in support of MCM USV integration. - Correct deficiencies identified during testing. - Support MCM USV D&R integration, test, and fixes. - Complete MCM USV integration.					
FY 2020 Base Plans: - Continue algorithm development for AN/AQS-20 Block 2 PMA Improvements including NSAM integration. - Correct deficiencies identified during MCM USV developmental testing. - Continue SAS Acoustic mine recognition development.					
FY 2020 OCO Plans: N/A					
FY 2019 to FY 2020 Increase/Decrease Statement: Decrease in funding as program moves into MCM USV DT in FY20.					
Title: AN/AQS-20 Support	0.900	0.900	0.800	0.000	0.800
Articles:	-	-	-	-	-
FY 2019 Plans: - Provide ongoing technical and management support to AN/AQS-20. - Continue to conduct test minefield maintenance.					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604127N / *(U)Surface Mine Countermeasures*	**Project (Number/Name)** 0530 / *Mine Hunt Systems*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
- Continue AN/AQS-20 Block 2 Mission Planning and Post Mission Analysis MCM USV for Concept of Employment development. - Complete Technical Insertion Plan. ***FY 2020 Base Plans:*** - Provide ongoing technical and management support to AN/AQS-20. - Continue to conduct test minefield maintenance. - Continue AN/AQS-20 Block 2 Mission Planning and Post Mission Analysis MCM USV Concept of Employment development. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Funding decreased from FY 2019 to FY 2020 due to the completion of the Technical Insertion Plan.					
Title: AN/AQS-20 Test and Evaluation	5.047	3.179	3.561	0.000	3.561
Articles:	-	-	-	-	-
FY 2019 Plans: - Complete AN/AQS-20 Block 2 DT. - Initiate SAS Acoustic recognition Testing. - Update Test and Evaluation Master Plan. - Conduct additional post DT AN/AQS-20C characterization and confidence testing to support tactics development. - Support MCM USV D&R integration and testing. ***FY 2020 Base Plans:*** - Continue SAS Acoustic recognition Testing. - Conduct contractor integration testing with the MCM USV. - Conduct DT with the MCM USV. - Refine tactics post MCM USV DT. - Support MCM USV User Operational Evaluation System (UOES) testing. ***FY 2020 OCO Plans:***					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604127N / *(U)Surface Mine Countermeasures*	**Project (Number/Name)** 0530 / *Mine Hunt Systems*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
N/A					
FY 2019 to FY 2020 Increase/Decrease Statement: Funding increase to support DT and UOES testing with MCM USV.					
Title: AN/AQS-20 Management Services	0.500	0.500	0.500	0.000	0.500
Articles:	-	-	-	-	-
FY 2019 Plans: - Provide planning and management for the AN/AQS-20 program. - Continue acquisition documentation in support of Full Rate Production (FRP) Decision Review. - Continue to provide Program Office travel support.					
FY 2020 Base Plans: - Provide planning and management for the AN/AQS-20 program. - Complete update of acquisition documentation in support of Full Rate Production (FRP) Decision Review. - Continue to provide Program Office travel support. - Conduct competitive procurement source selection efforts.					
FY 2020 OCO Plans: N/A					
Accomplishments/Planned Programs Subtotals	9.483	7.579	6.961	0.000	6.961

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• OPN/1601: *LCS MCM Mission Modules*	45.146	98.901	197.129	-	197.129	222.831	222.523	233.151	243.503	1,213.078	2,655.367

Remarks

OPN/1601 funding line accounts for several programs, of which the AN/AQS-20 program is only a portion.

D. Acquisition Strategy

AN/AQS-20 LRIP procurement continued following Block 2 (AQS-20C units) competitive contract award in FY 2014. Continue to meet MCM MP requirements to support production of Block 2 units. Conduct competitive procurement in FY 2020 and align resources with the MCM USV program.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604127N / *(U)Surface Mine Countermeasures*	**Project (Number/Name)** 0530 / *Mine Hunt Systems*

E. Performance Metrics

AN/AQS-20 - Successfully complete Block 2 DT in FY 2019. Achieve Full Rate Production (FRP) in FY 2020.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604127N / *(U)Surface Mine Countermeasures*	**Project (Number/Name)** 0530 / *Mine Hunt Systems*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
AN/AQS-20 Block 2 Integration	C/CPFF	Lockheed Martin : Not Specified	0.000	0.300	Nov 2017	0.000		0.000		-		0.000	0.000	0.300	-
AN/AQS-20 P3I	C/CPFF	Raytheon : Portsmouth, RI	0.000	0.509	Nov 2017	1.100	Nov 2018	1.800	Nov 2019	-		1.800	Continuing	Continuing	Continuing
AN/AQS-20 P3I	C/CPFF	ARL/UT : Austin, TX	0.000	0.000		0.250	Nov 2018	0.100	Dec 2019	-		0.100	Continuing	Continuing	Continuing
AN/AQS-20 Block 2 PMA	WR	NSWC, PC : Panama City FL	0.000	1.099	Nov 2017	0.800	Oct 2018	0.100	Oct 2019	-		0.100	Continuing	Continuing	Continuing
AN/AQS-20 Block 2 PMA	C/CPFF	ARL/UT : Austin, TX	0.000	1.128	Feb 2018	0.850	Nov 2018	0.100	Dec 2019	-		0.100	Continuing	Continuing	Continuing
		Subtotal	0.000	3.036		3.000		2.100		-		2.100	Continuing	Continuing	N/A

Remarks

FY 2017 and prior funding in Program Element (PE) 0603502N.

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
AN/AQS-20 Engineering Services	WR	NUWC/NPT : Newport, RI	0.000	0.365	Oct 2017	0.000		0.000		-		0.000	0.000	0.365	-
AN/AQS-20 Engineering Services	WR	NSWC, PC : Panama City, FL	0.000	0.135	Nov 2017	0.135	Oct 2018	0.140	Oct 2019	-		0.140	Continuing	Continuing	Continuing
AN/AQS-20 Engineering Services	C/CPFF	Raytheon : Portsmouth, RI	0.000	0.200	Dec 2017	0.200	Nov 2018	0.200	Nov 2019	-		0.200	Continuing	Continuing	Continuing
AN/AQS-20 ILS Function	WR	NSWC, PC : Panama City FL	0.000	0.200	Nov 2017	0.565	Nov 2018	0.460	Nov 2019	-		0.460	Continuing	Continuing	Continuing
		Subtotal	0.000	0.900		0.900		0.800		-		0.800	Continuing	Continuing	N/A

Remarks

FY 2017 and prior funding in Program Element (PE) 0603502N.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604127N / *(U)Surface Mine Countermeasures*	**Project (Number/Name)** 0530 / *Mine Hunt Systems*

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
AN/AQS-20 T&E Functions	WR	COTF : Norfolk, VA	0.000	0.200	Feb 2018	0.200	Nov 2018	0.200	Nov 2019	-		0.200	Continuing	Continuing	Continuing
AN/AQS-20 T&E Functions	WR	NSWC, PC : Panama City FL	0.000	4.247	Feb 2018	2.479	Oct 2018	2.851	Oct 2019	-		2.851	Continuing	Continuing	Continuing
AN/AQS-20 T&E Functions	C/CPFF	Raytheon : Portsmouth, RI	0.000	0.600	Feb 2018	0.500	Nov 2018	0.510	Nov 2019	-		0.510	Continuing	Continuing	Continuing
		Subtotal	0.000	5.047		3.179		3.561		-		3.561	Continuing	Continuing	N/A

Remarks

FY 2017 and prior funding in Program Element (PE) 0603502N.

COTF - Naval Command Operational Test and Evaluation Force

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
AN/AQS-20 Management Services	TBD	Various : Various	0.000	0.470	Dec 2017	0.470	Dec 2018	0.470	Dec 2019	-		0.470	Continuing	Continuing	Continuing
AN/AQS-20 Travel	TBD	Various : Various	0.000	0.030	Mar 2018	0.030	Mar 2019	0.030	Mar 2020	-		0.030	Continuing	Continuing	Continuing
		Subtotal	0.000	0.500		0.500		0.500		-		0.500	Continuing	Continuing	N/A

Remarks

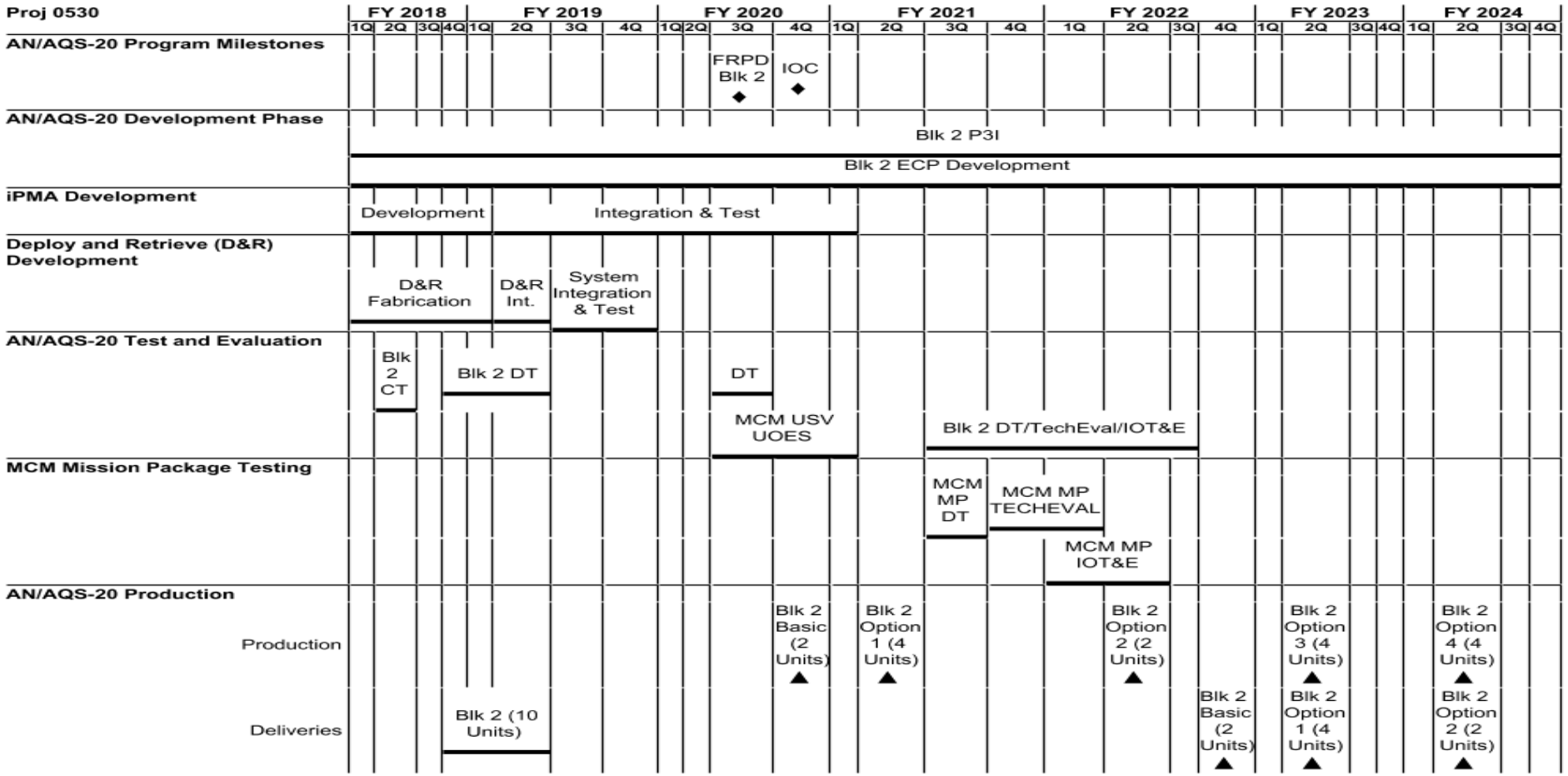
FY 2017 and prior funding in Program Element (PE) 0603502N.

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	9.483		7.579		6.961		-		6.961	Continuing	Continuing	N/A

Remarks

FY 2017 and prior funding in Program Element (PE) 0603502N.

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604127N / *(U)Surface Mine Countermeasures*	**Project (Number/Name)** 0530 / *Mine Hunt Systems*



2020PB - 0604127N - 0530

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604127N / *(U)Surface Mine Countermeasures*	**Project (Number/Name)** 0530 / *Mine Hunt Systems*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 0530				
AN/AQS-20 Program Milestones: AN/AQS-20 Full Rate Production (FRP) Decision Block 2	3	2020	3	2020
AN/AQS-20 Program Milestones: Initial Operational Capability (IOC)	4	2020	4	2020
AN/AQS-20 Development Phase: AN/AQS-20 Block 2 P3I	1	2018	4	2024
AN/AQS-20 Development Phase: AN/AQS-20 Materiel Reliability, Obsolesence, and Performance ECP Development (Block 2)	1	2018	4	2024
iPMA Development: iPMA Development	1	2018	1	2019
iPMA Development: iPMA/NSAM Integration and Test	2	2019	1	2021
Deploy and Retrieve (D&R) Development: Raytheon D&R Fabrication	1	2018	1	2019
Deploy and Retrieve (D&R) Development: D&R Integration	2	2019	2	2019
Deploy and Retrieve (D&R) Development: System Integration and Test	3	2019	4	2019
AN/AQS-20 Test and Evaluation: AN/AQS-20 Block 2 CT	2	2018	2	2018
AN/AQS-20 Test and Evaluation: AN/AQS-20 Block 2 DT	4	2018	2	2019
AN/AQS-20 Test and Evaluation: AN/AQS-20/MCM USV DT	3	2020	3	2020
AN/AQS-20 Test and Evaluation: MCM USV UOES	3	2020	1	2021
AN/AQS-20 Test and Evaluation: DT/TechEval/IOT&E w/ MCM MP	3	2021	3	2022
MCM Mission Package Testing: MCM MP Developmental Testing	3	2021	3	2021
MCM Mission Package Testing: MCM MP Tech Eval	4	2021	1	2022
MCM Mission Package Testing: MCM MP IOT&E	1	2022	2	2022
AN/AQS-20 Production: Production: AN/AQS-20 Block 2 New Basic Award (2 Units)	4	2020	4	2020
AN/AQS-20 Production: Production: AN/AQS-20 Block 2 Option 1 Award (4 Units)	2	2021	2	2021
AN/AQS-20 Production: Production: AN/AQS-20 Block 2 Option 2 Award (2 Units)	2	2022	2	2022

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604127N / *(U)Surface Mine Countermeasures*	**Project (Number/Name)** 0530 / *Mine Hunt Systems*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
AN/AQS-20 Production: Production: AN/AQS-20 Block 2 Option 3 Award (4 Units)	2	2023	2	2023
AN/AQS-20 Production: Production: AN/AQS-20 Block 2 Option 4 Award (4 Units)	2	2024	2	2024
AN/AQS-20 Production: Deliveries: AN/AQS-20 Block 2 Systems (10 Units)	4	2018	2	2019
AN/AQS-20 Production: Deliveries: AN/AQS-20 Block 2 New Basic Award Systems (2 Units)	4	2022	4	2022
AN/AQS-20 Production: Deliveries: AN/AQS-20 Block 2 Option 1 Systems (4 Units)	2	2023	2	2023
AN/AQS-20 Production: Deliveries: AN/AQS-20 Block 2 Option 2 Systems (2 Units)	2	2024	2	2024

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604127N / *(U)Surface Mine Countermeasures*	Project (Number/Name) 1233 / *Surface MCM Mid-life Upgrade*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
1233: *Surface MCM Mid-life Upgrade*	160.299	0.000	0.000	1.011	-	1.011	1.031	1.054	1.075	1.097	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Note

This project is a new start in FY2020

A. Mission Description and Budget Item Justification

This project provides resources for development, improvement and integration of SSQ-94 MCM Trainer. Trainer upgrade will incorporate the AN/SQQ-32 (V)4 sonar, SSN2(V)5 PINS and Mine Neutralization System Team Trainer.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Product Development	0.000	0.000	1.011	0.000	1.011
Articles:	-	-	-	-	-
Description: SSQ-94 MCM Trainer Development					
FY 2019 Plans: N/A					
FY 2020 Base Plans: Integrate MEDAL planning into the SSQ-94 MCM Trainer.					
FY 2020 OCO Plans: N/A					
FY 2019 to FY 2020 Increase/Decrease Statement: Increase in funding to integrate MEDAL Planning into the SSQ-94 MCM Trainer.					
Accomplishments/Planned Programs Subtotals	0.000	0.000	1.011	0.000	1.011

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604127N / *(U)Surface Mine Countermeasures*	**Project (Number/Name)** 1233 / *Surface MCM Mid-life Upgrade*

D. Acquisition Strategy

SSQ-94 - Naval Surface Warfare Center, Panama City (NSWC, PC) and ARL UT designed and developed the SSQ-94 MCM Trainer.

E. Performance Metrics

SSQ-94 Trainer upgrade completion

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604127N / *(U)Surface Mine Countermeasures*	Project (Number/Name) 1233 / *Surface MCM Mid-life Upgrade*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
MNS Development	Various	TBD : TBD	22.455	0.000		0.000		0.000		-		0.000	0.000	22.455	-
SSQ-94 Trainer	WR	NSWC, PC : NSWC, PC	16.344	0.000		0.000		1.011	Dec 2019	-		1.011	0.000	17.355	-
BSP: Develop Bottom Sediment Classifier	WR	NRL : WASHINGTON, DC	0.258	0.000		0.000		0.000		-		0.000	0.000	0.258	-
Systems Engineering and Integration	WR	NSWC, PC : PANAMA CITY, FL	0.306	0.000		0.000		0.000		-		0.000	0.000	0.306	-
System Development 1	WR	NSWC, PC : SAN DIEGO, CA	0.373	0.000		0.000		0.000		-		0.000	0.000	0.373	-
Systems Engineering 2	WR	NSWC, PC : PANAMA CITY, FL	2.915	0.000		0.000		0.000		-		0.000	0.000	2.915	-
Systems Engineering 3 MCM CES	WR	NSWC, PC : PANAMA CITY, FL	1.633	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
HFWB: Primary Hardware Development 1	C/CPAF	ARL UT : TEXAS	15.511	0.000		0.000		0.000		-		0.000	0.000	15.511	-
Primary Hardware Development 2	WR	ARL-UT : AUSTIN, TX	0.000	0.000		0.000		0.000		-		0.000	0.000	0.000	-
HFWB: Tow Cable Development	C/CPAF	ARL UT : TEXAS	1.399	0.000		0.000		0.000		-		0.000	0.000	1.399	-
HFWB: Ship Integration	WR	NSWC, PC : PANAMA CITY, FL	1.697	0.000		0.000		0.000		-		0.000	0.000	1.697	-
HFWB: SYSTEM ENGINEER	C/CPAF	ARL UT : TEXAS	9.065	0.000		0.000		0.000		-		0.000	0.000	9.065	-
Software Development MEDAL EA	C/CPFF	SAIC : McLean, VA	41.180	0.000		0.000		0.000		-		0.000	0.000	41.180	-
		Subtotal	113.136	0.000		0.000		1.011		-		1.011	Continuing	Continuing	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604127N / *(U)Surface Mine Countermeasures*	Project (Number/Name) 1233 / *Surface MCM Mid-life Upgrade*	

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Develop Logistics Products	WR	NSWC, PC : PANAMA CITY, FL	0.243	0.000		0.000		0.000		-		0.000	0.000	0.243	-
Software Development 1	C/CPFF	SAIC : McLean, VA	0.350	0.000		0.000		0.000		-		0.000	0.000	0.350	-
Software Development 2	C/CPFF	SAIC : McLean, Va	0.914	0.000		0.000		0.000		-		0.000	0.000	0.914	-
HFWB Software Development	C/CPAF	ARL-UT : TEXAS	8.450	0.000		0.000		0.000		-		0.000	0.000	8.450	-
HFWB Integrated Logistics Support	WR	NSWC, PC : PANAMA CITY, FL	2.765	0.000		0.000		0.000		-		0.000	0.000	2.765	-
Software Engineering 1 MCM CES	WR	NSWC, PC : PANAMA CITY, FL	1.517	0.000		0.000		0.000		-		0.000	0.000	1.517	-
Software Engineering 2 MEDAL	WR	NSWC, PC : PANAMA CITY, FL	2.458	0.000		0.000		0.000		-		0.000	0.000	2.458	-
		Subtotal	16.697	0.000		0.000		0.000		-		0.000	0.000	16.697	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
MEDAL Test and Evaluation	C/FP	SAIC : McLean, VA	7.636	0.000		0.000		0.000		-		0.000	0.000	7.636	-
MCM CES Test and Evaluation 1	C/CPAF	VARIOUS : VARIOUS	1.782	0.000		0.000		0.000		-		0.000	0.000	1.782	-
HFWB: Developmental Test and Evaluation	C/CPAF	ARL-UT : TEXAS	5.925	0.000		0.000		0.000		-		0.000	0.000	5.925	-
Test and Evaluation 2	C/CPAF	VARIOUS : VARIOUS	5.204	0.000		0.000		0.000		-		0.000	0.000	5.204	-
		Subtotal	20.547	0.000		0.000		0.000		-		0.000	0.000	20.547	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604127N / *(U)Surface Mine Countermeasures*	Project (Number/Name) 1233 / *Surface MCM Mid-life Upgrade*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management Support 1	C/CPFF	CACI : WASHINGTON, DC	0.263	0.000		0.000		0.000		-		0.000	0.000	0.263	-
Travel 1	WR	NAVSEA : WNY, DC	0.084	0.000		0.000		0.000		-		0.000	0.000	0.084	-
Government Engineering Support1	WR	NSWC, PC : PANAMA CITY, FL	0.325	0.000		0.000		0.000		-		0.000	0.000	0.325	-
MEDAL Program Management Support 2	Various	VARIOUS : VARIOUS	2.827	0.000		0.000		0.000		-		0.000	0.000	2.827	-
SBIR Assessment 2	Various	VARIOUS : VARIOUS	0.019	0.000		0.000		0.000		-		0.000	0.000	0.019	-
Program Management Support 3	C/CPFF	CACI : WASHINGTON, DC	1.341	0.000		0.000		0.000		-		0.000	0.000	1.341	-
Program Management Support 4	C/CPFF	CACI : WASHINGTON, DC	0.080	0.000		0.000		0.000		-		0.000	0.000	0.080	-
Government Engineering Support3	WR	NSWC, PC : PANAMA CITY, FL	0.090	0.000		0.000		0.000		-		0.000	0.000	0.090	-
Travel 3	C/CPAF	NAVSEA : WNY, DC	0.256	0.000		0.000		0.000		-		0.000	0.000	0.256	-
Program Management Support 5	C/CPFF	CACI : WASHINGTON, DC	0.167	0.000		0.000		0.000		-		0.000	0.000	0.167	-
Government Engineering Support4	WR	NSWC, PC : PANAMA CITY, FL	0.010	0.000		0.000		0.000		-		0.000	0.000	0.010	-
Travel4	C/CPAF	NSWC, PC : PANAMA CITY, FL	0.069	0.000		0.000		0.000		-		0.000	0.000	0.069	-
HFWB: Program Management Support 6	C/CPAF	VARIOUS : VARIOUS	1.442	0.000		0.000		0.000		-		0.000	0.000	1.442	-
HFWB: Government Engineering Support5	WR	NSWC, PC : PANAMA CITY, FL	0.750	0.000		0.000		0.000		-		0.000	0.000	0.750	-
HFWB: Travel 5	C/CPAF	NAVSEA : WNY, DC	0.080	0.000		0.000		0.000		-		0.000	0.000	0.080	-
Government Engineering Support6	WR	NSWC, PC : PANAMA CITY, FL	1.352	0.000		0.000		0.000		-		0.000	0.000	1.352	-
Travel 6	C/CPAF	NAVSEA : WNY, DC	0.238	0.000		0.000		0.000		-		0.000	0.000	0.238	-
SBIR Assessment 6	Various	VARIOUS : VARIOUS	0.054	0.000		0.000		0.000		-		0.000	0.000	0.054	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604127N / *(U)Surface Mine Countermeasures*	**Project (Number/Name)** 1233 / *Surface MCM Mid-life Upgrade*

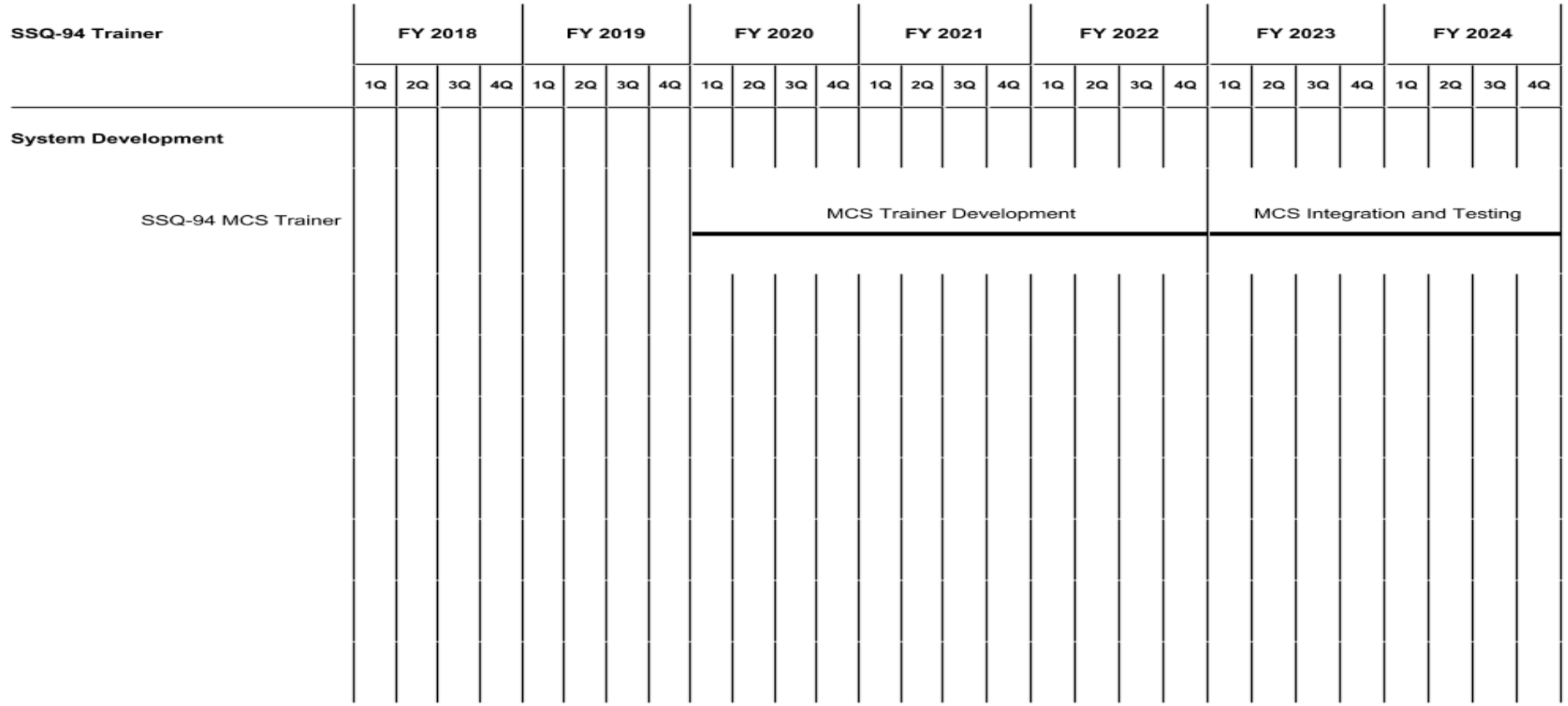
Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management Support 7	C/CPAF	VARIOUS : VARIOUS	0.350	0.000		0.000		0.000		-		0.000	0.000	0.350	-
Acquisition Workforce Fund	Various	VARIOUS : VARIOUS	0.122	0.000		0.000		0.000		-		0.000	0.000	0.122	-
		Subtotal	9.919	0.000		0.000		0.000		-		0.000	0.000	9.919	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	160.299	0.000		0.000		1.011		-		1.011	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604127N / *(U)Surface Mine Countermeasures*	**Project (Number/Name)** 1233 / *Surface MCM Mid-life Upgrade*



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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604127N / *(U)Surface Mine Countermeasures*	**Project (Number/Name)** 1233 / *Surface MCM Mid-life Upgrade*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
SSQ-94 Trainer				
System Development: SSQ-94 MCS Trainer: SSQ-94 MCS Trainer Development	1	2020	4	2022
System Development: SSQ-94 MCS Trainer: SSQ-94 MCS Integration and Testing	1	2023	4	2024

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604127N / *(U)Surface Mine Countermeasures*	Project (Number/Name) 1235 / *Mine Warfare Planning and Analysis*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
1235: *Mine Warfare Planning and Analysis*	0.000	3.042	7.948	10.763	-	10.763	9.295	8.759	8.907	9.085	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Mine Warfare (MIW) and Environmental Decision Aids Library (MEDAL) is a software intensive software acquisition program and is U.S. Navy's single Mine Warfare tactical decision support system for integrated mission planning, evaluation, and situational awareness. MEDAL provides mine and mine warfare planning and evaluation tools and databases to the MCM Commanders and is employed at the MCM unit level to perform MCM sortie planning and evaluation. The most recent MEDAL increment, known as MEDAL Enterprise Architecture (EA) and is no longer dependent on Global Command and Control System - Maritime (GCCS-M) for fielding this capability to MIW fleet users. MINEnet Tactical is the MCM operational component of MEDAL EA. It has been developed to be fielded to standard Navy networks, Consolidated Afloat Networks and Enterprise Services (CANES), Integrated Shipboard Network System (ISNS), and Navy Marine Corps Intranet (NMCI) servers and uses common web browser to support the user interface to all user client components. Completion of initial MINEnet Tactical fielding will allow MEDAL Build 11 to be retired.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: MEDAL Product Development	1.336	4.245	4.818	0.000	4.818
Articles:	-	-	-	-	-

FY 2019 Plans:

FY19 funding will initiate development of the MIW Integrated Synthetic Trainer (MIST). MIST is the means to conduct Integrated Phase training for MIW forces similar to a Fleet Synthetic Training (FST) event for a Carrier Strike Group/Expeditionary Strike Group (CSG/ESG). This tool will provide the capability to train the U.S. Navy's four MIW staffs that include one Theater Mine Warfare Commander (MIWC) and three Mine Countermeasures Commanders (MCMCs) against near peer threats. MIST will be a separate tool that executes in conjunction with the MEDAL mission planning and evaluation system used by MIW staffs and units. It will incorporate the laydown of simulated threat minefields expected to be used to blockade ports, defend against landing assaults, or deny access to sea lines of communication and to control the training event. It will use MIW staff created MEDAL MCM plans, underlying MIW databases, and real world environmental databases to generate simulated mission sorties and interactions with the defined minefields. These generated mission files will allow staffs to use MEDAL to evaluate each day's progress determining achieved clearance and remaining risk to ship traffic. MIST will have an adjustable "Game Clock" allowing staffs in faster than real time to conduct multi-week long MCM operations in a classroom environment. FY19 work will initially focus on defining user requirements,

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604127N / *(U)Surface Mine Countermeasures*	**Project (Number/Name)** 1235 / *Mine Warfare Planning and Analysis*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
software design, and transition to an Agile Software development process. FY19 funding will also support the MINEnet Tactical development to enhance the Minefield Planning capabilities, support interface changes, and provide updates to sortie planning and databases for the transition of AQS-20A to the AQS-20C configuration. The MEDAL EA course curriculum for MINEnet Tactical 1.3 will be updated and updated software will be fielded to the Mine Warfare Training Center. ***FY 2020 Base Plans:*** Work will also begin on MINEnet Tactical v1.4, which will provide the replacement of all commercial-off-the-shelf (COTS) components, which are either near end-of-life or no longer approved in Department of the Navy (DoN) Application and Database Management System (DADMS). Update application as required to support new and approved COTS components. Continue MIST V1.0 development. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** FY20 funding increase will support the continued development of the MIW Integrated Synthetic Trainer and the initial efforts for MINEnet Tactical v1.4.					
Title: MEDAL Engineering Support	0.423	2.395	4.128	0.000	4.128
Articles:	-	-	-	-	-
FY 2019 Plans: Perform MIW Integrated Synthetic Trainer (MIST) requirements analysis, draft a software function and software requirements specification with sufficient detail to begin agile development of software to support post System Functional Review/System Requirements Review (SFR/SRR). Complete the development of MEDAL EA MINEnet Tactical v1.3 capability to include Joint Direct Attack Munition (JDAM) Assault Breaching System (JABS) and surface MCM mechanical sweep planning and evaluation. Complete standup of MINEnet Tactical software support activity (SSA) and integrated systems engineering activity (ISEA). SSA and ISEA support will address fixing software defects and high-priority fleet change requests reported in MINEnet Tactical v1.2.2 and release the upgrades in the MINEnet Tactical v1.3 development baseline. Finally, the support effort will include communication with activities such as applied labs, government activities, and designated contractors. Assist in providing the speed, agility, adaptability, and flexibility required for modern MCM operations. FY19 work will					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604127N / *(U)Surface Mine Countermeasures*	**Project (Number/Name)** 1235 / *Mine Warfare Planning and Analysis*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
also complete cybersecurity transition from Department of Defense Information Assurance Certification and Accreditation Process (DIACAP) to Risk Management Framework (RMF). ***FY 2020 Base Plans:*** Provide system engineering support to initiate the development of MEDAL EA MINEnet Tactical v1.4 capability and Planning on Risk (PoR). Provide technical integration of developed algorithms and models that have demonstrated effectiveness with respect to objective requirements. Provide SSA and ISEA roles and functions. Field MINEnet Tactical Minefield Planning V1.0 at NSMWDC, Point Loma, San Diego replacing MEDAL B11 Minefield Planning. Begin initial fielding of MINEnet Tactical V1.3. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** FY20 funding increase supports the fielding of MINEnet Tactical to replace Build 11.					
Title: MEDAL Test and Evaluation	0.675	0.620	1.041	0.000	1.041
Articles:	-	-	-	-	-
FY 2019 Plans: Continue System Development annual testing activities with multiple platforms including LCS MCM Mission Package Application Software (MPAS), ISNS, CANES, ONENET, NMCI integration tests. Continue Cybersecurity patching and assessments. Deliver to Fleet in accordance with the MEDAL EA Fielding Plan. Conduct government acceptance test (GAT) for contractor delivered MEDAL Minefield Planning V1.0. Conduct GAT for MINEnet Tactical V1.3. ***FY 2020 Base Plans:*** Continue System Development annual testing activities with multiple platforms including LCS MCM MPAS, ISNS, CANES, ONENET, NMCI integration tests. Continue Cybersecurity patching and assessments. Deliver MEDAL EA to Fleet in accordance with the Fielding Plan. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** FY20 funding increase will support the delivery of MEDAL EA to the Fleet.					
Title: MEDAL Management Services	0.608	0.688	0.776	0.000	0.776

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604127N / *(U)Surface Mine Countermeasures*	**Project (Number/Name)** 1235 / *Mine Warfare Planning and Analysis*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Articles:	-	-	-	-	-
FY 2019 Plans: Continue to provide program management support and travel for MEDAL program. Program management (PM) shall include overall technical guidance and leadership for the program. Oversight of financial and logistics efforts. Coordination with Navy and other DoD organizations (MIW Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance [C4ISR], LCS and LCS MCM Mission Package, Expeditionary MCM C4ISR, MIW tactics development, long term planning, Assault Breaching System (ABS), and other programs as they relate to MCM command staff and MCM system sortie Mission Planning, Evaluation, and C4ISR), as required to ensure successful execution of the program. Communicate and coordinate with other program office tasking to include briefings, demonstrations, project planning, and project status as required.					
FY 2020 Base Plans: Continue to provide program management support and travel for MEDAL program. Program management (PM) shall include overall technical guidance and leadership for the program. Oversight of financial and logistics efforts. Coordination with Navy and other DoD organizations as required to ensure successful execution of the program. Communicate and coordinate with other program office tasking to include briefings, demonstrations, project planning, and project status as required.					
FY 2020 OCO Plans: N/A					
FY 2019 to FY 2020 Increase/Decrease Statement: FY20 funding increase will support required management support to successfully field MEDAL EA.					
Accomplishments/Planned Programs Subtotals	3.042	7.948	10.763	0.000	10.763

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• 2622/LV075: *Mine Sweeping Replacement (MEDAL).*	3.585	1.021	0.000	-	0.000	0.000	0.362	0.611	0.623	0.000	14.383

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604127N / *(U)Surface Mine Countermeasures*	**Project (Number/Name)** 1235 / *Mine Warfare Planning and Analysis*

D. Acquisition Strategy

Mine Warfare and Environmental Decision Aids Library (MEDAL) - requirements for MEDAL Builds are generated through a formal requirements process. Requirements conferences gather a list of candidate functions based on a logical sequence to fully implement the overall software architecture. The fleet is presented with a recommended list of candidate capabilities based on this program plan, doctrine, fleet comments, and technology. These capability items are then prioritized by the fleet representatives (coordinated by Naval Surface and Mine War-fighting Development Center [SMWDC]). The fleet inputs are then consolidated into an overall list which is then presented to Navy leadership for pricing and final selection. The selection is based on price, risk, available funding, and possibly by other program factors (e.g., ensure that MEDAL supports other program delivery schedules). Selection balances immediate needs, long term objectives, technical maturity and other programmatic factors. A verification and validation process is applied to any algorithms, tactics, or models to be incorporated in the software. The current sole source contract with SAIC completes OY4 on 30 Sept 2019. A new full competition contract that will allow indefinite delivery and indefinite quantity (IDIQ) options will be awarded by 30 July 2019.

E. Performance Metrics

Mine Warfare and Environmental Decision Aids Library (MEDAL) development to include integration of data fusion techniques and incorporation of Data Access Layer (DAL) architecture to meet FORCEnet requirements.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604127N / *(U)Surface Mine Countermeasures*	Project (Number/Name) 1235 / *Mine Warfare Planning and Analysis*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
MEDAL EA	C/CPAF	SAIC : McLean, VA	0.000	1.336	Oct 2017	1.885	Oct 2018	0.000		-		0.000	Continuing	Continuing	Continuing
MEDAL EA & MIW Integrated Synthetic Training (MIST)	SS/IDIQ	TBD : TBD	0.000	0.000		0.000		0.700	Oct 2019	-		0.700	Continuing	Continuing	Continuing
Medal EA & MIW Integrated Synthetic Training (MIST)	WR	NSWC PCD : Panama City FL	0.000	0.000		2.360	Oct 2018	4.118	Oct 2019	-		4.118	Continuing	Continuing	Continuing
		Subtotal	0.000	1.336		4.245		4.818		-		4.818	Continuing	Continuing	N/A

Remarks

FY 2017 and prior funding in Program Element (PE) 0603502N.

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
MEDAL EA & MIW Integrated Synthetic Training (MIST)	WR	NSWC PC : Panama City FL	0.000	0.423	Oct 2017	2.395	Oct 2018	3.278	Oct 2019	-		3.278	Continuing	Continuing	Continuing
MEDAL EA & MIW Integrated Synthetic Training (MIST)	C/IDDQ	TBD : TBD	0.000	0.000		0.000		0.850	Oct 2019	-		0.850	Continuing	Continuing	Continuing
		Subtotal	0.000	0.423		2.395		4.128		-		4.128	Continuing	Continuing	N/A

Remarks

FY 2017 and prior funding in Program Element (PE) 0603502N.

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
MEDAL EA	C/CPAF	SAIC : McLean, VA	0.000	0.675	Oct 2017	0.124	Oct 2018	0.000		-		0.000	Continuing	Continuing	Continuing

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604127N / *(U)Surface Mine Countermeasures*	**Project (Number/Name)** 1235 / *Mine Warfare Planning and Analysis*

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
MEDAL EA & MIW Integrated Synthetic Training (MIST)	WR	NSWC PCD : Panama City, FL	0.000	0.000		0.496	Oct 2018	1.041	Oct 2019	-		1.041	Continuing	Continuing	Continuing
		Subtotal	0.000	0.675		0.620		1.041		-		1.041	Continuing	Continuing	N/A

Remarks

FY 2017 and prior funding in Program Element (PE) 0603502N.

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
MEDAL	WR	NSWC PC : Panama City Fl	0.000	0.608	Oct 2017	0.688	Oct 2018	0.776	Oct 2019	-		0.776	Continuing	Continuing	Continuing
		Subtotal	0.000	0.608		0.688		0.776		-		0.776	Continuing	Continuing	N/A

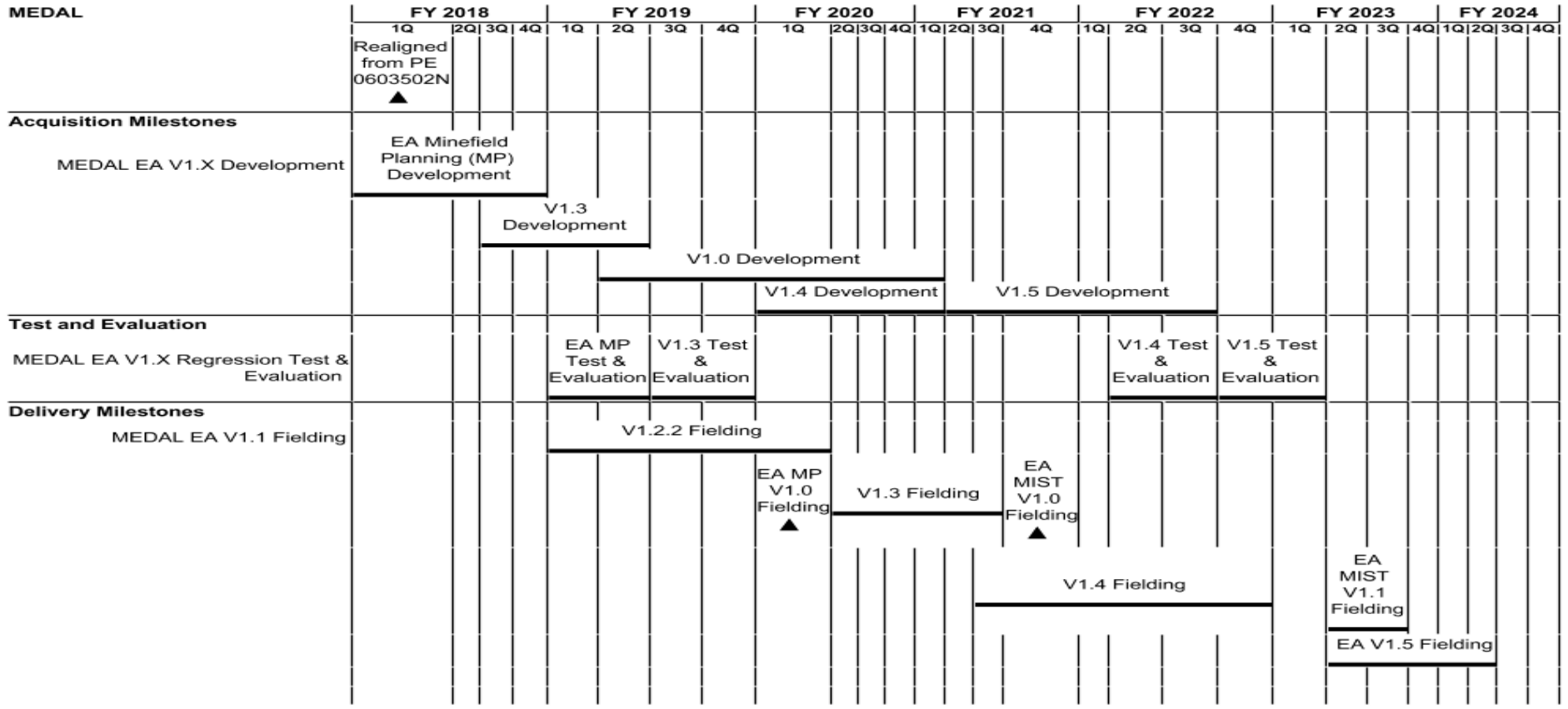
Remarks

FY 2017 and prior funding in Program Element (PE) 0603502N.

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	3.042		7.948		10.763		-		10.763	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604127N / *(U)Surface Mine Countermeasures*	**Project (Number/Name)** 1235 / *Mine Warfare Planning and Analysis*



2020DON - 0604127N - 1235

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604127N / *(U)Surface Mine Countermeasures*	**Project (Number/Name)** 1235 / *Mine Warfare Planning and Analysis*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
MEDAL				
Realigned from PE 0603502N	1	2018	1	2018
Acquisition Milestones: MEDAL EA V1.X Development: MEDAL EA Minefield Planning (MP) Development	1	2018	4	2018
Acquisition Milestones: MEDAL EA V1.X Development: MEDAL EA V1.3X	3	2018	2	2019
Acquisition Milestones: MEDAL EA V1.X Development: MIW Integrated Synthetic Training (MIST) V1.0 Development	2	2019	1	2021
Acquisition Milestones: MEDAL EA V1.X Development: MEDAL EA V1.4X Development	1	2020	1	2021
Acquisition Milestones: MEDAL EA V1.X Development: MEDAL EA V1.5X and MIST V1.1 Development	2	2021	3	2022
Test and Evaluation: MEDAL EA V1.X Regression Test & Evaluation: MEDAL EA MP Test & Evaluation	1	2019	2	2019
Test and Evaluation: MEDAL EA V1.X Regression Test & Evaluation: MEDAL EA V1.3X Test & Evaluation	3	2019	4	2019
Test and Evaluation: MEDAL EA V1.X Regression Test & Evaluation: MEDAL EA V1.4 & MIST V1.0 Test & Evaluation	2	2022	3	2022
Test and Evaluation: MEDAL EA V1.X Regression Test & Evaluation: MEDAL EA V1.5 & MIST V1.1 Test & Evaluation	4	2022	1	2023
Delivery Milestones: MEDAL EA V1.1 Fielding: MEDAL EA V1.2.2 Fielding	1	2019	1	2020
Delivery Milestones: MEDAL EA V1.1 Fielding: MEDAL EA MP V1.0 Fielding	1	2020	1	2020
Delivery Milestones: MEDAL EA V1.1 Fielding: MEDAL EA V1.3 Fielding	2	2020	3	2021
Delivery Milestones: MEDAL EA V1.1 Fielding: MEDAL EA MIST V1.0 Fielding	4	2021	4	2021
Delivery Milestones: MEDAL EA V1.1 Fielding: MEDAL EA V1.4 Fielding	3	2021	4	2022

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604127N / *(U)Surface Mine Countermeasures*	**Project (Number/Name)** 1235 / *Mine Warfare Planning and Analysis*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Delivery Milestones: MEDAL EA V1.1 Fielding: MEDAL EA MIST V1.1 Fielding	2	2023	3	2023
Delivery Milestones: MEDAL EA V1.1 Fielding: MEDAL EA V1.5 Fielding	2	2023	2	2024

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy											Date: March 2019	
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0604272N *I Tact Air Dir Infrared CM (TADIRCM)*							
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
Total Program Element	91.693	51.311	47.278	68.346	-	68.346	60.448	49.543	36.283	37.007	Continuing	Continuing
3304: *CIRCM*	91.693	5.763	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	97.456
3348: *DAIRCM Development*	0.000	45.548	47.278	68.346	-	68.346	60.448	49.543	36.283	37.007	Continuing	Continuing

A. Mission Description and Budget Item Justification

This element includes development of electronic warfare systems for the United States Navy (USN) and United States Marine Corps (USMC) assault aircraft. This includes the development and testing of advanced infrared countermeasures systems for emerging threats and emergency contingencies for Aircraft Survivability Equipment (ASE) suite integration.

FY 2018 RDT&E overseas contingency operations (OCO) funding was required to finalize testing in support of fielding the federated DAIRCM JUONS system.

FY 2019 RDT&E funding required to complete JUONS testing and to begin an integrated DAIRCM solution on MH-60S platforms via risk reduction efforts. The risk reduction efforts will modify Hardware (HW) and Software (SW) to the DAIRCM system as required to meet specifications. Program of Record will eventually support integration and retrofit of 300 USMC and 397 USN aircraft.

FY 2020 RDT&E funding required for continued development of the DAIRCM system (HW and SW) and integrated DAIRCM solution on MH-60S platform. MH-60S is the focus platform in early development and for DAIRCM performance testing. The AH-1Z and UH-1Y, and MH-60R integration specific development will begin at the DAIRCM contractors following MH-60S integration and will focus on ensuring the required interfaces are captured and developed for integration testing to be conducted at a later time.

JUSTIFICATION FOR BUDGET ACTIVITY: This program is funded under ADVANCED COMPONENT DEVELOPMENT AND PROTOTYPES because it includes all efforts necessary to evaluate integrated technologies, representative models or prototype systems in a high fidelity and realistic operating environment.

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy					Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*			R-1 Program Element (Number/Name) PE 0604272N *I Tact Air Dir Infrared CM (TADIRCM)*		
B. Program Change Summary ($ in Millions)	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**
Previous President's Budget	46.844	47.278	48.907	-	48.907
Current President's Budget	51.311	47.278	68.346	-	68.346
Total Adjustments	4.467	0.000	19.439	-	19.439
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	-1.243	0.000			
• Program Adjustments	5.710	0.000	19.400	-	19.400
• Rate/Misc Adjustments	0.000	0.000	0.039	-	0.039

Change Summary Explanation

The JUONS schedule delayed due to hardware(HW) and software(SW) issues identified during early DAIRCM testing and platform integration test. The schedule has also been driven by platform integration issues associated with multiple Enhanced GPS/INS units and software transferring/timing issues from older, slower processing chips to more advanced chipsets. Production start-up issues driving hardware deliveries. Hardware problems are solved and yield has improved significantly.

-JUONS Fielding changed ending quarter from 2Q19 to 4Q21
-JUONS B kit integration added 2Q19-4Q21
-JUONS A Kit Development changed 1Q17-1Q23 to 1Q17-2Q19
-JUONS A Kit Installation Test Aircraft changed end date from 2Q18 to 2Q19
-JUONS TRR changed from 1Q18 to 3Q19
-JUONS Integrated Test 2 changed from 4Q18 to 2Q19-3Q19
-JUONS Live Fire Test 2 changed from 1Q19 to 4Q19
-JUONS Quick Reaction Assessment changed from 1Q19 to 3Q19
-JUONS Test Assets Deliveries begin 3Q18
-JUONS Hardware Deliveries changed from 1Q18-1Q19 to 1Q19-4Q22

DAIRCM EMD contract lagged due to delayed approval of Program of Record and refinement of the PoR Statement of Work and Specification.

-DAIRCM SRR Changed from 3Q19 to 3Q20

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0604272N *I Tact Air Dir Infrared CM (TADIRCM)*

-DAIRCM SFR added 3Q20
-DAIRCM PDR changed from 1Q20 to 4Q20
-DAIRCM CDD added 4Q18 to 3Q19
-DAIRCM CDR changed from 3Q20 to 3Q21
-DAIRCM Software Qualification Test was removed
-DAIRCM B-Kit Integration & Test was removed
-DAIRCM Operation Assessment added 4Q24
-DAIRCM EMD Contract Award changed from 3Q19 to 1Q20
-DAIRCM Risk Reduction Delivery Order added 1Q19
-DAIRCM LRIP added 2Q23

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604272N / *Tact Air Dir Infrared CM (TADIRCM)*	Project (Number/Name) 3304 / *CIRCM*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
3304: *CIRCM*	91.693	5.763	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	97.456
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Common Infrared Countermeasures (CIRCM) efforts began for the Navy in FY 2013. This project includes the development, integration, and testing of a laser-based directed infrared countermeasure system for United States Navy and United States Marine Corps assault aircraft. This infrared countermeasure, when integrated with a threat warning detection system, will be capable of countering current and emerging infrared threats. An Under Secretary of Defense for Acquisition, Technology and Logistics (USD (AT&L)) Acquisition Decision Memorandum (ADM) dated 15 April 2009 designated the Army as the lead service for developing this capability for rotary-wing, tilt-rotor, and small fixed-wing aircraft across the Department of Defense. It also designated the program as an Acquisition Category (ACAT) ID special interest program. The Army has designated the acquisition effort for this capability as the CIRCM program. CIRCM is being evaluated as a potential replacement for Guardian Laser Tracker Assemblies (GLTA) on the DoN LAIRCM system.

Distributed Aperture Infrared Countermeasure (DAIRCM) developmental activities in hardware and software are being pursued to reduce the size, weight and power required to achieve a threat warning detection system integrated with an infrared countermeasure. DAIRCM development, integration and testing will first be conducted in a federated configuration to support Joint Urgent Operational Need Statement (JUONS) SO-0010 with Oversea Contingency Operations funded follow-on work that began in FY 2018 to provide an integrated (under glass) solution to host platforms. This program develops integrated hardware/software solutions that link on-board integrated Aircraft Survivability Equipment (iASE) that are compatible with mission planning information and store sensor data for post mission threat analysis. This project also adopts future multi-band, networking capabilities to facilitate real-time transfer of threat information, and off-board queuing and control of onboard sensors. CIRCM Funds for FY19 through FY23 are realigned to DAIRCM PU 3348.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: CIRCM Technology Development (TD)	5.763	0.000	0.000	0.000	0.000
Articles:	-	-	-	-	-
FY 2019 Plans: CIRCM efforts realigned to support DAIRCM PU 3348.					
FY 2020 Base Plans: N/A					
FY 2020 OCO Plans: N/A					
Accomplishments/Planned Programs Subtotals	5.763	0.000	0.000	0.000	0.000

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604272N / *Tact Air Dir Infrared CM (TADIRCM)*	**Project (Number/Name)** 3304 / *CIRCM*

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Common Infrared Countermeasures (CIRCM) was a new start for the Navy in FY 2013. CIRCM is an Acquisition Category (ACAT) ID Army lead acquisition program for the development, integration and production of an infrared countermeasure for US Army, US Navy, and US Marine Corps assault aircraft. The Army conducted a 21 month competitive prototyping Technology Development (TD) phase with two contractors. During the TD phase, the contractors developed TD test articles for various test events with emphasis placed on reliability. Contractors concurrently developed preliminary designs for the CIRCM system, conducted systems requirements review, system functional review, and preliminary design review systems engineering technical review events at appropriate times in the schedule. Upon completion of the TD phase, the Army conducted a competition for award of Engineering Manufacturing Development (EMD) contract(s). The EMD phase will be no more than 26 months and will include critical design reviews, test readiness reviews, procurement of 5 EMD test articles in FY 2017 for USN evaluation.

The federated DAIRCM system was chosen as the material solution to JUONS SO-0010 and funded via Rapid Acquisition Authority (RAA) with follow-on funding supplied via FY 2017 and FY 2018 Overseas Contingency Operations funding to complete the development, integration and test to support initial fielding in FY 2019. Department of Navy is in the process of developing a Capability Production Document (CPD) to support the transition to an integrated (under glass) solution. Development of the integrated DAIRCM solution will begin in FY 2018.

FY2017:
Procured 5 CIRCM test assets

FY2018:
Guardian Laser Tracker Assemblies(GLTA) Replacement evaluation

E. Performance Metrics

FY2018:
Guardian Laser Tracker Assemblies(GLTA) Replacement evaluation

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604272N / *Tact Air Dir Infrared CM (TADIRCM)*	Project (Number/Name) 3304 / *CIRCM*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Primary HDW Dev CIRCM	C/CPAF	NGC : Rolling Meadows	2.721	5.763	Mar 2018	0.000		0.000		-		0.000	0.000	8.484	8.484
Archived Production Development	Various	Various : Various	56.903	0.000		0.000		0.000		-		0.000	0.000	56.903	-
		Subtotal	59.624	5.763		0.000		0.000		-		0.000	0.000	65.387	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Archived Support	Various	Various : Various	10.556	0.000		0.000		0.000		-		0.000	0.000	10.556	-
		Subtotal	10.556	0.000		0.000		0.000		-		0.000	0.000	10.556	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Eng & Eval CIRCM	C/CPFF	Eglin AF Base : Fort Walton Beach FL	4.662	0.000		0.000		0.000		-		0.000	0.000	4.662	4.662
Archived Test and Evaluation	Various	Various : Various	12.711	0.000		0.000		0.000		-		0.000	0.000	12.711	-
		Subtotal	17.373	0.000		0.000		0.000		-		0.000	0.000	17.373	N/A

Remarks

Realigned to Product Development contract

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604272N / *Tact Air Dir Infrared CM (TADIRCM)*	**Project (Number/Name)** 3304 / *CIRCM*

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Archived Managment Services	Various	Various : Various	3.382	0.000		0.000		0.000		-		0.000	0.000	3.382	-
Govt Eng Supt CIRCM	WR	NAWCWD : Pt. Mugu, CA	0.758	0.000		0.000		0.000		-		0.000	0.000	0.758	-
		Subtotal	4.140	0.000		0.000		0.000		-		0.000	0.000	4.140	N/A

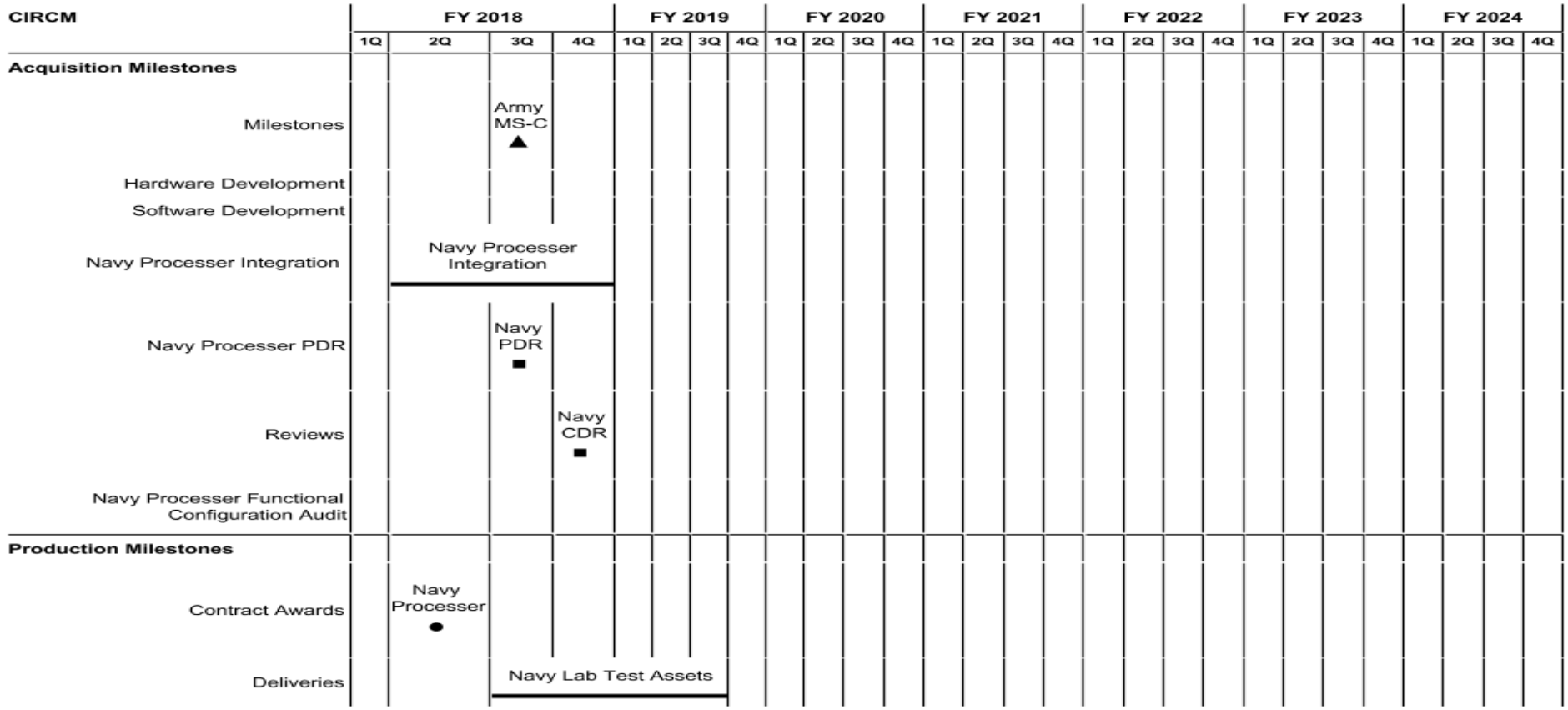
Remarks

Realigned to Product Development contract

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	91.693	5.763		0.000		0.000		-		0.000	0.000	97.456	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604272N / *Tact Air Dir Infrared CM (TADIRCM)*	**Project (Number/Name)** 3304 / *CIRCM*



2020OSD - 0604272N - 3304

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604272N / *Tact Air Dir Infrared CM (TADIRCM)*	**Project (Number/Name)** 3304 / *CIRCM*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
CIRCM				
Acquisition Milestones: Milestones: Army Milestone C (MS-C)	3	2018	3	2018
Acquisition Milestones: Navy Processer Integration: Navy Processer	2	2018	4	2018
Acquisition Milestones: Navy Processer PDR: Navy Processer PDR	3	2018	3	2018
Acquisition Milestones: Reviews: Navy Processer CDR	4	2018	4	2018
Production Milestones: Contract Awards: Navy Processer Contract	2	2018	2	2018
Production Milestones: Deliveries: Develop Navy Lab Assets Deliveries	3	2018	3	2019

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy											Date: March 2019	
Appropriation/Budget Activity 1319 / 4					R-1 Program Element (Number/Name) PE 0604272N / *Tact Air Dir Infrared CM (TADIRCM)*				Project (Number/Name) 3348 / *DAIRCM Development*			
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
3348: *DAIRCM Development*	0.000	45.548	47.278	68.346	-	68.346	60.448	49.543	36.283	37.007	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Distributed Aperture Infrared Countermeasures (DAIRCM) Developmental activities in hardware and software are being pursued to reduce the size, weight and power required to achieve a threat warning detection system integrated with an infrared countermeasure. DAIRCM development, integration and testing will first be conducted in a federated configuration to support Joint Urgent Operational Needs Statement (JUONS) SO-0010 to provide increased survivability against Man-Portable Air Defense Systems (MANPADS), Rocket Propelled Grenades (RPG), hostile gunfire, Anti-Aircraft Artillery (AAA) and laser-directed weapons. Follow-on work began in FY 2018 to provide an integrated (under glass) solution to the host platforms and will include development efforts to procure future threat technologies. This program develops integrated hardware/software solutions that link on-board integrated Aircraft Survivability Equipment (iASE) that are compatible with mission planning information and store sensor data for post mission threat analysis.

FY2019 Efforts will focus on completion of JUONS testing and installation of DAIRCM. FY19 will also begin risk reduction efforts for a POR start in FY20. The POR solution improves performance of the DAIRCM system, meets statutory requirements via Hardware and Software specifications and integration (under glass) with the MH-60S host platform, while maintaining interfaces for further integration for MH-60R, AH1Z, and UH-1Y.

FY 2020 RDT&E funding required for continued development of the DAIRCM system (HW and SW) and integration (under glass) of the DAIRCM solution on MH-60S platforms. MH-60S is the focus platform in early development and for DAIRCM performance testing. The AH-1Z and UH-1Y, and MH-60R integration specific development will begin at the DAIRCM contractors following MH-60S integration and will focus on ensuring the required interfaces are captured and developed for integration testing to be conducted at a later time.

JUSTIFICATION FOR BUDGET ACTIVITY: This program is funded under ADVANCED COMPONENT DEVELOPMENT AND PROTOTYPES because it includes all efforts necessary to evaluate integrated technologies, representative models or prototype systems in a high fidelity and realistic operating environment.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**
Title: DAIRCM Development	45.548	47.278	68.346	0.000	68.346
Articles:	-	-	-	-	-
FY 2019 Plans:					
Begin Risk Reduction efforts for transition to Program of Record (POR)					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604272N / *Tact Air Dir Infrared CM (TADIRCM)*	**Project (Number/Name)** 3348 / *DAIRCM Development*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Continue JUONS efforts ***FY 2020 Base Plans:*** Continue DAIRCM POR EMD efforts. Continue JUONS installs. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Program of Record (POR) transition begins in FY19 and EMD contract awards in FY20. Incremental funding in FY19 and FY20 will also continue to support DAIRCM JUONS effort.					
Accomplishments/Planned Programs Subtotals	45.548	47.278	68.346	0.000	68.346

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• APN/0576: *Assault DIRCM*	40.970	9.820	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	78.250

Remarks

D. Acquisition Strategy

The federated Distributed Aperture Infrared Countermeasures (DAIRCM) system is the solution for small/medium aircraft in response to Joint Urgent Operational Need Statement (JUONS) SO-0010. It was funded in FY16 via Rapid Acquisition Authority (RAA) executed from PUC 3304 CIRCM. Follow-on funding supplied via Overseas Contingency Operations in FY 2017 and FY 2019 APN OCO; FY 2018 RDT&E PUC 3348 . Funding provided to complete the development, integration test and support of initial fielding. Department of Navy is in the process of developing a Capability Production Document (CPD) to support the transition to an integrated (under glass) solution. Development, integration and test of the integrated solution will begin in FY19.

E. Performance Metrics

FY 2018: Program of Record Risk Reduction Delivery Order on Navy BOA scheduled for 3Q18.
FY 2019: Award of contract to meet statutory regulations scheduled for 3Q19.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604272N / *Tact Air Dir Infrared CM (TADIRCM)*	**Project (Number/Name)** 3348 / *DAIRCM Development*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Primary HW Dev DAIRCM	C/CPFF	DRS : Dallas, TX	0.000	11.548	Mar 2018	23.142	Jan 2019	34.650	Mar 2020	-		34.650	Continuing	Continuing	Continuing
Primary HW Dev DAIRCM	C/CPFF	Daylight Solutions : San Diego, CA	0.000	12.968	Mar 2018	1.000	Jan 2019	0.000		-		0.000	Continuing	Continuing	Continuing
H-60 Operational Flight Program Dev	C/CPFF	Lockheed Martin : Owego, NY	0.000	5.910	Mar 2018	0.200	Jan 2019	12.013	Mar 2020	-		12.013	Continuing	Continuing	Continuing
H-1 Operational Flight Program Deve	C/CPFF	Northrop Grumman : Woodland Hills, CA	0.000	0.000		0.000		5.000	Nov 2019	-		5.000	Continuing	Continuing	Continuing
Govt Eng Support	WR	NAWCAD : Patuxent River, MD	0.000	3.333	Jan 2018	0.000		2.600	Nov 2019	-		2.600	Continuing	Continuing	Continuing
Govt Eng Support	WR	FRC : Jacksonville, FL	0.000	0.549	Jan 2018	0.000		0.713	Nov 2019	-		0.713	Continuing	Continuing	Continuing
Govt Software Eng Support	WR	NAWCAD : PT Mugu	0.000	2.000	Dec 2017	0.000		3.000	Nov 2019	-		3.000	Continuing	Continuing	Continuing
Aircraft Integration	WR	FRC East : Cherry Point, NC	0.000	0.400	Nov 2017	0.000		0.312	Nov 2019	-		0.312	0.000	0.712	-
Govt Software Eng Support	WR	NRL : Washington, DC	0.000	0.000		2.900	Jan 2019	2.960	Nov 2019	-		2.960	Continuing	Continuing	Continuing
Govt Integrated Logistic Support	C/CPFF	ENGILITY : Chantilly, VA	0.000	0.000		0.000		0.406	Mar 2020	-		0.406	Continuing	Continuing	Continuing
		Subtotal	0.000	36.708		27.242		61.654		-		61.654	Continuing	Continuing	N/A

Remarks

(1) FY 2018 funding supported final test and evaluation of DAIRCM and JUONS. Program of Record (POR) transition begins in FY19.
(2) POR EMD contract established in FY19 incremental funding provided to support modification to existing DAIRCM JUONS.
(3) MH-60(Lead Platform) contract supports DAIRCM POR. H-60 Software development aligned to DAIRCM HW/SW development POR requirements

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604272N / *Tact Air Dir Infrared CM (TADIRCM)*	Project (Number/Name) 3348 / *DAIRCM Development*	

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Govt Integrated Logistic Support	WR	Fleet Readiness Depot : Jacksonville, FL	0.000	0.000		0.000		0.357	Nov 2019	-		0.357	Continuing	Continuing	Continuing
Logistic Deliverables	SS/CPFF	RIAC : Ft Belvoir, VA	0.000	0.500	Oct 2017	0.000		0.250	Nov 2019	-		0.250	Continuing	Continuing	Continuing
ESOH support	WR	NAWC WD : China lake	0.000	0.123	Oct 2017	0.068	Jan 2019	0.133	Nov 2019	-		0.133	Continuing	Continuing	Continuing
Integrated Logistic Support	C/CPAF	Wyle Laboratories : Lexington Park, MD	0.000	0.116	Jan 2018	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Comercial Shipping TAC code	TBD	Various : Various	0.000	0.017	Oct 2017	0.000		0.050	Oct 2019	-		0.050	Continuing	Continuing	Continuing
Integrated Logistic Support	WR	DTIC : Ft Belvoir, VA	0.000	0.000		0.000		0.000		-		0.000	0.000	0.000	-
		Subtotal	0.000	0.756		0.068		0.790		-		0.790	Continuing	Continuing	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Govt T&E Support	WR	NAWCAD : Patuxent River, MD	0.000	0.000		1.650	Dec 2018	1.000	Nov 2019	-		1.000	Continuing	Continuing	Continuing
Govt T&E Support	WR	NAWCWD : China Lake, CA	0.000	0.000		0.000		0.216	Nov 2019	-		0.216	Continuing	Continuing	Continuing
Flight Test/Live Fire	WR	USA DPG : Various	0.000	0.000		14.982	Mar 2019	0.405	Mar 2020	-		0.405	Continuing	Continuing	Continuing
Contractor T& E Support	WR	GWEF : Eglin AFB, FL	0.000	0.000		1.225	Feb 2019	1.000	Feb 2020	-		1.000	Continuing	Continuing	Continuing
Govt T&E Support	WR	COTF : Norfolk, VA	0.000	0.000		0.775	Jun 2019	0.108	Nov 2019	-		0.108	Continuing	Continuing	Continuing
Govt T&E Support	WR	CRANE : CRANE	0.000	0.350	Jan 2018	0.100	Jun 2019	0.500	Jan 2020	-		0.500	Continuing	Continuing	Continuing
OCO Govt T&E Support	WR	NAWCAD : Patuxent River, MD	0.000	1.568	Mar 2018	0.000		0.000		-		0.000	0.000	1.568	-
OCO Govt T&E Support	WR	NAWCWD : China Lake, CA	0.000	1.360	Jun 2018	0.000		0.000		-		0.000	0.000	1.360	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604272N / *Tact Air Dir Infrared CM (TADIRCM)*	Project (Number/Name) 3348 / *DAIRCM Development*	

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
OCO Flight Test/Live Fire	WR	USA DPG : Dugway, UT	0.000	1.968	Jun 2018	0.000		0.000		-		0.000	0.000	1.968	-
OCO HITL lab test	WR	GWEF : Eglin AFB, FL	0.000	0.000		0.000		0.000		-		0.000	0.000	0.000	-
OCO Contractor T& E Support	WR	GWEF : Eglin AFB, FL	0.000	0.450	Jun 2018	0.000		0.000		-		0.000	0.000	0.450	-
OCO Govt T&E Support	WR	COTF : Norfolk, VA	0.000	0.172	Jun 2018	0.000		0.000		-		0.000	0.000	0.172	-
OCO Flight Test/Live Fire	WR	Army : Huntsville AL	0.000	0.923	Apr 2018	0.000		0.000		-		0.000	0.000	0.923	-
		Subtotal	0.000	6.791		18.732		3.229		-		3.229	Continuing	Continuing	N/A

Remarks

Contractor T& E Support to GWEF will increase due to 2 events in FY19.

Management Services ($ in Millions)

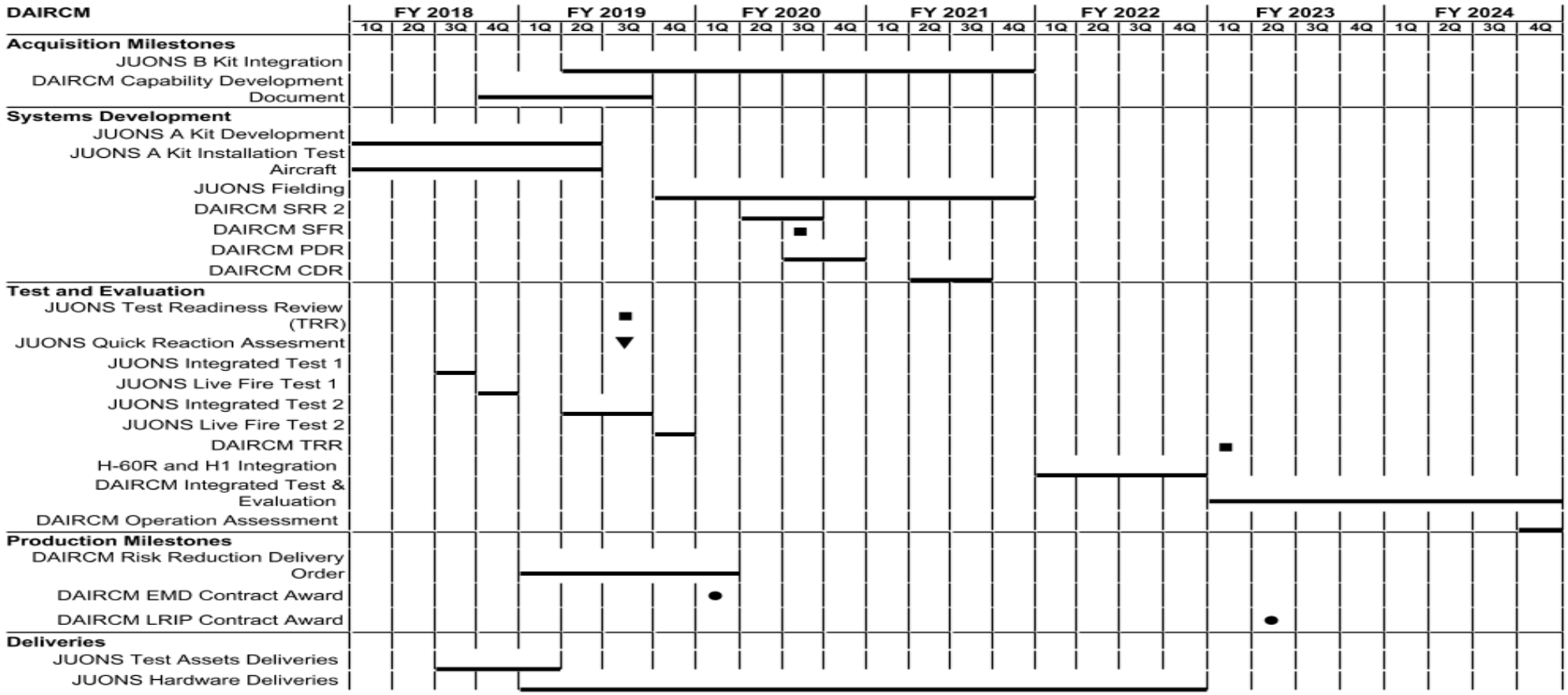
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Govt Eng Support	WR	NAWCWD : PT Mugu, CA	0.000	0.000		0.000		0.210	Oct 2019	-		0.210	Continuing	Continuing	Continuing
Contractor Mgmt Support	C/CPFF	Amelex : Patuxent River, MD	0.000	0.108	Nov 2017	0.000		0.500	Oct 2019	-		0.500	Continuing	Continuing	Continuing
Contractor Eng Support	C/CPFF	Engility : Patuxent River, MD	0.000	0.711	Jun 2018	0.700	Oct 2018	0.711	May 2020	-		0.711	Continuing	Continuing	Continuing
Travel	WR	NAVAIR Various : Patuxent River, MD	0.000	0.119	Dec 2017	0.300	Oct 2018	0.308	Oct 2019	-		0.308	Continuing	Continuing	Continuing
Govt PM support	WR	NAWCWD : Patuxent River, MD	0.000	0.000		0.000		0.711	Oct 2019	-		0.711	Continuing	Continuing	Continuing
Govt Eng Support	WR	NSWC : Dahlgren, VA	0.000	0.014	Jun 2018	0.000		0.020	Nov 2019	-		0.020	Continuing	Continuing	Continuing
Eng Support	C/CPFF	DCS : Bethesda, MD	0.000	0.341	Feb 2018	0.236	Jan 2019	0.213	Feb 2020	-		0.213	Continuing	Continuing	Continuing
		Subtotal	0.000	1.293		1.236		2.673		-		2.673	Continuing	Continuing	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604272N / *Tact Air Dir Infrared CM (TADIRCM)*	Project (Number/Name) 3348 / *DAIRCM Development*	

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	45.548		47.278		68.346		-		68.346	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604272N / *Tact Air Dir Infrared CM (TADIRCM)*	**Project (Number/Name)** 3348 / *DAIRCM Development*



2020PB - 0604272N - 3348

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604272N / *Tact Air Dir Infrared CM (TADIRCM)*	**Project (Number/Name)** 3348 / *DAIRCM Development*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
DAIRCM				
Acquisition Milestones: JUONS B Kit Integration: Schedule Detail	2	2019	4	2021
Acquisition Milestones: DAIRCM Capability Development Document: Schedule Detail	4	2018	3	2019
Systems Development: JUONS A Kit Development: Schedule Detail	1	2018	2	2019
Systems Development: JUONS A Kit Installation Test Aircraft: Schedule Detail (TEST)	1	2018	2	2019
Systems Development: JUONS Fielding: Schedule Detail	4	2019	4	2021
Systems Development: DAIRCM SRR 2: Schedule Detail	2	2020	3	2020
Systems Development: DAIRCM SFR: Schedule Detail	3	2020	3	2020
Systems Development: DAIRCM PDR: Schedule Detail	3	2020	4	2020
Systems Development: DAIRCM CDR: Schedule Detail	2	2021	3	2021
Test and Evaluation: JUONS Test Readiness Review (TRR): Schedule Detail	3	2019	3	2019
Test and Evaluation: JUONS Quick Reaction Assesment: Schedule Detail	3	2019	3	2019
Test and Evaluation: JUONS Integrated Test 1: Schedule Detail	3	2018	3	2018
Test and Evaluation: JUONS Live Fire Test 1: Schedule Detail	4	2018	4	2018
Test and Evaluation: JUONS Integrated Test 2: Schedule Detail	2	2019	3	2019
Test and Evaluation: JUONS Live Fire Test 2: Schedule Detail	4	2019	4	2019
Test and Evaluation: DAIRCM TRR: Schedule Detail	1	2023	1	2023
Test and Evaluation: H-60R and H1 Integration: Schedule Detail	1	2022	4	2022
Test and Evaluation: DAIRCM Integrated Test & Evaluation: Schedule Detail	1	2023	4	2024
Test and Evaluation: DAIRCM Operation Assessment: Schedule Detail	4	2024	4	2024
Production Milestones: DAIRCM Risk Reduction Delivery Order: Schedule Detail	1	2019	1	2020
Production Milestones: DAIRCM EMD Contract Award: Schedule Detail	1	2020	1	2020

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604272N / *Tact Air Dir Infrared CM (TADIRCM)*	**Project (Number/Name)** 3348 / *DAIRCM Development*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Production Milestones: DAIRCM LRIP Contract Award: Schedule Detail	2	2023	2	2023
Deliveries: JUONS Test Assets Deliveries: Schedule Detail	3	2018	1	2019
Deliveries: JUONS Hardware Deliveries: Schedule Detail	1	2019	4	2022

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0604286M *I (U)Marine Corps Additive Manufacturing Tech Dev*

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	0.000	6.168	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	6.168
2741: *Additive Manufacturing*	0.000	6.168	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	6.168

Note

These efforts transitioned to PE 0604289M in FY19.

A. Mission Description and Budget Item Justification

This program element supports cost associated with the research and development of Marine Corps Systems Command policy, acquisition process modifications, and prototyping to support the USMC Additive Manufacturing (AM) Initiative under the direction of DC I&L.

The USMC Additive Manufacturing Initiative is an initiative intended to give Marine units access to additive manufacturing techniques to allow them the opportunity to exercise innovation in the resolution of issues affecting unit combat readiness. This PE will support of the development of procedures to enable the approval and manufacturing of items requested from Marines. This involves the development of Marine Corps Policy, an approval process, engineering analysis and testing, establishment of facilities to produce prototype additive manufactured parts and development of training to support the Marine Corps use of additive manufacturing. This initiative incorporates development of strategic partnerships with other DoN Systems Commands and field activities to develop DoN standards, processes and other associated acquisition activities to support future use of additive manufacturing in DoN acquisition and readiness areas.

The Next Generation Logistics (NexLog) project supports cost associated with the research and development, experimentation and limited, rapid fielding of emerging logistics capabilities necessary to enable the Fleet Marine Forces to execute the Marine Corps Operating Concept and inform logistics policies. These emerging logistics capabilities include development of autonomous ground, surface and sub-surface materiel distribution systems; development of operational and tactical, in-field digital fabrication capabilities; and, the development of sensor-driven logistics information technology. This element also supports development of strategic partnerships with DoN Systems Commands and field activities in order to leverage their capabilities and align DoN standards and processes, while furthering the use of additive manufacturing, and other emerging logistics technologies, to increase warfighter readiness, capability, survivability and effectiveness.

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0604286M *I (U)Marine Corps Additive Manufacturing Tech Dev*

B. Program Change Summary ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	6.200	0.000	0.000	-	0.000
Current President's Budget	6.168	0.000	0.000	-	0.000
Total Adjustments	-0.032	0.000	0.000	-	0.000
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	0.204	0.000			
• SBIR/STTR Transfer	-0.236	0.000			
• Rate/Misc Adjustments	0.000	0.000	0.000	-	0.000

Change Summary Explanation

Decrease from FY19 to FY20 is due to the completion of large scale Additive Manufacturing efforts. Completed efforts were to prototype the additive manufacturing and robotic assembly of structures using large format additive manufacturing printers, articulating robotic manipulators and crowd sourcing efforts with Local Motors to develop concepts for a Modular Logistics Vehicle and a Small Unmanned Cargo Delivery System.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604286M / *(U)Marine Corps Additive Manufacturing Tech Dev*	Project (Number/Name) 2741 / *Additive Manufacturing*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
2741: *Additive Manufacturing*	0.000	6.168	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	6.168
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This project supports cost associated with the research and development of Marine Corps Systems Command policy, acquisition process modifications, prototyping, and future logistics innovations to support the USMC Additive Manufacturing (AM) Initiative under the direction of DC I&L.

The USMC Additive Manufacturing Initiative is an initiative intended to give Marine units access to additive manufacturing techniques to allow them the opportunity to exercise innovation in the resolution of issues affecting unit combat readiness. This effort supports the development of procedures to enable the approval and manufacturing of items requested from Marines. This involves the development of Marine Corps Policy, an approval process, engineering analysis and testing, establishment of facilities to produce prototype additive manufactured parts and development of training to support the Marine Corps use of additive manufacturing. It also includes research and development of autonomous ground cargo delivery systems, tactical employment of in field digital manufacturing, and sensor driven logistics information technology. This initiative incorporates development of strategic partnerships with other DoN Systems Commands and field activities to develop DoN standards, processes and other associated acquisition activities to support future use of additive manufacturing in DoN acquisition and readiness areas.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Expeditionary Logistics - Legacy Equipment and System Readiness Support	3.896	0.000	0.000	0.000	0.000
Articles:	-	-	-	-	-
FY 2019 Plans: -In FY19 this effort transitions to PE 0604289M beginning in FY19.					
FY 2020 Base Plans: N/A					
FY 2020 OCO Plans: N/A					
Title: Expeditionary Logistics - Expeditionary Manufacturing and Repair Processes	2.272	0.000	0.000	0.000	0.000
Articles:	-	-	-	-	-
FY 2019 Plans: -In FY19 this effort transitions to PE 0604289M beginning in FY19.					
FY 2020 Base Plans:					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604286M / *(U)Marine Corps Additive Manufacturing Tech Dev*	**Project (Number/Name)** 2741 / *Additive Manufacturing*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
N/A ***FY 2020 OCO Plans:*** N/A					
Accomplishments/Planned Programs Subtotals	6.168	0.000	0.000	0.000	0.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

The AM program utilizes a non-traditional acquisition strategy, due to AM being a set of enabling technologies vice a conventional platform for milestone-driven acquisition. It will incorporate strategic partnerships with other DoN activities, as well as the Joint Staff and services. For that reason, these AM investments are designed to explore future capabilities where AM may resolve gaps in logistical readiness, provide a warfighting solutions, and to mitigate AM-related risk within existing programs of record.

Beginning in FY 19, this effort was realigned to PE 0604289M/Expeditionary Logistics.

E. Performance Metrics

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604286M / *(U)Marine Corps Additive Manufacturing Tech Dev*	Project (Number/Name) 2741 / *Additive Manufacturing*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
AM Guidebook development	MIPR	NSWC : Carderock, MD	0.000	0.630	Jun 2018	0.000		0.000		-		0.000	0.000	0.630	-
AM Prototype Parts and Redesign	MIPR	Army : Picatinny Arsenal, NJ	0.000	3.984	Jun 2018	0.000		0.000		-		0.000	0.000	3.984	-
AM Structure Design	MIPR	Army/ERDC : Vicksburg, MS	0.000	1.304	Jun 2018	0.000		0.000		-		0.000	0.000	1.304	-
		Subtotal	0.000	5.918		0.000		0.000		-		0.000	0.000	5.918	N/A

Remarks

The AM program utilizes a non-traditional acquisition strategy due to AM being a set of enabling technologies vice a conventional platform for milestone-driven acquisition. The funding distribution above reflects research and development efforts for additive manufacturing enabling technologies.

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Support AM Manuf. and Repair Product	MIPR	NSWC : Carderock, MD	0.000	0.200	Jun 2018	0.000		0.000		-		0.000	0.000	0.200	-
Travel	Various	Various : Various	0.000	0.050	Aug 2018	0.000		0.000		-		0.000	0.000	0.050	-
		Subtotal	0.000	0.250		0.000		0.000		-		0.000	0.000	0.250	N/A

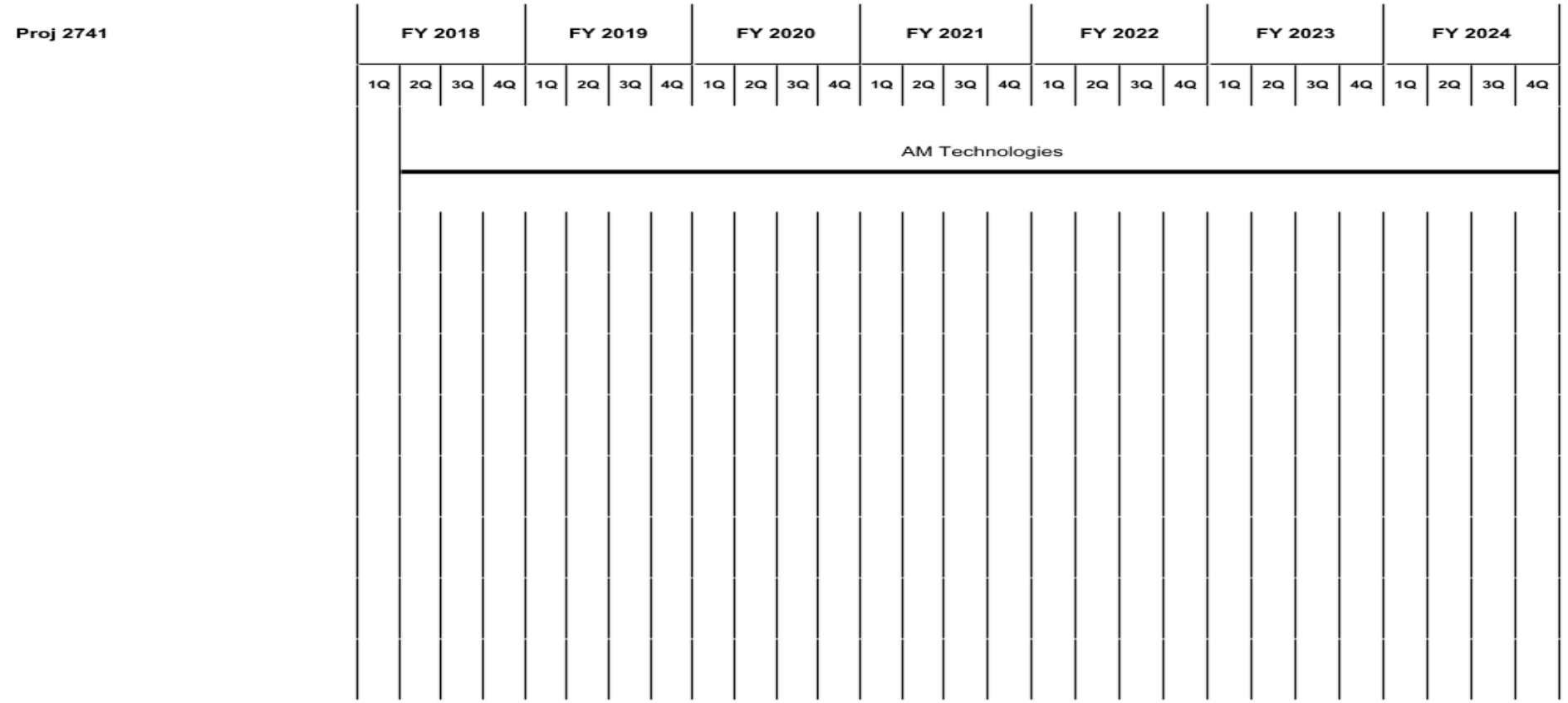
Remarks

The AM program utilizes a non-traditional acquisition strategy, due to AM being a set of enabling technologies vice a conventional platform for milestone-driven acquisition. The funding distribution above reflects research and development efforts for additive manufacturing enabling technologies.

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	6.168		0.000		0.000		-		0.000	0.000	6.168	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604286M / *(U)Marine Corps Additive Manufacturing Tech Dev*	**Project (Number/Name)** 2741 / *Additive Manufacturing*



2020OSD - 0604286M - 2741

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604286M / *(U)Marine Corps Additive Manufacturing Tech Dev*	**Project (Number/Name)** 2741 / *Additive Manufacturing*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 2741				
Additive Manufacturing Technologies	2	2018	4	2024

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy											Date: March 2019	
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0604289M *I (U)Expeditionary Logistics*							
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
Total Program Element	0.000	0.000	6.073	4.420	-	4.420	9.972	9.228	8.389	8.557	Continuing	Continuing
2741: *Additive Manufacturing*	0.000	0.000	6.073	1.971	-	1.971	5.018	4.270	3.430	3.499	Continuing	Continuing
2743: *Next Generation Logistics (NexLog)*	0.000	0.000	0.000	2.449	-	2.449	4.954	4.958	4.959	5.058	Continuing	Continuing

Note

In FY 2019 efforts in this PE transferred from PE 0604286M.

A. Mission Description and Budget Item Justification

This program element supports cost associated with the research and development of Marine Corps Systems Command policy, acquisition process modifications, and prototyping to support the USMC Additive Manufacturing (AM) Initiative under the direction of Deputy Commandant, Installations and Logistics (DC I&L).

The USMC Additive Manufacturing Initiative is an initiative intended to give Marine units access to additive manufacturing techniques to allow them the opportunity to exercise innovation in the resolution of issues affecting unit combat readiness. This PE will support of the development of procedures to enable the approval and manufacturing of items requested from Marines. This involves the development of Marine Corps Policy, an approval process, engineering analysis and testing, establishment of facilities to produce prototype additive manufactured parts and development of training to support the Marine Corps use of additive manufacturing. This initiative incorporates development of strategic partnerships with other DoN Systems Commands and field activities to develop DoN standards, processes and other associated acquisition activities to support future use of additive manufacturing in DoN acquisition and readiness areas.

The Next Generation Logistics (NexLog) project supports cost associated with the research and development, experimentation and limited, rapid fielding of emerging logistics capabilities necessary to enable the Fleet Marine Forces to execute the Marine Corps Operating Concept and inform logistics policies. These emerging logistics capabilities include development of autonomous ground, surface and sub-surface materiel distribution systems; development of operational and tactical, in-field digital fabrication capabilities; and, the development of sensor-driven logistics information technology. This element also supports development of strategic partnerships with DoN Systems Commands and field activities in order to leverage their capabilities and align DoN standards and processes, while furthering the use of additive manufacturing, and other emerging logistics technologies, to increase warfighter readiness, capability, survivability and effectiveness.

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy					Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*			R-1 Program Element (Number/Name) PE 0604289M *I (U)Expeditionary Logistics*		
B. Program Change Summary ($ in Millions)	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**
Previous President's Budget	0.000	11.081	9.194	-	9.194
Current President's Budget	0.000	6.073	4.420	-	4.420
Total Adjustments	0.000	-5.008	-4.774	-	-4.774
• Congressional General Reductions	-	-0.062			
• Congressional Directed Reductions	-	-4.946			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Program Adjustments	0.000	0.000	-2.274	-	-2.274
• Rate/Misc Adjustments	0.000	0.000	-2.500	-	-2.500

Change Summary Explanation

The FY2020 funding request was reduced by $2.27M to account for the availability of prior year execution balances.

Decrease from FY 2019 to FY 2020 due to completion of the large scale Additive Manufacturing efforts.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604289M / *(U)Expeditionary Logistics*	Project (Number/Name) 2741 / *Additive Manufacturing*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
2741: *Additive Manufacturing*	0.000	0.000	6.073	1.971	-	1.971	5.018	4.270	3.430	3.499	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This project supports cost associated with the research and development of Marine Corps Systems Command policy, acquisition process modifications, prototyping, and future logistics innovations to support the USMC Additive Manufacturing (AM) Initiative under the direction of Deputy Commandant Installations & Logistics.

The USMC Additive Manufacturing Initiative is an initiative intended to give Marine units access to additive manufacturing techniques to allow them the opportunity to exercise innovation in the resolution of issues affecting unit combat readiness. This effort supports the development of procedures to enable the approval and manufacturing of items requested from Marines. This involves the development of Marine Corps Policy, an approval process, engineering analysis and testing, establishment of facilities to produce prototype additive manufactured parts and development of training to support the Marine Corps use of additive manufacturing. It also includes research and development of autonomous ground cargo delivery systems, tactical employment of in field digital manufacturing, and sensor driven logistics information technology. This initiative incorporates development of strategic partnerships with other DoN Systems Commands and field activities to develop DoN standards, processes and other associated acquisition activities to support future use of additive manufacturing in DoN acquisition and readiness areas.

The FY 2020 funding request was reduced by $2.274 million to account for the availability of prior year execution balances.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Additive Manufacturing	0.000	6.073	1.971	0.000	1.971
Articles:	-	-	-	-	-
FY 2019 Plans: - Complete AM Characterization Process to develop, optimize, verify, and document a testing system and methodology for performing mechanical property characterization (stress-strain response) of parts created by Additive Manufacturing (AM) methodologies. - Complete large scale AM efforts with ERDC to prototype the additive manufacture and robotic assembly of structures using large format additive manufacturing printers and articulating robotic manipulators. - Complete crowd sourcing efforts with Local Motors to develop concepts for a Modular Logistics Vehicle and a Small Unmanned Cargo Delivery System. - Continue efforts to identify and develop Additive Manufacturing (AM) requirements, verification methods, and technical data needed to acquire AM manufactured components. -Continue fabrication of prototype hardware, fixtures, and jigs that facilitate design processes and procedures for test and performance verification.					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604289M / *(U)Expeditionary Logistics*	**Project (Number/Name)** 2741 / *Additive Manufacturing*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
- Continue system engineering efforts to identify and develop AM fabrication requirements, field repair procedures, and technical data needed to effectively repair AM manufactured components. - Initiate prototype testing to verify component design and reliability attributes. - Initiate certification studies to assess potential performance/integration issues with expeditionary repaired AM parts. ***FY 2020 Base Plans:*** - Continue efforts to identify and develop Additive Manufacturing (AM) requirements, verification methods, and technical data needed to acquire AM manufactured components. - Continue fabrication of prototype hardware, fixtures, and jigs that facilitate design processes and procedures for test and performance verification. - Continue system engineering efforts to identify and develop AM fabrication requirements, field repair procedures, and technical data needed to effectively repair AM manufactured components. - Continue prototype testing to verify component design and reliability attributes. - Continue certification studies to assess potential performance/integration issues with expeditionary repaired AM parts. ***FY 2020 OCO Plans:*** No OCO funds. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Decrease of $4.102M from FY19 to FY20 reflects Marine Corps adjustment to better align resources with execution and completion of the large scale AM efforts. Completed efforts were to prototype the additive manufacturing and robotic assembly of structures using large format additive manufacturing printers, articulating robotic manipulators and crowd sourcing efforts with Local Motors to develop concepts for a Modular Logistics Vehicle and a Small Unmanned Cargo Delivery System.					
Accomplishments/Planned Programs Subtotals	0.000	6.073	1.971	0.000	1.971

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• RDTEN/0604286M: *(U)Marine Corps Additive Manufacturing Tech Dev*	5.964	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	5.964

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604289M / *(U)Expeditionary Logistics*	**Project (Number/Name)** 2741 / *Additive Manufacturing*

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost

Remarks

D. Acquisition Strategy

The AM program utilizes a non-traditional acquisition strategy, due to AM being a set of enabling technologies vice a conventional platform for milestone-driven acquisition. It will incorporate strategic partnerships with other DoN activities, as well as the Joint Staff and services. For that reason, these AM investments are designed to explore future capabilities where AM may resolve gaps in logistical readiness, provide a warfighting solutions, and to mitigate AM-related risk within existing programs of record.

In FY 19 this effort has been realigned from PE 0604286M/(U)Marine Corps Additive Manufacturing Tech Dev.

E. Performance Metrics

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604289M / *(U)Expeditionary Logistics*	Project (Number/Name) 2741 / *Additive Manufacturing*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
AM Guidebook development	MIPR	NSWC : Dahlgren, VA	0.000	0.000		0.200	Feb 2019	0.100	Feb 2020	-		0.100	Continuing	Continuing	Continuing
AM Guidebook development	MIPR	NAVSEA/PSU-ARL : State College, PA	0.000	0.000		0.350	Feb 2019	0.000		-		0.000	Continuing	Continuing	Continuing
AM Guidebook development	MIPR	NSWC : Carderock, MD	0.000	0.000		0.250	Mar 2019	0.000		-		0.000	0.000	0.250	-
AM Training Material	MIPR	JHU-APL : Carderock, MD	0.000	0.000		0.250	Mar 2019	0.200	Feb 2020	-		0.200	0.000	0.450	-
AM Technical Data Package Development	MIPR	NAVAIR : Pax River, MD	0.000	0.000		0.100	Feb 2019	0.100	Mar 2020	-		0.100	0.000	0.200	-
AM Process Qualification and Certification	MIPR	MITRE : TBD	0.000	0.000		0.400	Feb 2019	0.000		-		0.000	0.000	0.400	-
AM Prototype Parts and Redesign	MIPR	Army : TBD	0.000	0.000		0.400	Mar 2019	0.200	Feb 2020	-		0.200	0.000	0.600	-
AM Develop USMC Fleet Wide Repository	MIPR	NAVFAC : TBD	0.000	0.000		0.250	Feb 2019	0.100	Mar 2020	-		0.100	0.000	0.350	-
AM Expeditionary Laboratory and Training Facility	Various	TBD : TBD	0.000	0.000		0.638	Feb 2019	0.200	Mar 2020	-		0.200	0.000	0.838	-
AM Structure Design	MIPR	rmy/ERDC : Vicksburg, MS	0.000	0.000		0.500	Feb 2019	0.190	Mar 2020	-		0.190	0.000	0.690	-
		Subtotal	0.000	0.000		3.338		1.090		-		1.090	Continuing	Continuing	N/A

Remarks

The AM program utilizes a non-traditional acquisition strategy, due to AM being a set of enabling technologies vice a conventional platform for milestone-driven acquisition. The funding distribution above reflects research and development efforts for additive manufacturing enabling technologies.

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
AM Identification of Legacy Part	C/FFP	GE : Columbus, OH	0.000	0.000		0.250	Mar 2019	0.000		-		0.000	0.000	0.250	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604289M / *(U)Expeditionary Logistics*	Project (Number/Name) 2741 / *Additive Manufacturing*	

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
AM Identification of New Part	MIPR	JHU-APL : Columbia, MD	0.000	0.000		0.400	Feb 2019	0.200	Mar 2020	-		0.200	Continuing	Continuing	Continuing
AM Identify Cases for Prototypes	MIPR	NSWC : Dahlgren, VA	0.000	0.000		0.300	Mar 2019	0.200	Apr 2020	-		0.200	0.000	0.500	-
AM Program Acquisition Strategy and Sustainment	MIPR	TBD : TBD	0.000	0.000		0.885	Feb 2019	0.200	Feb 2020	-		0.200	0.000	1.085	-
AM Research Advances 3D Printer Technology	MIPR	NSWC-CD : Carderock, MD	0.000	0.000		0.250	Feb 2019	0.150	Jan 2020	-		0.150	0.000	0.400	-
AM Identification Advanced Prototyping Lab/ Workspace	MIPR	DTIC / GTRI : TBD	0.000	0.000		0.600	Feb 2019	0.100	Jan 2020	-		0.100	0.000	0.700	-
Travel	Various	TBD : TBD	0.000	0.000		0.050	Jan 2019	0.031	Jan 2020	-		0.031	0.000	0.081	-
		Subtotal	0.000	0.000		2.735		0.881		-		0.881	Continuing	Continuing	N/A

Remarks

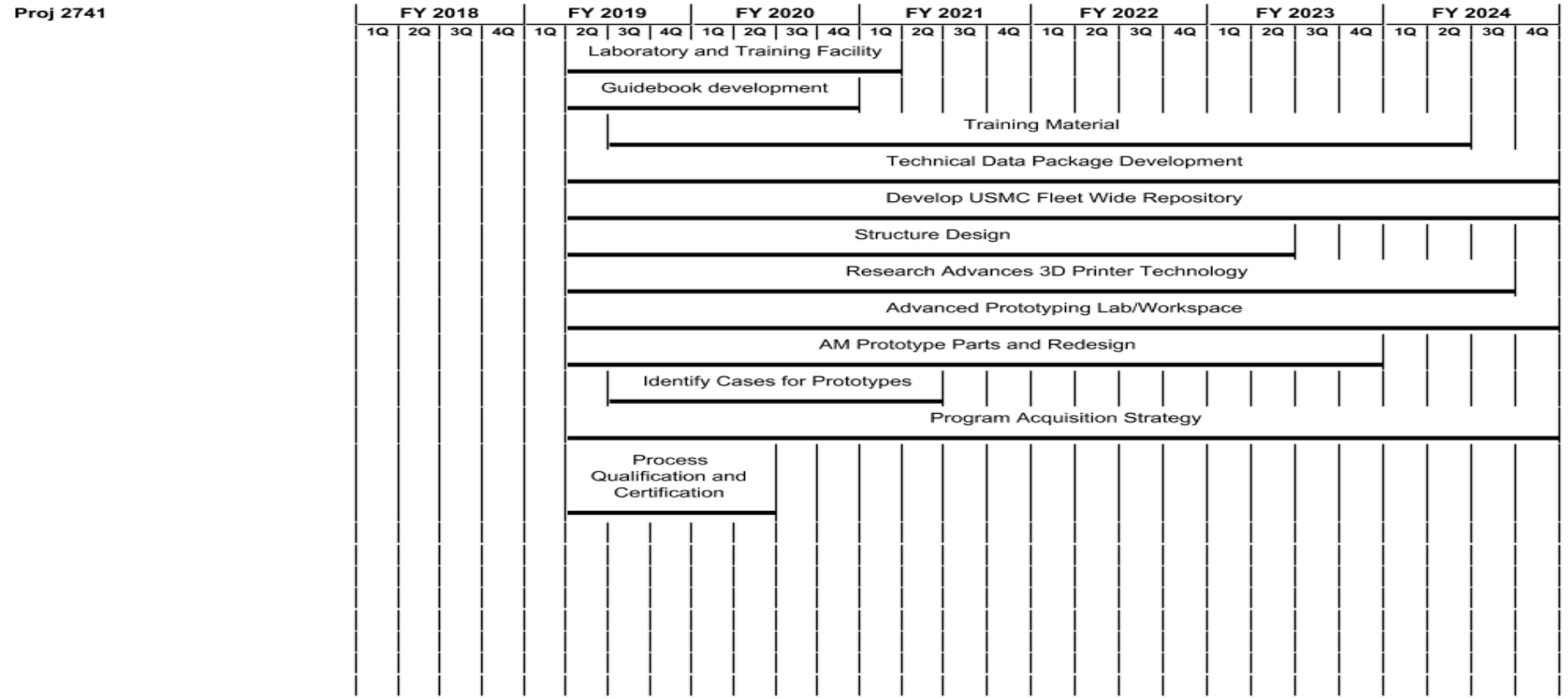
The AM program utilizes a non-traditional acquisition strategy, due to AM being a set of enabling technologies vice a conventional platform for milestone-driven acquisition. The funding distribution above reflects research and development efforts for additive manufacturing enabling technologies.

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	0.000		6.073		1.971		-		1.971	Continuing	Continuing	N/A

Remarks

Decrease of $4.102M from FY19 to FY20 reflects Marine Corps adjustment to better align resources with execution and completion of the large scale AM efforts.

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604289M / *(U)Expeditionary Logistics*	**Project (Number/Name)** 2741 / *Additive Manufacturing*



2020PB - 0604289M - 2741

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604289M / *(U)Expeditionary Logistics*	**Project (Number/Name)** 2741 / *Additive Manufacturing*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 2741				
Laboratory and Training Facility	2	2019	1	2021
Guidebook development	2	2019	4	2020
Training Material	3	2019	2	2024
Technical Data Package Development	2	2019	4	2024
Develop USMC Fleet Wide Repository	2	2019	4	2024
Structure Design	2	2019	2	2023
-Research Advances 3D Printer Technology	2	2019	3	2024
Advanced Prototyping Lab/Workspace	2	2019	4	2024
AM Prototype Parts and Redesign	2	2019	4	2023
Identify Cases for Prototypes	3	2019	2	2021
Program Acquisition Strategy	2	2019	4	2024
Process Qualification and Certification	2	2019	2	2020

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604289M / *(U)Expeditionary Logistics*	Project (Number/Name) 2743 / *Next Generation Logistics (NexLog)*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
2743: *Next Generation Logistics (NexLog)*	0.000	0.000	0.000	2.449	-	2.449	4.954	4.958	4.959	5.058	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Note

This is a new Project in FY 2020.

A. Mission Description and Budget Item Justification

The Next Generation Logistics (NexLog) project supports costs associated with the research and development, experimentation and limited, rapid fielding of emerging logistics capabilities necessary to enable the Fleet Marine Forces to execute the Marine Corps Operating Concept and inform logistics policies. These emerging logistics capabilities include, but are not limited, the development of intelligent distribution systems such autonomous Unmanned Logistics System (ULS) operating in the ground, air, surface and sub-surface domains. The development of enabling technologies that will increase the speed needed to detect an impending support requirement as well as the speed of response to satisfy that requirement. This involves the deployment of sensor technologies, collection of clean, properly tagged data, and the ability to electronically mine and monitor that sensor data for anomalies and micro-patterns that will provide logistics intelligence augmentation, thereby increasing Marine Air Ground Task Force (MAGTF) lethality.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Unmanned Logistics Systems	0.000	0.000	1.199	0.000	1.199
Articles:	-	-	-	-	-
Description: This Unmanned Logistics System (ULS) thrust area directly supports DoD and USMC directed innovation efforts that enable critical and emerging operational efforts to include Expeditionary Advance Basing Operations (EABO) and Littoral Operations in a Constrained Environment (LOCE). The current and emerging projects in this thrust area also better enable speed and Operating Force lethality while reducing MAGTF risk and acting as a force multiplier. ULS capabilities also lightens the MAGTF loads, and allows commanders to control the timing of delivery of mission critical, time sensitive supplies and equipment. Specifically, this project thrust area explores a number of promising Joint and OSD coordinated projects to include, but not limited to Unmanned Logistics Systems in the Surface, Ground, Air and Sub-Surface domains.					
FY 2019 Plans: N/A					
FY 2020 Base Plans:					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604289M / *(U)Expeditionary Logistics*	**Project (Number/Name)** 2743 / *Next Generation Logistics (NexLog)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
-Initiate ULS-Ground development projects that include development of unmanned electric vehicles that have an ever increasing range, high payload capacity and are ruggedized for use in support of combat scenarios. Also, in the ULS-Ground domain are projects that explore emerging capabilities that can be applied to current inventory assets through autonomous applique kits. -Initiate ULS- Surface include Pipefish, which fills the bulk fuel supply, mobility, and distribution gaps between large tankers and requirements at the points of need both at sea and ashore at a low operating cost and risk level. -Initiate ULS-Surface projects including the Autonomous Littoral Connector, which provides a low cost autonomous resupply platform utilizing legacy LCM-8 landing craft integrated with autonomous technology being utilized on the Sea Hunter program, delivering critical supplies to the Operating Forces at a significantly reduced risk while increasing the force's reach. -Initiate exploration of numerous ULS-Air domain projects to included ULS-Air Small, Medium and Large Platforms that help explore autonomous technologies emerging from industry and the DoD Lab environment to provide an organic, highly autonomous, aerial distribution capability within sustainment and maneuver units. ULS-Air provides rapid, responsive, and flexible sustainment options in support of dispersed and semi-independent operations critical to the most likely future operating environment. -Initiate exploration into other autonomous enabling capabilities to include artificial intelligence, sensing capability, autonomic response and integrated fast turn, emerging commercial technologies. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increase of $1.199M from FY 2019 to FY 2020 is due to initiation of Unmanned Logistics Systems RDTEN efforts.					
Title: Data Driven Logistics Autonomous Learning and Innovation ***Articles:*** ***Description:*** This Data Driven Logistics (D2L) thrust area directly supports DoD and USMC directed innovation efforts that enable critical and emerging operational efforts to include Expeditionary Advance Basing Operations and Littoral Operations (EABO) Littoral Operations in a Constrained Environment (LOCE). The current and	0.000 -	0.000 -	1.250 -	0.000 -	1.250 -

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604289M / *(U)Expeditionary Logistics*	**Project (Number/Name)** 2743 / *Next Generation Logistics (NexLog)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
emerging projects in this thrust area also better enable speed and Operating Force lethality while reducing MAGTF risk and ensuring increased artificial intelligence, augmented reality integration, improved command and control, focused analytics, greater data accuracy and more responsive processes. ***FY 2019 Plans:*** N/A ***FY 2020 Base Plans:*** - Initiate the Support Data Driven Logistic Sensor Driven Logistic Projects such as Joint Operational Energy Command and Control (JOEC2), shot round counter and the Personal Combat Assistant and Reporting Device (PCARD) system, whose development may ultimately provide sensored technologies at the tactical edge. Additionally, JOEC2 and shot round counter enables supply monitoring of battlefield consumption rates for ammunition and bulk fuel accountability, visibility, and energy command and control from the tactical edge to the enterprise, providing logistical information in real-time from the individual Marine through the highest echelon, enabling logistics units to be proactive vice reactive in the provision of needed sustainment. These emerging capabilities help to create a central hub for data that permits the application of analytical and data-driven algorithms that can have operational and strategic affects with future efforts that may be leveraged by fires, medical, and drones. -Initiate other D2L efforts include sensor driven logistics, augmented reality, logistics artificial intelligence pilots and condition based maintenance efforts meant to increase predictive maintenance, focus resources and provide assets at the critical points to avoid backlogs and Operating Force burdens. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increase of $1.250M from FY 2019 to FY 2020 is due to initiation of Data Driven Logistics Autonomous Learning and Innovation RDTEN efforts.					
Accomplishments/Planned Programs Subtotals	0.000	0.000	2.449	0.000	2.449

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604289M / *(U)Expeditionary Logistics*	**Project (Number/Name)** 2743 / *Next Generation Logistics (NexLog)*

D. Acquisition Strategy

NexLog will incorporate strategic partnerships with other DoN activities, as well as the Joint Staff and services. For that reason, these investments are designed to explore future capabilities that may resolve gaps in logistical readiness, provide warfighting solutions, and mitigate Log-related risk within existing programs of record. Ensure the USMC can meet the logistics challenges of future operating environments.

-Accelerate measurable transition outcomes
-Grow logistics innovation network and partnerships
-Promote warfighter-driven logistics innovation
-Mature the innovation skillset

E. Performance Metrics

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604289M / *(U)Expeditionary Logistics*	Project (Number/Name) 2743 / *Next Generation Logistics (NexLog)*	

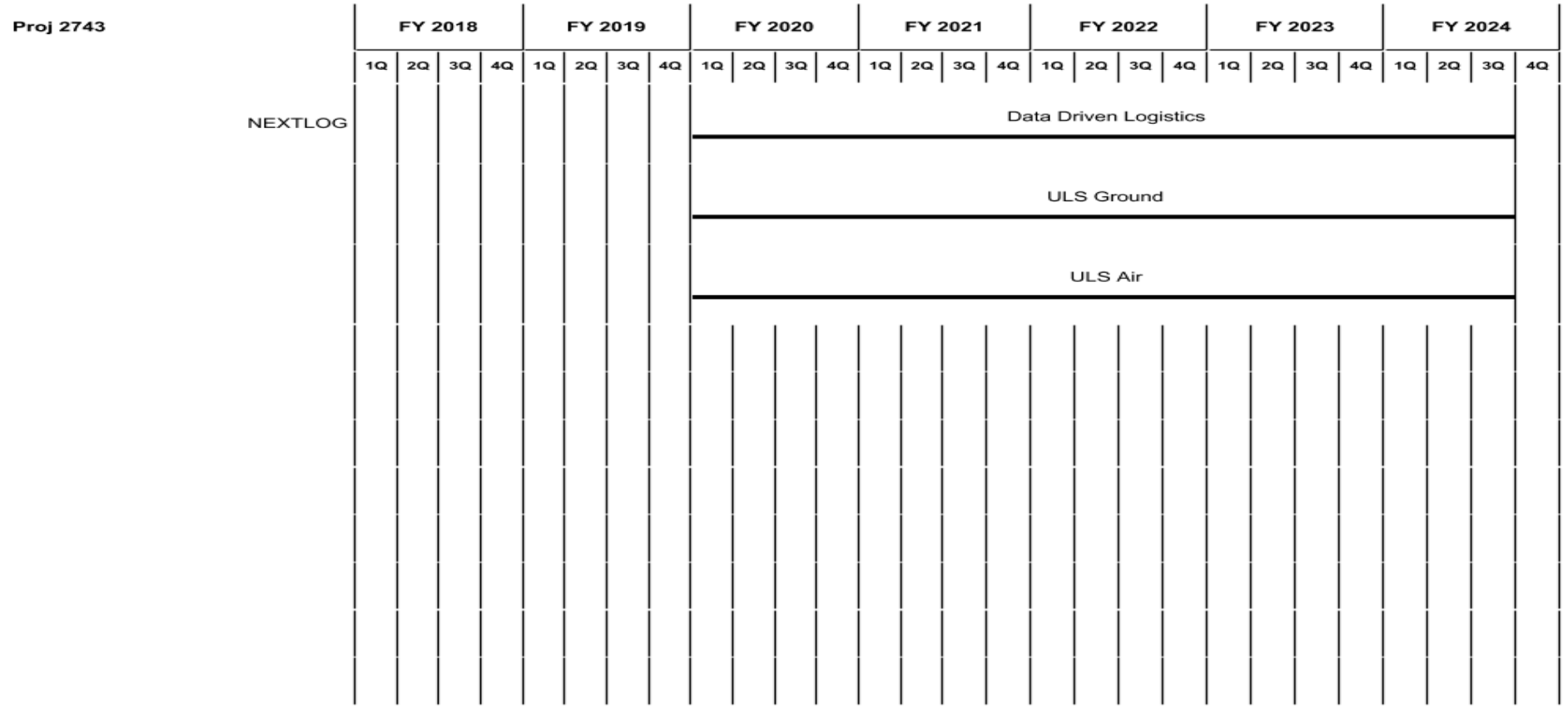
Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
ULS-Ground	MIPR	TBD : TBD	0.000	0.000		0.000		0.349	Jan 2020	-		0.349	Continuing	Continuing	Continuing
Data Driven Logistic Sensor Driven Logistic Projects	MIPR	TBD : TBD	0.000	0.000		0.000		0.600	Jan 2020	-		0.600	Continuing	Continuing	Continuing
Data Driven Logistics Asset Management/ Inventory Security Projects	MIPR	TBD : TBD	0.000	0.000		0.000		0.300	Jan 2020	-		0.300	Continuing	Continuing	Continuing
Data Driven Logistics Artificial Intelligence, and Capabilities Based Mainenance	MIPR	TBD : TBD	0.000	0.000		0.000		0.350	Jan 2020	-		0.350	Continuing	Continuing	Continuing
Travel	Various	TBD : TBD	0.000	0.000		0.000		0.050	Jan 2020	-		0.050	Continuing	Continuing	Continuing
ULS - Air	MIPR	TBD : TBD	0.000	0.000		0.000		0.800	Jan 2020	-		0.800	Continuing	Continuing	Continuing
		Subtotal	0.000	0.000		0.000		2.449		-		2.449	Continuing	Continuing	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	0.000		0.000		2.449		-		2.449	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604289M / *(U)Expeditionary Logistics*	**Project (Number/Name)** 2743 / *Next Generation Logistics (NexLog)*



2020PB - 0604289M - 2743

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604289M / *(U)Expeditionary Logistics*	**Project (Number/Name)** 2743 / *Next Generation Logistics (NexLog)*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 2743				
NEXTLOG: Data Driven Logistics	1	2020	3	2024
NEXTLOG: Unmannded Logistics Systems Ground	1	2020	3	2024
NEXTLOG: Unmannded Logistics Systems Air	1	2020	3	2024

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy											Date: March 2019	
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0604320M *I (U)Rapid Technology Capability Prototype*							
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
Total Program Element	0.000	16.443	7.107	4.558	-	4.558	9.049	8.662	7.732	7.887	Continuing	Continuing
0386: *Rapid Prototype Development, Marine Corps*	0.000	6.786	7.107	4.558	-	4.558	9.049	8.662	7.732	7.887	Continuing	Continuing
9999: *Congressional Adds*	0.000	9.657	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	9.657

A. Mission Description and Budget Item Justification

The Commandant of the Marine Corps (CMC) directed the formation of the Marine Corps Rapid Capabilities Office (MCRCO) to accelerate the identification, development and assessment of capabilities that appear to offer significant military utility. The MCRCO will seek emergent and disruptive technology to rapidly develop and deliver operational prototypes that increase Operating Forces' survivability and lethality, and that will inform requirement development and investment planning. Prototypes to be assessed will be at a Technology Readiness Level 7 or higher and can be either non developmental government off the shelf, non-developmental commercial off the shelf, or developmental items.

FY18 efforts include, but are not limited to, product development and operational forces assessment for Tactical Electro-Magnetic Signature Operations and Support (TEMSOS) and Organic Precision Fires (formerly Long Range Precision Fires). TEMSOS will provide enhanced uninterruptable intra-unit communications, alternate precision navigation, friendly force electromagnetic signature monitoring, enhanced situational awareness, and tactical advantage through electronic attack. Organic Precision Fires will provide long-range guided anti-armor precision fires with both on-board and meshed data links for enhanced targeting accuracy for this small unmanned aircraft munition. These capabilities have been identified as key immediate operational force survivability and lethality enablers to counter current enemy capabilities. 26 March General Officer Board of Directors (GOBoD) decision moved the planned SWARM effort into the FY19 Autonomous Vehicle focus area.

FY19 efforts include Autonomous Vehicles, Tactical Information Warfare, and Urban Engagement Systems.

Autonomous Vehicles: This effort will identify, prototype, and assess the use in a variety of combat and supporting use employments, vehicles capable of sensing their environment, while navigating and functioning independently without human conduction to take evasive or defensive action and avoid detection, tracking, targeting or attack, provide an alternative reconnoiter capability in non-permissive settings for the purpose of mapping and patrolling for the purpose of intensifying combat power and reducing risk to the force.

Tactical Information Warfare: This effort will identify, prototype, and assess various informations systems that provide small unit ability to undermine local opposing force information quality, while ensuring friendly forces a timely, accurate, superior capability to automatically correlate relevant active and passive information from organic and non-organic sensors that will increase their combat effectiveness in this emerging warfighting discipline.

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0604320M *I (U)Rapid Technology Capability Prototype*

Urban Engagement Systems: This effort will identify, prototype and assess small unit systems to provide them enhanced situational awareness to locate and track opposing forces in tall buildings, narrow alleys, sewage tunnels and subway systems in order to minimize friendly force exposure, reduce potential collateral damage, and offer increased force protection measures by means of amplified lethality, improved discrimination ability, and enhances survivability.

FY20 efforts include Fight the Naval Force Forward, Human Performance Augmentation, and Organic Resource Generation. These efforts are linked to USMC specific warfighting strategies, the National Defense Strategy, the Marine Operating Concept, and the Marine Corps Warfighting Lab Campaign Plan. These policy and strategy linkages insure these efforts will be focused on the proper priorities.

The Fight the Naval Force Forward effort will identify, prototype, and assess systems that provide critical capabilities for small task organized units operating as the forward edge of an inside force. Efforts includes active and passive systems that operate with resilience in a Network-Contested Environment (NCE) and smaller, dispersed, and resilient systems which operate from diverse platforms.

The Human Performance Augmentation effort will identify, prototype, and assess various wearables that enhance physical and or cognitive capabilities of the individual Marine that will increase their combat effectiveness. System efforts include exoskeletons, man-machine, and artificial intelligence interfaces to enhance performance including close combat lethality in complex terrain.

The Organic Resource Generation effort will identify, prototype and assess personal and small unit systems in optionally mounted configurations that enable creation of various classes of supply to extend operational endurance and reduce logistical reliance. Organic Resource Generation efforts include decentralized energy generation, water recycling and desalination, energy storage, increase deployed energy efficiency, bio-fuels, and non-commercially dependent distributed logistics.

B. Program Change Summary ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	7.055	7.107	7.271	-	7.271
Current President's Budget	16.443	7.107	4.558	-	4.558
Total Adjustments	9.388	0.000	-2.713	-	-2.713
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.612	0.000			
• Program Adjustments	0.000	0.000	-2.712	-	-2.712
• Rate/Misc Adjustments	0.000	0.000	-0.001	-	-0.001
• Congressional Add Adjustments	10.000	-	-	-	-

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0604320M *I (U)Rapid Technology Capability Prototype*

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2018	FY 2019
Project: 9999: *Congressional Adds*		
Congressional Add: *Increase Rapid Acquisition Capability for MC Warfighting Lab*	9.657	0.000
Congressional Add Subtotals for Project: 9999	9.657	0.000
Congressional Add Totals for all Projects	9.657	0.000

Change Summary Explanation

The FY2020 funding request was reduced by $2.71M to account for the availability of prior year execution balances.

The decrease from FY19 to FY20 is due primarily to the reduced requirement for product development required to initiate the Fight the Naval Force Forward, Human Performance Augmentation, and Organic Resource Generation projects relative to those conducted in FY19.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604320M / *(U)Rapid Technology Capability Prototype*	Project (Number/Name) 0386 / *Rapid Prototype Development, Marine Corps*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
0386: *Rapid Prototype Development, Marine Corps*	0.000	6.786	7.107	4.558	-	4.558	9.049	8.662	7.732	7.887	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Commandant of the Marine Corps (CMC) directed the formation of the Marine Corps Rapid Capabilities Office (MCRCO) to accelerate the identification, development and assessment of capabilities that appear to offer significant military utility. The MCRCO will seek emergent and disruptive technology to rapidly develop and deliver operational prototypes that increase Operating Forces' survivability and lethality, and that will inform requirement development and investment planning. Prototypes to be assessed will be at a Technology Readiness Level 7 or higher and can be either non developmental government off the shelf, non-developmental commercial off the shelf, or developmental items.

FY18 efforts included, but were not limited to, product development and operational forces assessment for Tactical Electro-Magnetic Signature Operations and Support (TEMSOS) and Organic Precision Fires (formerly Long Range Precision Fires). TEMSOS will provide enhanced uninterruptable intra-unit communications, alternate precision navigation, friendly force electromagnetic signature monitoring, enhanced situational awareness, and tactical advantage through electronic attack. Organic Precision Fires will provide long-range guided anti-armor precision fires with both on-board and meshed data links for enhanced targeting accuracy for this small unmanned aircraft munition. These capabilities have been identified as key immediate operational force survivability and lethality enablers to counter current enemy capabilities. 26 March General Officer Board of Directors (GOBoD) decision moved the planned SWARM effort into the FY19 Autonomous Vehicle focus area. Initial Autonomy & Artificial Intelligence (AAI) Explosive Ordnance Disposal (EOD) efforts and Augmented Reality (AR) software development were also FY18 efforts.

FY19 efforts include Autonomous Vehicles, Tactical Information Warfare, and Urban Engagement Systems. Autonomous Vehicles will identify, prototype, and assess the use in a variety of combat and supporting use employments, vehicles capable of sensing their environment, while navigating and functioning independently without human conduction. Tactical Information Warfare will identify, prototype, and assess systems that allow small units to undermine local opposing force information, while ensuring friendly force superior command and control. Effort will correlate relevant active and passive sensors that increase combat effectiveness. Urban Engagement Systems will prototype and assess small unit enhanced situational awareness systems to locate and track opposing forces in tall buildings, narrow alleys, sewage tunnels and subway systems. Goal is to minimize friendly force exposure, reduce potential collateral damage, and enhance survivability.

Autonomous Vehicles: effort will identify, prototype, and assess the use in a variety of combat and supporting use employments, vehicles capable of sensing their environment, while navigating and functioning independently without human conduction to take evasive or defensive action and avoid detection, tracking, targeting or attack, provide an alternative reconnoiter capability in non-permissive settings for the purpose of mapping and patrolling for the purpose of intensifying combat power and reducing risk to the force.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604320M / *(U)Rapid Technology Capability Prototype*	**Project (Number/Name)** 0386 / *Rapid Prototype Development, Marine Corps*

Tactical Information Warfare: effort will identify, prototype, and assess various information systems that provide small unit ability to undermine local opposing force information quality, while ensuring friendly forces a timely, accurate, superior capability to automatically correlate relevant active and passive information from organic and non-organic sensors that will increase their combat effectiveness in this emerging war-fighting discipline.

Urban Engagement Systems: effort will identify, prototype and assess small unit systems to provide them enhanced situational awareness to locate and track opposing forces in tall buildings, narrow alleys, sewage tunnels and subway systems in order to minimize friendly force exposure, reduce potential collateral damage, and offer increased force protection measures by means of amplified lethality, improved discrimination ability, and enhances survivability.

FY20 efforts include Fight the Naval Force Forward, Human Performance Augmentation, and Organic Resource Generation. These efforts are linked to USMC specific warfighting strategies, the National Defense Strategy, the Marine Operating Concept, and the Marine Corps Warfighting Lab Campaign Plan. These policy and strategy linkages insure these efforts will be focused on the proper priorities.

The Fight the Naval Force Forward effort will identify, prototype, and assess systems that provide critical capabilities for small task organized units operating as the forward edge of an inside force. Efforts includes active and passive systems that operate with resilience in a Network-Contested Environment (NCE) and smaller, dispersed, and resilient systems which operate from diverse platforms.

The Human Performance Augmentation effort will identify, prototype, and assess various wearables that enhance physical and or cognitive capabilities of the individual Marine that will increase their combat effectiveness. System efforts include exoskeletons, man-machine, and artificial intelligence interfaces to enhance performance including close combat lethality in complex terrain.

The Organic Resource Generation effort will identify, prototype and assess personal and small unit systems in optionally mounted configurations that enable creation of various classes of supply to extend operational endurance and reduce logistical reliance. Organic Resource Generation efforts include decentralized energy generation, water recycling and desalination, energy storage, increase deployed energy efficiency, bio-fuels, and non-commercially dependent distributed logistics.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Product Development	3.064	5.878	3.250	0.000	3.250
Articles:	-	-	-	-	-
FY 2019 Plans: FY19 Product Development Autonomous Vehicles: Initiate efforts to identify, prototype, and assess the use in a variety of combat and supporting use employments, vehicles capable of sensing their environment, while navigating and functioning independently without human conduction to take evasive or defensive action and avoid detection, tracking, targeting or attack, provide an alternative reconnoiter capability in non-permissive settings for the purpose of mapping and patrolling for the purpose of intensifying combat power and reducing risk to the force.					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604320M / *(U)Rapid Technology Capability Prototype*	**Project (Number/Name)** 0386 / *Rapid Prototype Development, Marine Corps*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
FY19 Product Development Tactical Information Warfare: Initiate efforts to identify, prototype, and assess various information systems that provide small unit ability to undermine local opposing force information quality, while ensuring friendly forces a timely, accurate, superior capability to automatically correlate relevant active and passive information from organic and non-organic sensors that will increase their combat effectiveness in this emerging war-fighting discipline. FY19 Product Development Urban Engagement Systems: Initiate efforts to identify, prototype and assess small unit systems to provide them enhanced situational awareness to locate and track opposing forces in tall buildings, narrow alleys, sewage tunnels and subway systems in order to minimize friendly force exposure, reduce potential collateral damage, and offer increased force protection measures by means of amplified lethality, improved discrimination ability, and enhances survivability. ***FY 2020 Base Plans:*** FY20 efforts include Fight the Naval Force Forward, Human Performance Augmentation, and Organic Resource Generation. These efforts are linked to USMC specific warfighting strategies, the National Defense Strategy, the Marine Operating Concept, and the Marine Corps Warfighting Lab Campaign Plan. These policy and strategy linkages insure these efforts will be focused on the proper priorities. The Fight the Naval Force Forward effort will identify, prototype, and assess systems that provide critical capabilities for small task organized units operating as the forward edge of an inside force. Efforts includes active and passive systems that operate with resilience in a Network-Contested Environment (NCE) and smaller, dispersed, and resilient systems which operate from diverse platforms. The Human Performance Augmentation effort will identify, prototype, and assess various wearables that enhance physical and or cognitive capabilities of the individual Marine that will increase their combat effectiveness. System efforts include exoskeletons, man-machine, and artificial intelligence interfaces to enhance performance including close combat lethality in complex terrain. The Organic Resource Generation effort will identify, prototype and assess personal and small unit systems in optionally mounted configurations that enable creation of various classes of supply to extend operational endurance and reduce logistical reliance. Organic Resource Generation efforts include decentralized energy					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604320M / *(U)Rapid Technology Capability Prototype*	**Project (Number/Name)** 0386 / *Rapid Prototype Development, Marine Corps*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
generation, water recycling and desalination, energy storage, increase deployed energy efficiency, bio-fuels, and non-commercially dependent distributed logistics. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** The decrease of $2.578M (from $5.878M in FY19 to $3.3M in FY20) in FY 2020 product development is due to reduction in the scope of development required for the Fight the Naval Force Forward, Human Performance Augmentation, and Organic Resource Generation projects as compared to those conducted in FY19.					
Title: Support ***Articles:*** ***FY 2019 Plans:*** Initiate support efforts to include development of a innovation portal and other data collection efforts. ***FY 2020 Base Plans:*** Continue support efforts to include development of a innovation portal, modeling and simulation, and other data collection efforts. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** The increase of $36K in FY2020 from $566K to $602K reflects a slight increase in the scope of support.	0.000 -	0.566 -	0.602 -	0.000 -	0.602 -
Title: Management ***Articles:*** ***FY 2019 Plans:*** N/A ***FY 2020 Base Plans:*** N/A ***FY 2020 OCO Plans:*** N/A	3.722 -	0.000 -	0.000 -	0.000 -	0.000 -
Title: Test & Evaluation	0.000	0.663	0.706	0.000	0.706

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604320M / *(U)Rapid Technology Capability Prototype*	**Project (Number/Name)** 0386 / *Rapid Prototype Development, Marine Corps*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Articles:	-	-	-	-	-
FY 2019 Plans: FY19 Autonomous Vehicles: Initiate efforts to test and evaluate prototypes to assess their use in a variety of combat and supporting use employments. Vehicles tested will be capable of sensing their environment, while navigating and functioning independently without human conduction, taking evasive or defensive action, avoiding detection, tracking, targeting, attacking, provide an alternative reconnoiter capability in non-permissive settings for the purpose of mapping and patrolling for the purpose of intensifying combat power. The purpose of this effort is to reduce risk to the force. FY19 Operations Forces (OPFOR) Assessment Information Warfare: Initiate efforts to test and evaluate prototypes to assess various information systems that provide small unit ability to undermine local opposing force information quality, while ensuring friendly forces a timely, accurate, superior capability to automatically correlate relevant active and passive information from organic and non-organic sensors. FY19 Operations Forces (OPFOR) Assessment Urban Engagement Systems: Initiate efforts to test and evaluate prototypes to assess a state of the art urban range with appropriate buildings and streets that properly reflect an urban environment. Systems must locate and track opposing forces in tall buildings, narrow alleys, sewage tunnels and subway systems in order to minimize friendly force exposure, reduce potential collateral damage, and offer increased force protection.					
FY 2020 Base Plans: FY20 efforts include testing and evaluation of the Fight the Naval Force Forward, Human Performance Augmentation, and Organic Resource Generation efforts which are linked to USMC specific warfighting strategies, the National Defense Strategy, the Marine Operating Concept, and the Marine Corps Warfighting Lab Campaign Plan. These policy and strategy linkages insure these testing and evaluation efforts will be focused on the proper priorities. The Fight the Naval Force Forward effort will assess systems that provide critical capabilities for small task organized units operating as the forward edge of an inside force. Testing efforts include active and passive systems that operate with resilience in a Network-Contested Environment (NCE) and smaller, dispersed, and resilient systems which operate from diverse platforms.					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604320M / *(U)Rapid Technology Capability Prototype*	**Project (Number/Name)** 0386 / *Rapid Prototype Development, Marine Corps*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
The Human Performance Augmentation effort will assess various wearables that enhance physical and or cognitive capabilities of the individual Marine that will increase their combat effectiveness. Testing efforts include exoskeletons, man-machine, and artificial intelligence interfaces to enhance performance including close combat lethality in complex terrain. The Organic Resource Generation effort will assess personal and small unit systems in optionally mounted configurations that enable creation of various classes of supply to extend operational endurance and reduce logistical reliance. Organic Resource Generation testing efforts include decentralized energy generation, water recycling and desalination, energy storage, increase deployed energy efficiency, bio-fuels, and non-commercially dependent distributed logistics. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** The increase in testing efforts of $43K (from $663K to $706K) reflect a slight increase in testing requirements.					
Accomplishments/Planned Programs Subtotals	6.786	7.107	4.558	0.000	4.558

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

The MCRCO Process consists of three phases, Identify, Assess, and Inform, where each have unique function support of the mission. All MCRCO projects will align to this phased approach. In the Identify Phase the MCRCO undertakes a continuous process of investigation and compiling of technologies, concepts, and prototypes for various capability areas. Activities in this phase include but are not limited to research, war gaming/lectures/and external experiment attendance, industry and Federally Funded Research and Development Center (FFRDC) engagements, Innovation Portal Challenges and Forums, gap identification, and emerging technology analysis. This phase is where the MCRCO portfolio of projects are determined and approved for execution. In the second Phase, Assess, the operational assessments are performed. The Assess Phase has three utility focuses that prototypes must demonstrate prior to being assessed: Military Utility, Enabling Competition, and Lifecycle Affordability. The Inform Phase provides the results of the assessment event and includes transition to a program office if applicable.

E. Performance Metrics

All reviews will be documented in the Capability Assessment Report.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604320M / *(U)Rapid Technology Capability Prototype*	Project (Number/Name) 0386 / *Rapid Prototype Development, Marine Corps*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
TEMSOS Prototype Purchase, Development, and Integration_Fires	C/CPFF	ACC/Ft Belvior, VA : Durham, NC	0.000	1.040	Sep 2018	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Organic Precision Fires	C/FP	MCSC : Quantico, VA	0.000	0.355	Sep 2018	0.000		0.000		-		0.000	0.000	0.355	-
AR Software Development	Grant	WHS Pentagon : Arilington, VA	0.000	0.300	Aug 2018	0.000		0.000		-		0.000	0.000	0.300	-
OPF Software Development	C/CPIF	DTIC : Ft Belvoir, VA	0.000	0.043	Mar 2019	0.000		0.000		-		0.000	0.000	0.043	-
Autonomous Vehicles Development	WR	NSWC : Panama City, FL	0.000	0.000		0.250	Mar 2019	0.000		-		0.000	0.000	0.250	-
Information Warfare Development	WR	NSWC : Crane, IN	0.000	0.000		0.250	Mar 2019	0.000		-		0.000	0.000	0.250	-
Urban Engagement Systems Development	WR	NSWC : Corona, CA	0.000	0.000		0.130	Mar 2019	0.000		-		0.000	0.000	0.130	-
Autonomous Vehicle Contract Award	C/CPIF	MCSC : Quantico, VA	0.000	0.000		2.248	Mar 2019	0.000		-		0.000	0.000	2.248	-
Information Warfare Contract Award	C/CPIF	MCSC : Quantico, VA	0.000	0.000		2.000	Mar 2019	0.000		-		0.000	0.000	2.000	-
Urban Engagement Systems Contract Award	C/CPIF	MCSC : Quantico, VA	0.000	0.000		1.000	Mar 2019	0.000		-		0.000	0.000	1.000	-
Naval Force Forward	Various	Not Specified : Not Specified	0.000	0.000		0.000		1.000	May 2020	-		1.000	0.000	1.000	-
Human Performance Augmentation	Various	Not Specified : Not Specified	0.000	0.000		0.000		0.750	May 2020	-		0.750	0.000	0.750	-
Organic Resource Generation	Various	Not Specified : Not Specified	0.000	0.000		0.000		1.500	May 2020	-		1.500	0.000	1.500	-
		Subtotal	0.000	1.738		5.878		3.250		-		3.250	Continuing	Continuing	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604320M / *(U)Rapid Technology Capability Prototype*	Project (Number/Name) 0386 / *Rapid Prototype Development, Marine Corps*	

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Engineering Analysis and program office support	C/FFP	MCSC : Quantico, VA	0.000	0.000		0.566	Mar 2019	0.602	Mar 2020	-		0.602	0.000	1.168	-
		Subtotal	0.000	0.000		0.566		0.602		-		0.602	0.000	1.168	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
OPF Testing	MIPR	Dugway Proving Ground : Dugway, UT	0.000	0.600	Feb 2019	0.000		0.000		-		0.000	0.000	0.600	-
TEMSOS Testing	MIPR	Yuma Proving Grounds : Yuma, AZ	0.000	0.126	Mar 2019	0.000		0.000		-		0.000	0.000	0.126	-
Autonomous Vehicles OPFOR Assessment	MIPR	Yuma Proving Grounds : Yuma, AZ	0.000	0.000		0.250	Mar 2019	0.000		-		0.000	0.000	0.250	-
Information Warfare OPFOR Assessment	MIPR	Electronic Proving Ground (EPG) : Ft Huachuca, AZ	0.000	0.000		0.263	Mar 2019	0.000		-		0.000	0.000	0.263	-
Urban Engagement Systems OPFOR Assessment	MIPR	Muscatatuck : Bulerville, IN	0.000	0.000		0.150	Mar 2019	0.000		-		0.000	0.000	0.150	-
Naval Force Forward	MIPR	Yuma Proving Grounds : Yuma, AZ	0.000	0.000		0.000		0.290	Jan 2020	-		0.290	0.000	0.290	-
Human Performance Augmentation	MIPR	Human Performance Augmentation : Bulerville, IN	0.000	0.000		0.000		0.102	Jan 2020	-		0.102	0.000	0.102	-
Organic Resource Generation	C/BA	Electronic Proving Ground (EPG) : Ft Huachuca, AZ	0.000	0.000		0.000		0.314	Jan 2020	-		0.314	0.000	0.314	-
		Subtotal	0.000	0.726		0.663		0.706		-		0.706	0.000	2.095	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604320M / *(U)Rapid Technology Capability Prototype*	Project (Number/Name) 0386 / *Rapid Prototype Development, Marine Corps*	

Management Services ($ in Millions)

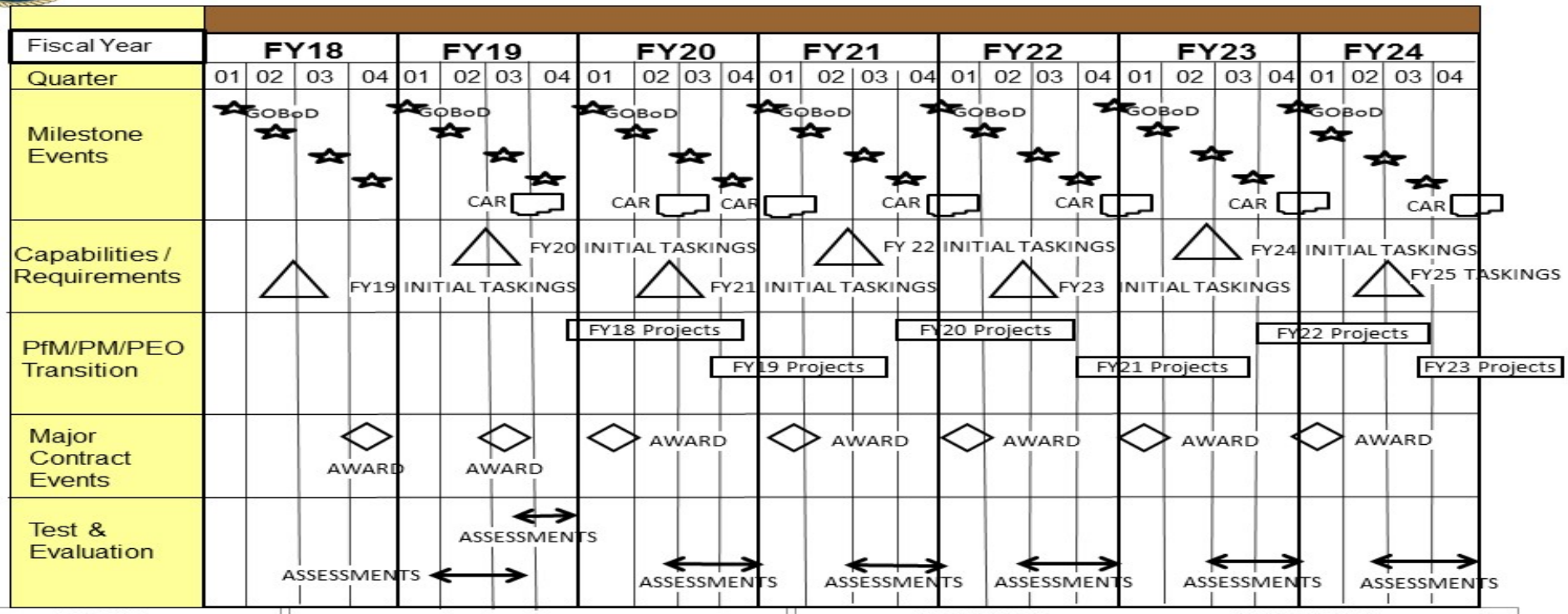
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
TEMSOS Government Engineering	WR	NSWC Crane : Crane, IN	0.000	1.143	May 2018	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Program Management Support	WR	NSWC Crane : Crane, IN	0.000	0.402	May 2018	0.000		0.000		-		0.000	0.000	0.402	-
TEMSOS Government Engineering	WR	SSC LANT : Charleston, SC	0.000	0.748	Jul 2018	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
OPF Contract Engineering	C/FP	DTIC : Fort Belvoir, VA	0.000	0.506	Jun 2018	0.000		0.000		-		0.000	0.000	0.506	-
TEMSOS Engineering Analysis Services	WR	MCSIL : Point Mugu, CA	0.000	0.745	Jul 2018	0.000		0.000		-		0.000	0.000	0.745	-
TEMSOS Contract Engineering	TBD	NSWC Crane : Crane, IN	0.000	0.178	Sep 2018	0.000		0.000		-		0.000	0.000	0.178	-
AAI EOD Engineering	WR	SSC PAC : San Diego, CA	0.000	0.600	Sep 2018	0.000		0.000		-		0.000	0.000	0.600	-
		Subtotal	0.000	4.322		0.000		0.000		-		0.000	Continuing	Continuing	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	6.786		7.107		4.558		-		4.558	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604320M / *(U)Rapid Technology Capability Prototype*	**Project (Number/Name)** 0386 / *Rapid Prototype Development, Marine Corps*

MCRCO Schedule Framework



ACRONYMS
CAR – Capability Assessment Report
GOBoD – General Officer Board of Directors
EMS – Electromagnetic Spectrum

KEY
GOBoD Decision
Documentation
Contract Action
Key Event
Assessments

FY 19 PROJECTS
Autonomous Systems
Tactical Information Warfare
Urban Engagement Systems

FY 20 PROJECTS
Fight the Naval Force Forward
Human Performance Augmentation
Organic Resource Generation

1

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604320M / *(U)Rapid Technology Capability Prototype*	**Project (Number/Name)** 0386 / *Rapid Prototype Development, Marine Corps*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 0386				
Contract Award	1	2020	1	2020
Operations Forces (OPFOR) Assessments	2	2020	4	2020
Capability Assessment Review (CAR)	2	2020	3	2020

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604320M / *(U)Rapid Technology Capability Prototype*	Project (Number/Name) 9999 / *Congressional Adds*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
9999: *Congressional Adds*	0.000	9.657	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	9.657
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Commandant of the Marine Corps (CMC) directed the formation of the Marine Corps Rapid Capabilities Office (MCRCO) to accelerate the identification, development and assessment of capabilities that appear to offer significant military utility. The MCRCO will seek emergent and disruptive technology to rapidly develop and deliver operational prototypes that increase operating forces' survivability and lethality, and that will inform requirement development and investment planning. Prototypes to be assessed will be at a Technology Readiness Level 7 (TRL-7) or higher and can be either non developmental government off the shelf, non-developmental commercial off the shelf, or developmental items.

FY18 efforts include, but are not limited to, product development and operational forces assessment for Tactical Electro-Magnetic Signature Operations and Support (TEMSOS), Organic Precision Fires (formerly Long Range Precision Fires), initial Autonomy & Artificial Intelligence (AAI) Explosive Ordnance Disposal (EOD) analysis, and Augmented Reality (AR) software development.

TEMSOS will provide enhanced uninterruptable intra-unit communications, alternate precision navigation, friendly force electromagnetic signature monitoring, enhanced situational awareness, and tactical advantage through electronic attack.

Organic Precision Fires will provide long-range guided anti-armor precision fires with both on-board and meshed data links for enhanced targeting accuracy for this small unmanned aircraft munition.

These capabilities have been identified as key immediate operational force survivability and lethality enablers to counter current enemy capabilities. 26 March General Officer Board of Directors (GOBoD) decision moved the planned FY18 SWARM effort into the FY19 Autonomous Vehicle focus area.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019
Congressional Add: Increase Rapid Acquisition Capability for MC Warfighting Lab	9.657	0.000
FY 2018 Accomplishments: Initiated product development and operational forces assessment of Tactical Electro-Magnetic Spectrum and Organic Precision Fires (formerly Long Range Precision Fires) capabilities. TEMSOS will provide enhanced uninterruptable intra-unit communications, alternate precision navigation, friendly force electromagnetic signature monitoring, enhanced situational awareness, and tactical advantage through electronic attack. Organic Precision Fires will provide long-range guided anti-armor precision fires with both on-board and meshed data links for enhanced targeting accuracy for this small unmanned aircraft munition. These capabilities have been identified as key immediate operational force survivability and lethality enablers to		

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604320M / *(U)Rapid Technology Capability Prototype*	**Project (Number/Name)** 9999 / *Congressional Adds*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019
counter current enemy capabilities. 26 March General Officer Board of Directors (GOBoD) decision moved the planned SWARM effort into the FY19 Autonomous Vehicle focus area. But FY18 includes Autonomy & Artificial Intelligence (AAI) Explosive Ordnance Disposal (EOD) early start efforts. ***FY 2019 Plans:*** N/A		
Congressional Adds Subtotals	9.657	0.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance plans link and measure as much as possible the proposed spending in programmatic terms and tie that spending directly with programmatic results. For the Rapid Capability Office, assessments provide good, reliable, accurate, and useful data in performance criteria in order to determine if the capability should transition to a program management office.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604320M / *(U)Rapid Technology Capability Prototype*	Project (Number/Name) 9999 / *Congressional Adds*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
TEMSOS	MIPR	DLA : Philadelphia, PA	0.000	1.771	Aug 2018	0.000		0.000		-		0.000	0.000	1.771	-
Organic Percision Fires	C/FFP	MCSC : Quantico, VA	0.000	4.500	Mar 2019	0.000		0.000		-		0.000	0.000	4.500	-
AAI EOD	C/FFP	MCSC : Quantico, VA	0.000	1.200	Mar 2019	0.000		0.000		-		0.000	0.000	1.200	-
OPF Software Development	C/FFP	DTIC : Fort Belvoir, VA	0.000	0.171	Mar 2019	0.000		0.000		-		0.000	0.000	0.171	-
Transition	TBD	MCSC : Quantico, VA	0.000	2.015	Mar 2019	0.000		0.000		-		0.000	0.000	2.015	-
		Subtotal	0.000	9.657		0.000		0.000		-		0.000	0.000	9.657	N/A

Remarks

Transition costs provide continuity of effort for TEMSOS, OPF, and AAI activities until they align to the appropriate program management office in FY20.

	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	9.657		0.000		0.000		-		0.000	0.000	9.657	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604320M / *(U)Rapid Technology Capability Prototype*	**Project (Number/Name)** 9999 / *Congressional Adds*

MCRCO Schedule Framework

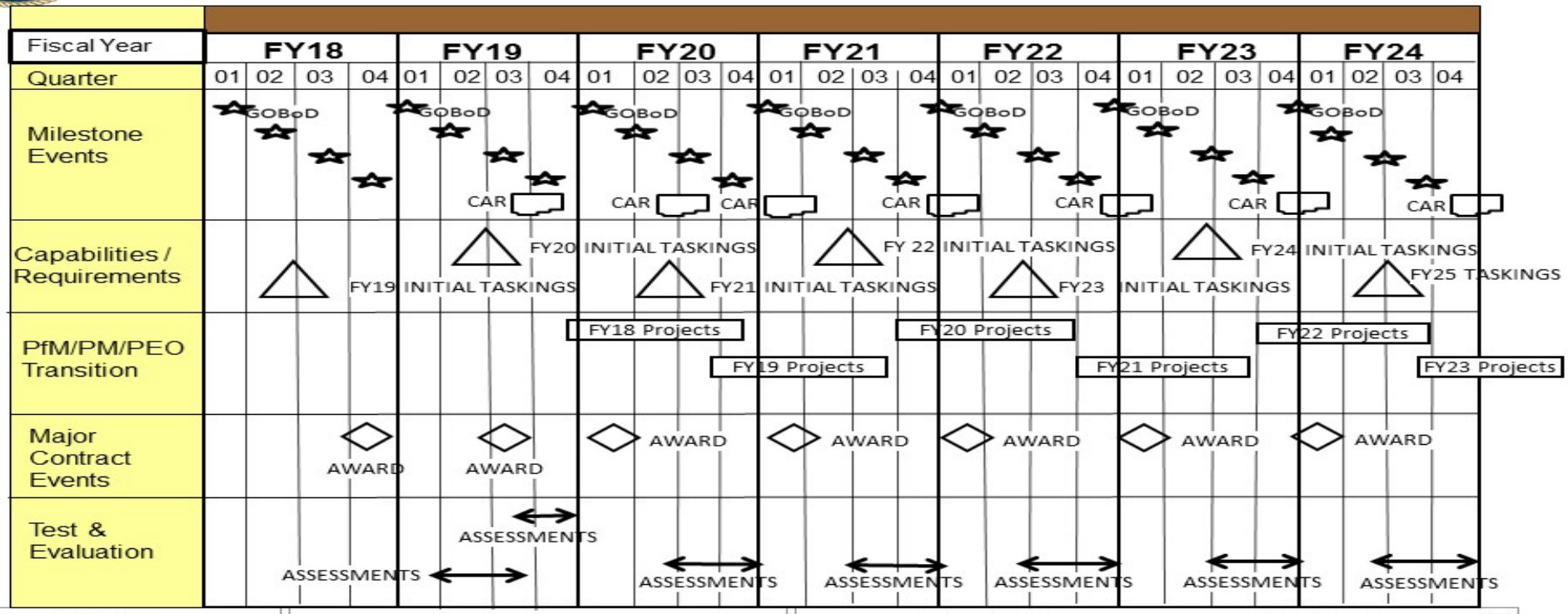


Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604320M / *(U)Rapid Technology Capability Prototype*	**Project (Number/Name)** 9999 / *Congressional Adds*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 9999				
Prototype Contract Award	4	2018	4	2018
Operational Assessments	1	2019	3	2019
Capability Assessment Review	3	2019	4	2019

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0604454N *I (U)LX(R)*

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	84.268	9.431	5.549	12.500	-	12.500	12.289	3.027	3.096	3.161	Continuing	Continuing
2474: *LPD Flight II Design & Total Integration*	84.268	9.431	5.549	12.500	-	12.500	12.289	3.027	3.096	3.161	Continuing	Continuing

A. Mission Description and Budget Item Justification

The FY 2018 Defense Appropriations Act authorized the procurement of LPD 30. Per signed Acquisition Decision Memorandum, LPD 17 Flight II will meet the Capabilities Development Document for LX(R) and shall subsume all previous LX(R) efforts. LPD 30 will be the first ship of LPD 17 Flight II.

LPD 17 Flight II is expected to functionally replace LSD-41 Class ships and LSD-49 Class ships for embark, transport, control, insert, sustainment, and extract of Marine Air-Ground Task Force elements and supporting forces by helicopters, landing craft, and amphibious vehicles. Efforts are required to continue pursuing affordability initiatives. Efforts also include Gate and Milestone (MS) reviews/documentation, Capability Development Document (CDD), Indicative/Preliminary/Contract Design (ID/PD/CD), accelerated detail design of LPD 30 and development of logistics and Test & Evaluation documentation. In addition, this program element includes the Live Fire Test & Evaluation (LFT&E) and Operational Evaluation (OPEVAL) tests required for the lead ship. Program is on track to support FY 2027 retirement of LSDs.

FY 2012-FY 2014 LX(R) efforts previously budgeted in PE 0603564N.

B. Program Change Summary ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	9.578	5.549	12.694	-	12.694
Current President's Budget	9.431	5.549	12.500	-	12.500
Total Adjustments	-0.147	0.000	-0.194	-	-0.194
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.147	0.000			
• Program Adjustments	0.000	0.000	-0.145	-	-0.145
• Rate/Misc Adjustments	0.000	0.000	-0.049	-	-0.049

Change Summary Explanation

The FY 2018 Defense Appropriations Act contained language authorizing the procurement of LPD 30. This has accelerated the production of the first LPD 17 Class Flight II (formerly LXR) ship from FY 2020 to FY 2018.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604454N / *(U)LX(R)*	Project (Number/Name) 2474 / *LPD Flight II Design & Total Integration*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
2474: *LPD Flight II Design & Total Integration*	84.268	9.431	5.549	12.500	-	12.500	12.289	3.027	3.096	3.161	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

2474 - LPD 17 Flight II is expected to functionally replace LSD-41 Class ships and LSD-49 Class ships for embark, transport, control, insert, sustainment, and extract of Marine Air-Ground Task Force elements and supporting forces by helicopters, landing craft, and amphibious vehicles. Efforts are required to continue pursuing affordability initiatives. Efforts also include Gate and Milestone (MS) reviews/documentation, Capability Development Document (CDD), Indicative/Preliminary/Contract Design (ID/PD/CD), accelerated detail design of LPD 30 and development of logistics and Test & Evaluation documentation. In addition, this program element includes the Live Fire Test & Evaluation (LFT&E) and Operational Evaluation (OPEVAL) tests required for the lead ship. Program is on track to support FY 2027 retirement of LSDs.

FY 2012-FY 2014 LX(R) efforts previously budgeted in PE 0603564N.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: LX(R) DESIGN/TOTAL SHIP INTEGRATION	9.431	5.549	12.500	0.000	12.500
Articles:	-	-	-	-	-
FY 2019 Plans: Conduct a peer review and a program review decision meeting with the Milestone Decision Authority in support of lead ship Detailed Design and Construction (DD&C) contract award. Continue affordability initiatives and development of Cost Reduction Initiatives (CRIs) for follow on ships. Continue to attend and contribute to T&E Working-level Integrated Product Team (WIPT) meetings with stakeholders. Continue to work with Naval Warfare Centers on Integrated Topside Integration activities to mitigate Electromagnetic Environmental Effects (E3) risks and Enterprise Air Search Radar (EASR) integration analysis.					
FY 2020 Base Plans: Begin Live Fire Test & Evaluation Efforts and update TEMP. Continue affordability initiatives and development of Cost Reduction Initiatives (CRIs) for follow on ships. Procure High Temperature Superconducting (HTS) degaussing cable to support prototyping development for installation on LPD 28 for a full ship demonstration to					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604454N / *(U)LX(R)*	**Project (Number/Name)** 2474 / *LPD Flight II Design & Total Integration*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
support LPD 17 Flight II design changes. Continue to work with Naval Warfare Centers on Integrated Topside Integration activities to mitigate (E3) risks and EASR integration analysis. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** $6.951 million increase due to additional test and systems integration efforts to include EASR.					
Accomplishments/Planned Programs Subtotals	9.431	5.549	12.500	0.000	12.500

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• SCN/3010: *LPD Flight II*	1,800.000	350.000	247.100	-	247.100	1,590.900	0.000	1,738.892	0.000	0.000	5,740.892

Remarks

D. Acquisition Strategy

Sole Source to Huntington Ingalls Industries.

E. Performance Metrics

Performance metrics are included in the CDD.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604454N / *(U)LX(R)*	**Project (Number/Name)** 2474 / *LPD Flight II Design & Total Integration*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Design/Systems Integration	C/CPIF	CSC, Alion, ICI : Washington, DC	25.923	1.644	Jun 2018	1.847	Nov 2018	3.800	Oct 2019	-		3.800	Continuing	Continuing	Continuing
Design/Systems Integration	WR	NSWC Carderock/ SSES Philadelphia : NSWC Beth, MD/ SSES Philadelphia, PA	18.522	2.078	Jan 2018	1.809	Oct 2018	6.560	Oct 2019	-		6.560	Continuing	Continuing	Continuing
Design/Systems Integration	WR	NSWC Dahlgren : Dahlgren, VA	1.877	0.560	Jun 2018	0.415	Oct 2018	0.985	Oct 2019	-		0.985	Continuing	Continuing	Continuing
Design/Systems Integration	WR	PEO C4I, PEO IWS : Washington, DC	4.694	1.170	Jan 2018	0.982	Oct 2018	0.555	Oct 2019	-		0.555	Continuing	Continuing	Continuing
Design/Systems Integration	WR	NAWC Lakehurst : Lakehurst, NJ	1.197	0.404	Apr 2018	0.193	Oct 2018	0.350	Oct 2019	-		0.350	Continuing	Continuing	Continuing
Design/Systems Integration	C/BA	NSWC, Panama City : Panama City, FL	0.850	0.275	Jan 2018	0.000		0.000		-		0.000	0.000	1.125	-
Design/Systems Integration	WR	NSWC, Port Hueneme : Port Hueneme, CA	0.848	0.300	Jun 2018	0.122	Oct 2018	0.000		-		0.000	Continuing	Continuing	Continuing
Design/Systems Integration	C/CPFF	HII, General Dynamics : Various	29.891	3.000	Aug 2018	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Design/Systems Integration	WR	NAVSEALOGCEN : Mechanicsburg, PA	0.466	0.000		0.181	Oct 2018	0.000		-		0.000	0.000	0.647	-
		Subtotal	84.268	9.431		5.549		12.250		-		12.250	Continuing	Continuing	N/A

Test and Evaluation ($ in Millions)

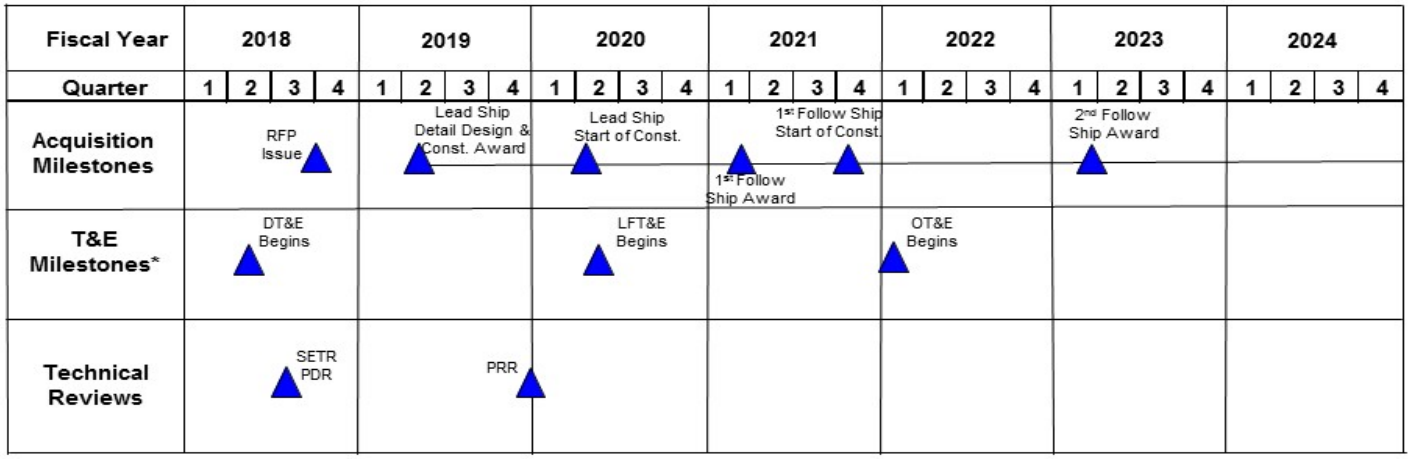
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Test and Evaluation	C/BA	COTF : Norfolk, VA	0.000	0.000		0.000		0.250	Oct 2019	-		0.250	0.000	0.250	-
		Subtotal	0.000	0.000		0.000		0.250		-		0.250	0.000	0.250	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604454N / *(U)LX(R)*	Project (Number/Name) 2474 / *LPD Flight II Design & Total Integration*	

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	84.268	9.431		5.549		12.500		-		12.500	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604454N / *(U)LX(R)*	**Project (Number/Name)** 2474 / *LPD Flight II Design & Total Integration*



*Note: LPD 28 and LPD 29 will be used to conduct test events as they incorporate some LPD Flight II changes prior to the lead Flight II Ship. LPD 28, LPD 29 and LPD 30 each incorporate LX(R) changes across three ships.

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604454N / *(U)LX(R)*	**Project (Number/Name)** 2474 / *LPD Flight II Design & Total Integration*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 2474				
Begin Developmental Test and Evaluation Phase	2	2018	2	2018
System Engineering Technical Review/Preliminary Design Review	3	2018	3	2018
RFP Release	4	2018	4	2018
Lead Ship Detail Design & Construction Award	2	2019	2	2019
Production Readiness Review	4	2019	4	2019
Lead Ship Start of Construction	2	2020	2	2020
Begin Live Fire Test and Evaluation Phase	2	2020	2	2020
First Follow Ship Contract Award	1	2021	1	2021
First Follow Ship Start of Construction	4	2021	4	2021
Operational Test & Evaluation Begins	1	2022	1	2022
Second Follow Ship Contract Award	1	2023	1	2023

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy											Date: March 2019	
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0604536N *I (U)Advanced Undersea Prototyping*							
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
Total Program Element	39.850	64.038	112.669	181.967	-	181.967	126.106	33.463	229.887	235.984	Continuing	Continuing
3393: *UxS Autonomy, C2,*	1.486	2.000	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	3.486
3394: *Adv Undersea Prototyping-Vehicles, Propulsion & Navigation*	36.644	59.124	87.669	181.967	-	181.967	126.106	33.463	229.887	235.984	Continuing	Continuing
3395: *UxS Payloads*	1.220	1.936	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	3.156
3396: *UxS Endurance*	0.500	0.978	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	1.478
9999: *Congressional Adds*	0.000	0.000	25.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	25.000

Note

FY 2019 and future funding for Projects 3393, 3395 and 3396 are in Program Element (PE) 0604029N.
These three projects realigned from PE 0604536N starting in FY 2019; this PE will only focus on the XLUUV class of vehicles.

A. Mission Description and Budget Item Justification

The Orca Extra Large Unmanned Undersea Vehicle (XLUUV) is the Navy's Extra Large UUV effort as part of the UUV Family of Systems (FoS). The Orca XLUUV effort has been established to address a Joint Emergent Operational Need (JEON). Orca XLUUV is a multi-phased accelerated acquisition effort to rapidly deliver capability to the Fleet. Phase 1 is a competitively sourced design effort. Phase 2 is a down select to one, possibly both, of the Phase 1 vendors in FY 2019 for fabrication and testing of the vehicle and support elements. Fabrication award of additional Orca XLUUV systems is planned for FY 2023 and FY 2024. XLUUV will have a modular payload bay, with defined interfaces that current and future payloads must adhere to for employment from the vehicle. The Orca XLUUV effort will integrate the currently required payload, and additional potential future payloads will be developed, evaluated, and preliminarily integrated in the Core Technologies Program Element 0604029N.

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0604536N *I (U)Advanced Undersea Prototyping*

B. Program Change Summary ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	66.543	87.669	95.267	-	95.267
Current President's Budget	64.038	112.669	181.967	-	181.967
Total Adjustments	-2.505	25.000	86.700	-	86.700
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	25.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-2.506	0.000			
• Program Adjustments	0.000	0.000	86.773	-	86.773
• Rate/Misc Adjustments	0.001	0.000	-0.073	-	-0.073

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2018	FY 2019
Project: 9999: *Congressional Adds*		
Congressional Add: *Updated Acquisition Strategy*	0.000	25.000
Congressional Add Subtotals for Project: 9999	0.000	25.000
Congressional Add Totals for all Projects	0.000	25.000

Change Summary Explanation

Program Changes:
FY18: -$2,506K SBIR/STTR Reduction, +$1K Miscellaneous Adjustments
FY19: +$25,000K Congressional Add (Updated Acquisition Strategy)
FY20: +$87,773K Balance UUV portfolio, -$1,000K under execution reduction, -$73K miscellaneous adjustments

Technical: Not applicable.
Schedule: Not applicable.

The FY 2020 funding request was reduced by $1.000 million to account for the availability of prior year execution balances.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy											Date: March 2019	
Appropriation/Budget Activity 1319 / 4					R-1 Program Element (Number/Name) PE 0604536N / *(U)Advanced Undersea Prototyping*				Project (Number/Name) 3393 / *UxS Autonomy, C2,*			
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
3393: *UxS Autonomy, C2,*	1.486	2.000	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	3.486
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Note

FY 2019 and future funding for Project 3393 is in Program Element (PE) 0604029N. Project realigned from PE 0604536N starting in FY 2019.

A. Mission Description and Budget Item Justification

Advanced Undersea energy efforts will leverage existing independent research and development in energy-dense technology that could meet power requirements for Unmanned Undersea Vehicle (UUV) missions, which are limited by the amount of power that they can carry. Efforts under this program element include research, development, test, and evaluation of advanced energy solutions initially applicable to XLUUVs for increased energy endurance and efficiency to extend the reach of unmanned undersea systems.

The Common Control/Autonomy portion of this project funds risk reduction and developmental efforts of autonomy systems and architectures to work to develop common standards, interfaces, and systems to support cross-domain applications. This includes advanced development prototyping and demonstrations to accelerate the design and development of commonality and interoperability capabilities for the cross-domain (Surface and Sub-Surface, Aviation and Ground) requirements of the Navy.

Coordinating with the Common Control System where applicable, these efforts will demonstrate scalable, adaptable and interoperable warfighting capabilities across various unmanned systems. The advanced development emphasis will be to encourage innovation and enable rapid integration of UxS capabilities across domains while working to develop common standards, interfaces, and systems. These efforts will define, develop and demonstrate capability that advance new technology, hardware and software of Control Systems that could be used to operate multiple and dissimilar Naval UxSs. Supports Advanced Development and Prototyping of PE 0305205N: UAS Integration and Interoperability.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Product Development	1.460	0.000	0.000	0.000	0.000
Articles:	-	-	-	-	-
FY 2019 Plans: FY 2019 funding in Program Element (PE) 0604029N.					
FY 2020 Base Plans: N/A					
FY 2020 OCO Plans:					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604536N / *(U)Advanced Undersea Prototyping*	**Project (Number/Name)** 3393 / *UxS Autonomy, C2,*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
N/A					
Title: Support ***Articles:*** ***FY 2019 Plans:*** FY 2019 funding in Program Element (PE) 0604029N. ***FY 2020 Base Plans:*** N/A ***FY 2020 OCO Plans:*** N/A	0.390 -	0.000 -	0.000 -	0.000 -	0.000 -
Title: Management Services ***Articles:*** ***FY 2019 Plans:*** FY 2019 funding in Program Element (PE) 0604029N. ***FY 2020 Base Plans:*** N/A ***FY 2020 OCO Plans:*** N/A	0.150 -	0.000 -	0.000 -	0.000 -	0.000 -
Accomplishments/Planned Programs Subtotals	2.000	0.000	0.000	0.000	0.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Design Advanced Energy components to reach Preliminary Design Review in FY18. Develop and build advanced energy prototype and integrate system when ready. Test advanced energy prototype starting in FY21. Develop requirements, standards, interfaces, and architecture for Autonomy and Common Control System (CCS) unmanned system software components to support common prototyping and experimentation.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604536N / *(U)Advanced Undersea Prototyping*	**Project (Number/Name)** 3393 / *UxS Autonomy, C2,*

Design and develop CCS unmanned system software components for common cross domain prototyping and system integration with surrogate systems starting in FY22. Coordination with UxS platforms will eliminate redundant efforts, encourage innovation, and improve coordination of unmanned systems across multiple domains. Schedules were updated to align with updated funding profiles.
Leveraging the available applicable portions of the Common Control System (CCS) capabilities and products, the effort will work to reduce risk with advanced development efforts across Naval operating domains. The advanced energy efforts will leverage resources and prototype expertise to encourage industry innovation and allow for rapid integration into unmanned systems. Coordinate with other UxS Programs and Systems on the development of UUV autonomy standards, architectures, and systems, defining and focusing autonomy efforts. Develop algorithms and models and simulations for testing autonomy that could be inserted into UUVs.

E. Performance Metrics

Demonstrate use of advanced UUV Energy technology in an Advanced Development Model prototype. Demonstrate CCS & autonomy software through surrogate systems.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604536N / *(U)Advanced Undersea Prototyping*	**Project (Number/Name)** 3393 / *UxS Autonomy, C2,*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Energy Prototype Contract	SS/CPFF	ARL PSU : State College, PA	0.600	0.677	Jan 2018	0.000		0.000		-		0.000	0.000	1.277	-
Common Control System (CCS) Cross-Domain Architecture Development	Various	Various : Various	0.200	0.370	Jan 2018	0.000		0.000		-		0.000	0.000	0.570	-
Autonomy	Various	Various : Various	0.500	0.413	Dec 2017	0.000		0.000		-		0.000	0.000	0.913	-
		Subtotal	1.300	1.460		0.000		0.000		-		0.000	0.000	2.760	N/A

Remarks

FY 2019 and future funding for Project 3393 is in Program Element (PE) 0604029N.

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Energy Prototype Engineering Support 1	SS/CPFF	ARL PSU : State College, PA	0.035	0.152	Jan 2018	0.000		0.000		-		0.000	0.000	0.187	-
Auontomy Support	Various	NAVSEA Activities : Washington, DC	0.020	0.135	Dec 2017	0.000		0.000		-		0.000	0.000	0.155	-
Common Control System (CCS) Engineering Support	Various	Various : Various	0.038	0.103	Dec 2017	0.000		0.000		-		0.000	0.000	0.141	-
		Subtotal	0.093	0.390		0.000		0.000		-		0.000	0.000	0.483	N/A

Remarks

FY 2019 and future funding for project 3393 is in Program Element (PE) 0604029N.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604536N / *(U)Advanced Undersea Prototyping*	**Project (Number/Name)** 3393 / *UxS Autonomy, C2,*

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Energy Prototype Management	Various	Various : Various	0.035	0.050	Dec 2017	0.000		0.000		-		0.000	0.000	0.085	-
Autonomy	Various	NAVSEA Activities : Washington, DC	0.020	0.050	Dec 2017	0.000		0.000		-		0.000	0.000	0.070	-
Common Control System (CCS)	Various	NAVAIR : Pax River, MD	0.038	0.050	Feb 2018	0.000		0.000		-		0.000	0.000	0.088	-
		Subtotal	0.093	0.150		0.000		0.000		-		0.000	0.000	0.243	N/A

Remarks

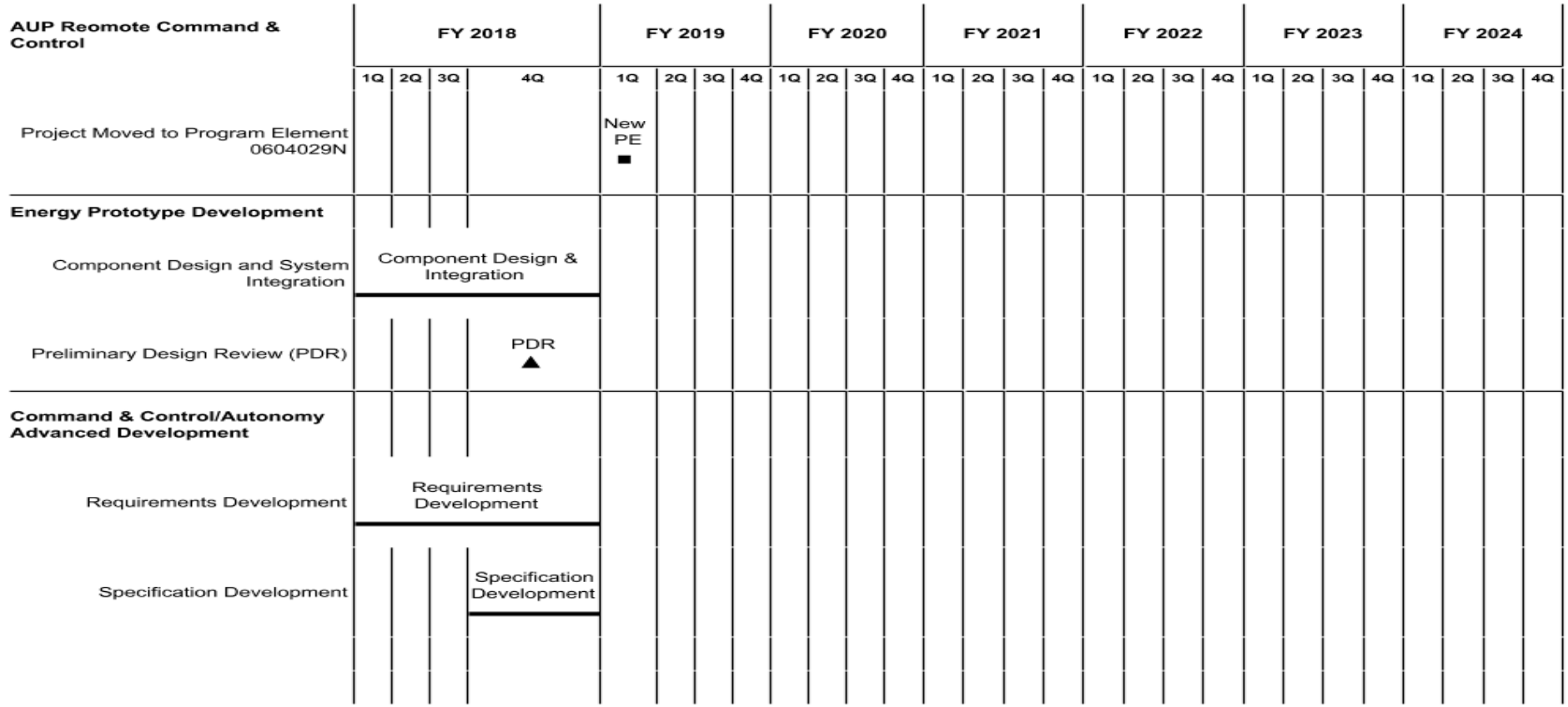
FY 2019 and future funding for Project 3393 is in Program Element (PE) 0604029N.

	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	1.486	2.000		0.000		0.000		-		0.000	0.000	3.486	N/A

Remarks

FY 2019 and future funding for Project 3393 is in Program Element (PE) 0604029N.

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604536N / *(U)Advanced Undersea Prototyping*	**Project (Number/Name)** 3393 / *UxS Autonomy, C2,*



2020DON - 0604536N - 3393

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604536N / *(U)Advanced Undersea Prototyping*	**Project (Number/Name)** 3393 / *UxS Autonomy, C2,*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
AUP Reomote Command & Control				
Project Moved to Program Element 0604029N:	1	2019	1	2019
Energy Prototype Development: Component Design and System Integration: Component Design and System Integration	1	2018	4	2018
Energy Prototype Development: Preliminary Design Review (PDR): Preliminary Design Reveiw (PDR)	4	2018	4	2018
Command & Control/Autonomy Advanced Development: Requirements Development: Requirements Development	1	2018	4	2018
Command & Control/Autonomy Advanced Development: Specification Development: Specification Development	4	2018	4	2018

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604536N / *(U)Advanced Undersea Prototyping*	Project (Number/Name) 3394 / *Adv Undersea Prototyping-Vehicles, Propulsion & Navigation*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
3394: *Adv Undersea Prototyping-Vehicles, Propulsion & Navigation*	36.644	59.124	87.669	181.967	-	181.967	126.106	33.463	229.887	235.984	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Note

The FY 2020 funding request was reduced by $1.000 million to account for the availability of prior year execution balances.

A. Mission Description and Budget Item Justification

The Orca Extra Large Unmanned Undersea Vehicle (XLUUV) is the Navy's Extra Large UUV effort as part of the UUV Family of Systems (FoS). The Orca XLUUV effort has been established to address a Joint Emergent Operational Need (JEON). Orca XLUUV will have a modular payload bay, with defined interfaces that current and future payloads must adhere to for employment from the vehicle. The Orca XLUUV effort will integrate the currently required payload, and additional potential future payloads will be developed, evaluated, and preliminarily integrated under the Core Technologies Program Element 0604029N.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: XLUUV Product Development	49.850	77.577	168.435	0.000	168.435
Articles:	-	-	-	-	-
Description: Orca XLUUV is being developed via a full and open competition to two industry teams to design systems (with possible down select to one vendor or a dual selection of both vendors for fabrication).					
FY 2019 Plans: Completed Phase 1 design efforts and conducted CDRs early in FY19 for both industry teams. Received Proposals from both vendors for Phase 2 fabrication. Conducting down select to one industry partner (or make a dual selection) and award contract for fabrication of up to five (5) Orca XLUUVs. Begin vehicle fabrication, including procurement of remaining materials (long lead materials previously procured in FY18), initial assembly, bench and subsystem testing, and integration of the first vehicles (possibly from both vendors).					
FY 2020 Base Plans: Continue Phase 2 fabrication of initial vehicles (possibly from both vendors). Vehicle integration of subsystems, includes propulsion, sensors, payload, communications, and control systems. First vehicle(s) to begin in water testing by the end of FY 2020. Continue fabrication for follow-on vehicles and material purchasing.					
FY 2020 OCO Plans:					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604536N / *(U)Advanced Undersea Prototyping*	**Project (Number/Name)** 3394 / *Adv Undersea Prototyping-Vehicles, Propulsion & Navigation*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increase due to a full year of fabrication of 5 vehicles and beginning in water testing, possibly from two vendors.					
Title: XLUUV Support	5.344	6.110	9.422	0.000	9.422
Articles:	-	-	-	-	-
FY 2019 Plans: Engineering support in completion of detailed design. Review and approve CRDLs, design products, and complete critical design review. Engineering and acquisition support of the source selection for the Phase 2 fabrication contract(s). Supported development of government test planning, life cycle planning, and payload integration certification. Oversee and provide expert support of fabrication efforts, and bench and subsystem testing. ***FY 2020 Base Plans:*** Support engineering and technical oversight of fabrication efforts and engineering services including engineering change proposals. Review and approve CDRLs, design products, and manufacturing processes. Provide expert oversight and support of subsystem and system testing. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increase due to full year of support for Orca XLUUV design fabrication of up to five (5) vehicles and the beginning of in water testing.					
Title: XLUUV Management Services	3.930	3.982	4.110	0.000	4.110
Articles:	-	-	-	-	-
FY 2019 Plans: Provide technical guidance, project planning, program management and travel for Orca prototyping. Provide financial and contracting support, and coordinated work with Fleet, test support, engineering support, and contractors. ***FY 2020 Base Plans:***					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604536N / *(U)Advanced Undersea Prototyping*	**Project (Number/Name)** 3394 / *Adv Undersea Prototyping-Vehicles, Propulsion & Navigation*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Provide technical guidance, project planning, program management and travel for Orca prototyping. Provide financial and contracting support, and coordinated work with Fleet, test support, engineering support, and contractors. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increase due to full year of management of XLUUV vehicle fabrication and in water testing.					
Accomplishments/Planned Programs Subtotals	59.124	87.669	181.967	0.000	181.967

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Orca XLUUV is a multi-phased accelerated acquisition effort to rapidly deliver capability to the Fleet. Phase 1 is a competitively sourced design effort. Two design contracts were awarded to Industry in FY 2017. Phase 2 commences with a down select in FY 2019 to one, possibly both, of the Phase 1 vendors for fabrication and testing of the vehicle and support elements. Up to five (5) Orca XLUUV systems (vehicles, mobile C2 equipment, and support equipment) are to be fabricated for demonstration and use by the Fleet. Phases 3 and 4 provide the option to fabricate up to four (4) additional systems via competitive sourcing from the vendor(s) who fabricated vehicles in Phase 2. Fabrication award of these additional Orca XLUUV systems is planned for FY 2023 and FY 2024. Transition to a program of record may occur in FY 2023 or FY 2024 should the Navy issue follow on requirements for the XLUUV with new payload capabilities.
XLUUV will have a modular payload bay, with defined interfaces that current and future payloads must adhere to for employment from the vehicle. Potential future payloads, advanced energy solutions, and enhanced autonomy and command and control will be developed and evaluated under the Core Technologies PE 0604029N and integrated into Orca XLUUV when ready.

E. Performance Metrics

CDR completion in 1Q FY 2019. Phase 2 award in 2Q FY 2019. First vehicle delivery by end FY 2020.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604536N / *(U)Advanced Undersea Prototyping*	Project (Number/Name) 3394 / *Adv Undersea Prototyping-Vehicles, Propulsion & Navigation*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Payload Design documentation	C/CPIF	Various : Various	0.085	3.650	Nov 2017	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Design & Long Lead Material, including sub-systems	C/CPIF	Boeing : Huntington Beach, CA	16.554	23.100	Dec 2017	9.904	Dec 2018	0.000		-		0.000	Continuing	Continuing	Continuing
Design & Long Lead Material, including sub-systems	C/CPIF	Lockheed Martin : Riviera Baech, FL	16.554	23.100	Dec 2017	3.695	Dec 2018	0.000		-		0.000	Continuing	Continuing	Continuing
Fabrication of up to 5 XLUUVs, including sub-systems	C/FPIF	TBD : TBD	0.000	0.000		63.978	Jan 2019	168.435	Dec 2019	-		168.435	Continuing	Continuing	Continuing
		Subtotal	33.193	49.850		77.577		168.435		-		168.435	Continuing	Continuing	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
RFP/PSPED Dev	SS/CPFF	APL/JHU : Laurel, MD	0.300	0.000		0.000		0.000		-		0.000	0.000	0.300	-
Source Selection	WR	NSWC CD : Carderock, MD	1.090	0.000		0.428	Nov 2018	0.000		-		0.000	Continuing	Continuing	Continuing
Source Selection	WR	SSC PAC : San Diego, CA	0.205	0.000		0.312	Nov 2018	0.000		-		0.000	Continuing	Continuing	Continuing
Engineering Support	WR	NSWC CD : Bethesda, MD	0.000	0.000		1.200	Nov 2018	2.105	Nov 2019	-		2.105	0.000	3.305	-
Engineering Support	WR	NSWC IH : Indian Head, MD	0.000	0.000		0.900	Nov 2018	1.303	Nov 2019	-		1.303	0.000	2.203	-
Engineering and Logistic Support	WR	NUWC KPT : Keyport, WA	0.000	0.000		1.500	Nov 2018	2.860	Nov 2019	-		2.860	0.000	4.360	-
Technical Warrant Holder Support	Various	NAVSEA Activities : Washington, DC	0.000	0.000		0.500	Nov 2018	0.632	Nov 2019	-		0.632	0.000	1.132	-
Oversight of Efforts	Various	VAR : Various	1.028	5.344	Mar 2018	1.270	Nov 2018	2.522	Nov 2019	-		2.522	Continuing	Continuing	Continuing

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604536N / *(U)Advanced Undersea Prototyping*	**Project (Number/Name)** 3394 / *Adv Undersea Prototyping-Vehicles, Propulsion & Navigation*

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
		Subtotal	2.623	5.344		6.110		9.422		-		9.422	Continuing	Continuing	N/A

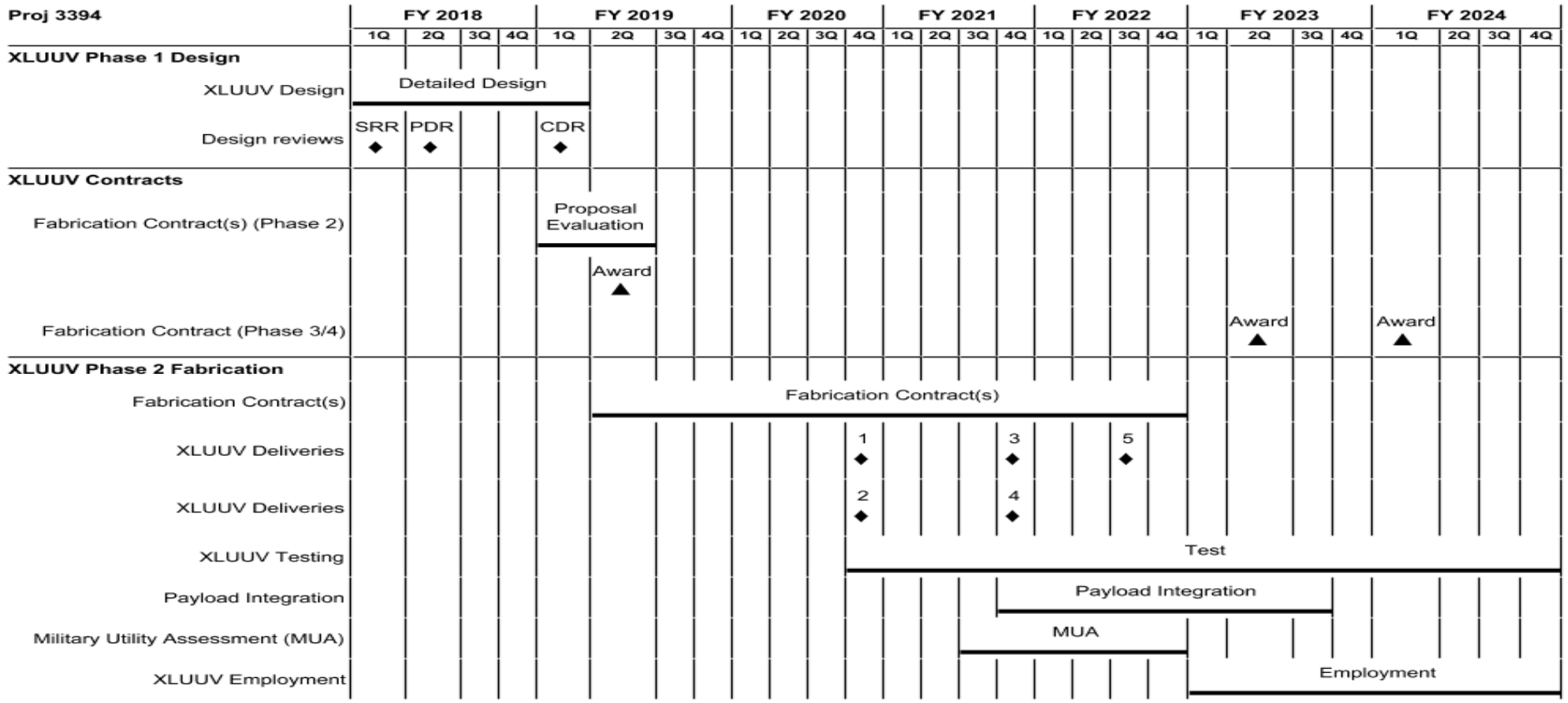
Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Mgmt & Techncal Efforts	WR	NAVSEA Activities : WASHINGTON, D.C.	0.828	3.930	Oct 2017	3.982	Nov 2018	4.110	Nov 2019	-		4.110	Continuing	Continuing	Continuing
		Subtotal	0.828	3.930		3.982		4.110		-		4.110	Continuing	Continuing	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	36.644	59.124		87.669		181.967		-		181.967	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604536N / *(U)Advanced Undersea Prototyping*	**Project (Number/Name)** 3394 / *Adv Undersea Prototyping-Vehicles, Propulsion & Navigation*



2020PB - 0604536N - 3394

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604536N / *(U)Advanced Undersea Prototyping*	**Project (Number/Name)** 3394 / *Adv Undersea Prototyping-Vehicles, Propulsion & Navigation*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 3394				
XLUUV Phase 1 Design: XLUUV Design: Design	1	2018	1	2019
XLUUV Phase 1 Design: Design reviews: SRR	1	2018	1	2018
XLUUV Phase 1 Design: Design reviews: PDR	2	2018	2	2018
XLUUV Phase 1 Design: Design reviews: CDR	1	2019	1	2019
XLUUV Contracts: Fabrication Contract(s) (Phase 2): Proposal Evaluation	1	2019	2	2019
XLUUV Contracts: Fabrication Contract(s) (Phase 2): Contract Award	2	2019	2	2019
XLUUV Contracts: Fabrication Contract (Phase 3/4): Award(Phase 3/4)	2	2023	2	2023
XLUUV Contracts: Fabrication Contract (Phase 3/4): Award	1	2024	1	2024
XLUUV Phase 2 Fabrication: Fabrication Contract(s): Fabrication Contract(s)	2	2019	4	2022
XLUUV Phase 2 Fabrication: XLUUV Deliveries: Delivery System 1	4	2020	4	2020
XLUUV Phase 2 Fabrication: XLUUV Deliveries: Delivery System 3	4	2021	4	2021
XLUUV Phase 2 Fabrication: XLUUV Deliveries: Delivery System 5	3	2022	3	2022
XLUUV Phase 2 Fabrication: XLUUV Deliveries: Delivery System 2	4	2020	4	2020
XLUUV Phase 2 Fabrication: XLUUV Deliveries: Delivery System 4	4	2021	4	2021
XLUUV Phase 2 Fabrication: XLUUV Testing: Test	4	2020	4	2024
XLUUV Phase 2 Fabrication: Payload Integration: Integration	4	2021	3	2023
XLUUV Phase 2 Fabrication: Military Utility Assessment (MUA): Schedule Detail	3	2021	4	2022
XLUUV Phase 2 Fabrication: XLUUV Employment: Schedule Detail	1	2023	4	2024

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy											Date: March 2019	
Appropriation/Budget Activity 1319 / 4					R-1 Program Element (Number/Name) PE 0604536N / *(U)Advanced Undersea Prototyping*				Project (Number/Name) 3395 / *UxS Payloads*			
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
3395: *UxS Payloads*	1.220	1.936	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	3.156
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Note

FY 2019 and future funding for Project 3395 is in Program Element (PE) 0604029N. Project realigned from PE 0604536N starting in FY 2019.

A. Mission Description and Budget Item Justification

Funding supports advanced undersea prototyping of undersea explosive payloads from XLUUVs. This program leverages the developments at ONR and other activities for undersea weapons, work to complete analysis of feasibility, policy, lethality, and performance of integrating undersea weapons systems on XLUUVs. The program will design new hardware, investigate and develop new interfaces/systems to increase lethality in both the undersea and surface targets. New C2 algorithms will be developed for advanced targeting.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Explosive Payloads	1.936	0.000	0.000	0.000	0.000
Articles:	-	-	-	-	-
FY 2019 Plans: FY 2019 funding in Program Element (PE) 0604029N.					
FY 2020 Base Plans: N/A					
FY 2020 OCO Plans: N/A					
Accomplishments/Planned Programs Subtotals	1.936	0.000	0.000	0.000	0.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Leverage the knowledge base at the Naval Research and Development Enterprise to complete the feasibility studies that will then lead to the development of critical technology. The effort will heavily use the experience resident in the undersea weapons industrial base.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604536N / *(U)Advanced Undersea Prototyping*	**Project (Number/Name)** 3395 / *UxS Payloads*

E. Performance Metrics

Successful launch of undersea weapons from an Orca XLUUV.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604536N / *(U)Advanced Undersea Prototyping*	**Project (Number/Name)** 3395 / *UxS Payloads*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
XL Payload Interface Design & Fabrication	C/CPIF	Various : Various	0.741	0.967	Mar 2018	0.000		0.000		-		0.000	0.000	1.708	-
COMMAND AND CONTROL	WR	Various : Various	0.100	0.302	Jan 2018	0.000		0.000		-		0.000	0.000	0.402	-
Tech Support	C/CPFF	Various : Various	0.189	0.204	Jan 2018	0.000		0.000		-		0.000	0.000	0.393	-
Management	WR	Various : Various	0.190	0.133	Nov 2017	0.000		0.000		-		0.000	0.000	0.323	-
Safety	WR	NSWC Indian Head : Indian Head, MD	0.000	0.330	Jan 2018	0.000		0.000		-		0.000	0.000	0.330	-
		Subtotal	1.220	1.936		0.000		0.000		-		0.000	0.000	3.156	N/A

Remarks

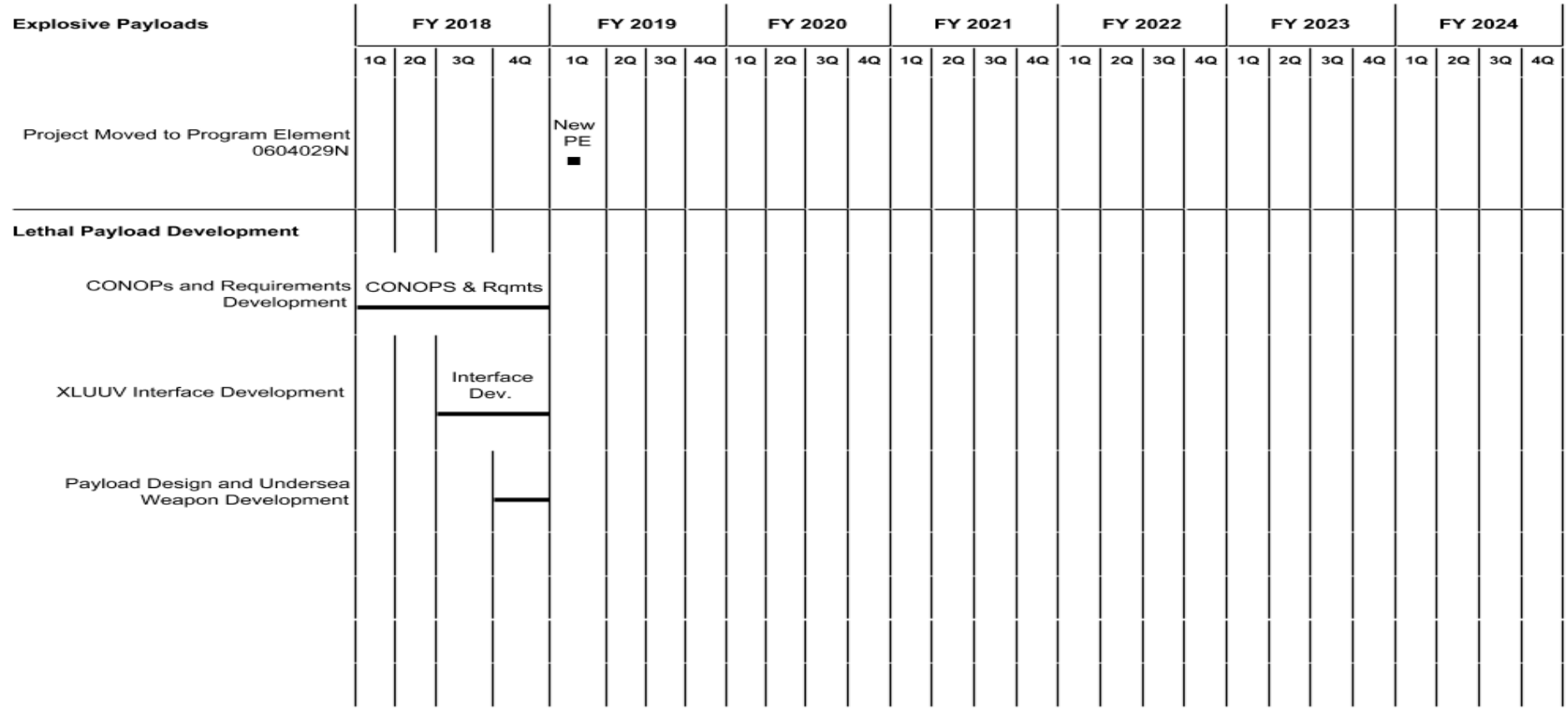
FY 2019 and future funding for Project 3395 is in Program Element (PE) 0604029N.

	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	1.220	1.936		0.000		0.000		-		0.000	0.000	3.156	N/A

Remarks

FY 2019 and future funding for Project 3395 is in Program Element (PE) 0604029N.

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604536N / *(U)Advanced Undersea Prototyping*	**Project (Number/Name)** 3395 / *UxS Payloads*



2020DON - 0604536N - 3395

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604536N / *(U)Advanced Undersea Prototyping*	**Project (Number/Name)** 3395 / *UxS Payloads*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Explosive Payloads				
Project Moved to Program Element 0604029N:	1	2019	1	2019
Lethal Payload Development: CONOPs and Requirements Development: CONOPs and Requirements	1	2018	4	2018
Lethal Payload Development: XLUUV Interface Development: Schedule Detail	3	2018	4	2018
Lethal Payload Development: Payload Design and Undersea Weapon Development: Phase A concept design- XL UUV Interface development	4	2018	4	2018

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy											Date: March 2019	
Appropriation/Budget Activity 1319 / 4					R-1 Program Element (Number/Name) PE 0604536N / *(U)Advanced Undersea Prototyping*				Project (Number/Name) 3396 / *UxS Endurance*			
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
3396: *UxS Endurance*	0.500	0.978	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	1.478
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Note

FY 2019 and future funding for Project 3396 is in Program Element (PE) 0604029N. Project realigned from PE 0604536N starting in FY 2019.

A. Mission Description and Budget Item Justification

Advanced undersea prototyping will experiment and demonstrate non-lethal payloads on Orca XLUUVs for use on Orca XLUUV and other FoS UUVs. This effort will investigate the possibilities of employing non-lethal payloads from the XLUUV to support ISR and strike missions. Non-kinetic payloads provide the warfare commander an option to stop aggressive behavior without escalating the conflict. Non-lethal payloads that will be considered include jamming, EO/IR dazzling, microwave, aerial assets, and other methods.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Non Lethal Payloads	0.978	0.000	0.000	0.000	0.000
Articles:	-	-	-	-	-
FY 2019 Plans: FY 2019 funding in Program Element (PE) 0604029N.					
FY 2020 Base Plans: N/A					
FY 2020 OCO Plans: N/A					
Accomplishments/Planned Programs Subtotals	0.978	0.000	0.000	0.000	0.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

A technology study and market research will be completed in the first 12 months to examine the options available and the impact to the warfighter the different technology options bring. This will use a group of experts throughout the advanced undersea industry. Initial design efforts of a prototype system for the development

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604536N / *(U)Advanced Undersea Prototyping*	**Project (Number/Name)** 3396 / *UxS Endurance*

of a non-kinetic payload will start in late FY18 for preliminary efforts with main efforts occurring after the study is completed. The payload will be integrated and demonstrated on the Orca XLUUV.

E. Performance Metrics

Non-kinetic payload integrated onto an XLUUV. Detailed metrics are classified.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604536N / *(U)Advanced Undersea Prototyping*	**Project (Number/Name)** 3396 / *UxS Endurance*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Technology study	Various	Various : Various	0.470	0.000		0.000		0.000		-		0.000	0.000	0.470	-
Design, Material, & Fabrication Efforts	WR	Various : Various	0.000	0.828	Nov 2017	0.000		0.000		-		0.000	0.000	0.828	-
		Subtotal	0.470	0.828		0.000		0.000		-		0.000	0.000	1.298	N/A

Remarks

FY 2019 and future funding for Project 3396 is in Program Element (PE) 0604029N.

Support ($ in Millions)

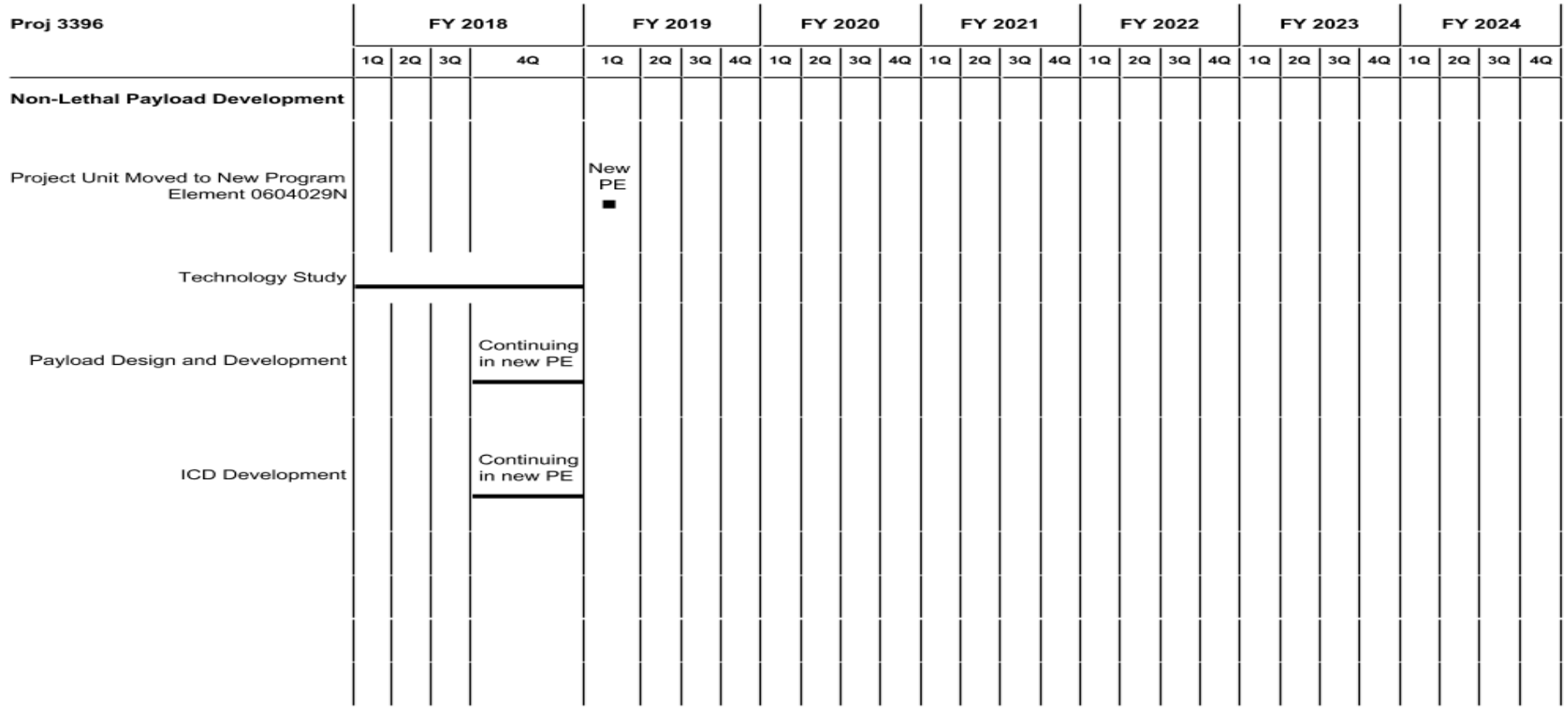
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
DESIGN ANALYSIS	WR	NRL : WASHINGTON, D.C.	0.000	0.000		0.000		0.000		-		0.000	0.000	0.000	-
Program Support	C/FFP	Various : Arlington, VA	0.030	0.150	Dec 2017	0.000		0.000		-		0.000	0.000	0.180	-
		Subtotal	0.030	0.150		0.000		0.000		-		0.000	0.000	0.180	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.500	0.978		0.000		0.000		-		0.000	0.000	1.478	N/A

Remarks

FY 2019 and future funding for Project 3396 is in Program Element (PE) 0604029N.

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604536N / *(U)Advanced Undersea Prototyping*	**Project (Number/Name)** 3396 / *UxS Endurance*



2020DON - 0604536N - 3396

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604536N / *(U)Advanced Undersea Prototyping*	**Project (Number/Name)** 3396 / *UxS Endurance*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 3396				
Non-Lethal Payload Development: Project Unit Moved to New Program Element 0604029N:	1	2019	1	2019
Non-Lethal Payload Development: Technology Study:	1	2018	4	2018
Non-Lethal Payload Development: Payload Design and Development:	4	2018	4	2018
Non-Lethal Payload Development: ICD Development:	4	2018	4	2018

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604536N / *(U)Advanced Undersea Prototyping*	Project (Number/Name) 9999 / *Congressional Adds*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
9999: *Congressional Adds*	0.000	0.000	25.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	25.000
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Orca Extra Large Unmanned Undersea Vehicle (XLUUV) is the Navy's Extra Large UUV effort as part of the UUV Family of Systems (FoS). The Orca XLUUV effort has been established to address a Joint Emergent Operational Need (JEON). Orca XLUUV will have a modular payload bay, with defined interfaces that current and future payloads must adhere to for employment from the vehicle. The Orca XLUUV effort will integrate the currently required payload, and additional potential future payloads will be developed, evaluated, and preliminarily integrated under the Core Technologies Program Element 0604029N.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019
Congressional Add: Updated Acquisition Strategy	0.000	25.000
FY 2018 Accomplishments: N/A		
FY 2019 Plans: Conducting down select to one industry partner (or make a dual selection) and award contract for fabrication of up to five (5) Orca XLUUVs. Begin vehicle fabrication, including purchase of remaining vehicle materials (long lead materials previously authorized in FY18), initial assembly, bench and subsystem testing, and integration of the first vehicles (possibly from both vendors).		
Congressional Adds Subtotals	0.000	25.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Orca XLUUV is a multi-phased accelerated acquisition effort to rapidly deliver capability to the Fleet. Phase 1 is a competitively sourced design effort. Two design contracts were awarded to Industry in FY 2017. Phase 2 commences with a down select in FY 2019 to one, possibly both, of the Phase 1 vendors for fabrication and testing of the vehicle and support elements. Up to five (5) Orca XLUUV systems (vehicles, mobile C2 equipment, and support equipment) are to be fabricated for demonstration and use by the Fleet.

E. Performance Metrics

Phase 2 award in 2Q FY 2019.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604536N / *(U)Advanced Undersea Prototyping*	**Project (Number/Name)** 9999 / *Congressional Adds*

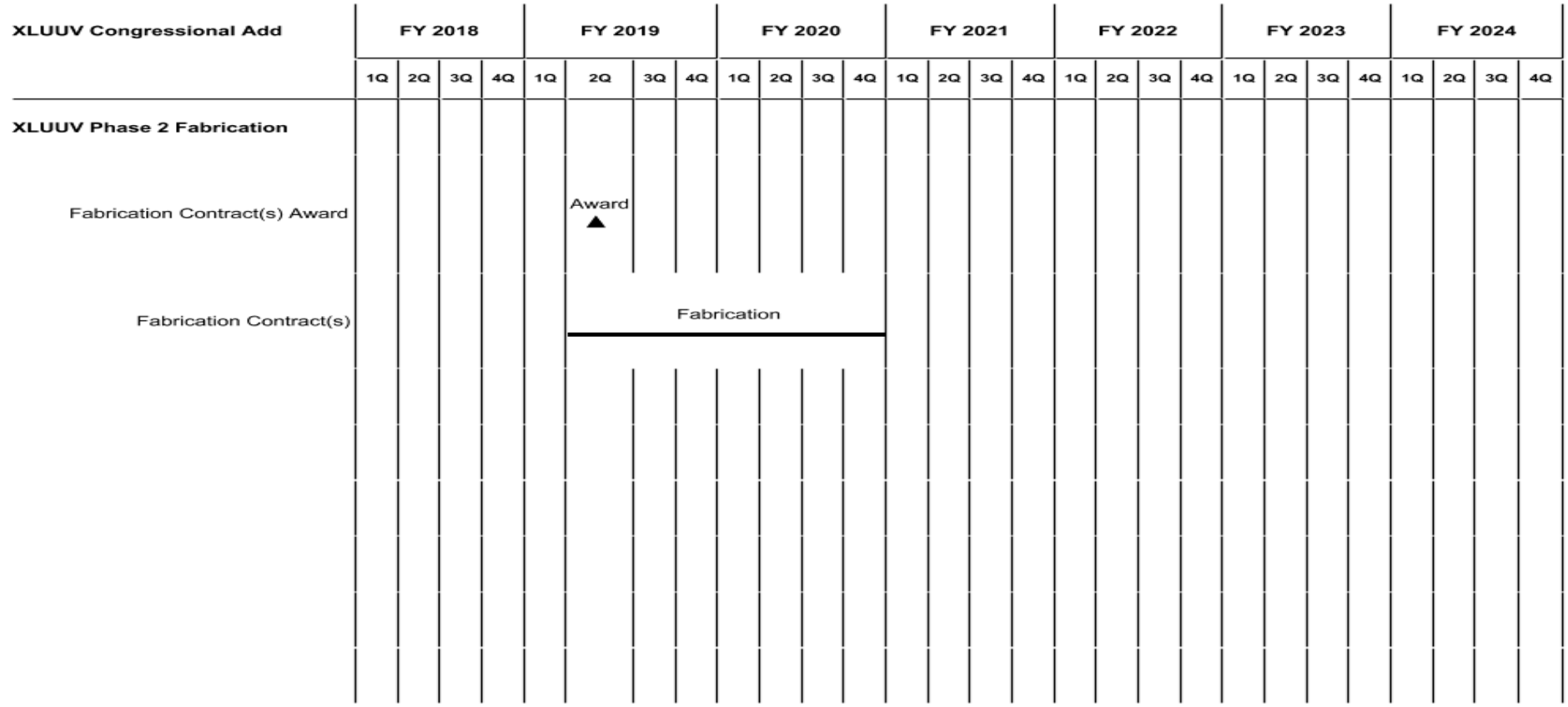
Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Fabrication Contract(s)	C/FPIF	TBD : TBD	0.000	0.000		25.000	Mar 2019	0.000		-		0.000	0.000	25.000	-
		Subtotal	0.000	0.000		25.000		0.000		-		0.000	0.000	25.000	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	0.000		25.000		0.000		-		0.000	0.000	25.000	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604536N / *(U)Advanced Undersea Prototyping*	**Project (Number/Name)** 9999 / *Congressional Adds*



2020PB - 0604536N - 9999

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604536N / *(U)Advanced Undersea Prototyping*	**Project (Number/Name)** 9999 / *Congressional Adds*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
XLUUV Congressional Add				
XLUUV Phase 2 Fabrication: Fabrication Contract(s) Award: Schedule Detail	2	2019	2	2019
XLUUV Phase 2 Fabrication: Fabrication Contract(s):	2	2019	4	2020

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0604636N *I Counter Umanned Aircraft Systems (C-UAS)*

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	0.000	0.000	0.000	5.500	-	5.500	5.610	5.722	5.836	5.953	Continuing	Continuing
3241: *Counter Unmanned Aircraft Systems (C-UAS)*	0.000	0.000	0.000	5.500	-	5.500	5.610	5.722	5.836	5.953	Continuing	Continuing

Note

This is a new Program Element (PE) in FY 2020.

A. Mission Description and Budget Item Justification

The Counter Unmanned Aircraft System (C-UAS) program was initiated in response to a Joint Emergent Operational Need (JEON) Statement issued by U.S. Strategic Command. The program originated as a Rapid Deployment Capability (RDC). The RDC strategy introduced the employment of integrated C-UAS solution sets designed to protect high value or critical Naval assets, and support public safety against threats posed by the inadvertent or unlawful misuse of unmanned aircraft systems (UAS). More details available at a higher classification level.

FY20 funding is requested to manage, evaluate, verify and implement system assessments, strategies, improvements, program management, and systems engineering support.

A deployed C-UAS capability improves defenses against the rapidly evolving capabilities of remote and autonomously-controlled devices. With UAS becoming more readily available, affordable and capable, the threat of inadvertent or unlawful flight over restricted spaces multiplies exponentially, raising concern that these UAS may be used as tools for surveillance, espionage or hostile actions at critical Navy Installations.

B. Program Change Summary ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	0.000	0.000	0.000	-	0.000
Current President's Budget	0.000	0.000	5.500	-	5.500
Total Adjustments	0.000	0.000	5.500	-	5.500
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Rate/Misc Adjustments	0.000	0.000	5.500	-	5.500

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0604636N *I Counter Umanned Aircraft Systems (C-UAS)*

Change Summary Explanation

Technical: Not applicable.

Schedule: Not applicable.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604636N / *Counter Umanned Aircraft Systems (C-UAS)*	Project (Number/Name) 3241 / *Counter Unmanned Aircraft Systems (C-UAS)*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
3241: *Counter Unmanned Aircraft Systems (C-UAS)*	0.000	0.000	0.000	5.500	-	5.500	5.610	5.722	5.836	5.953	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Note

This is a new Project in FY 2020.

A. Mission Description and Budget Item Justification

The Counter Unmanned Aircraft System (C-UAS) program was initiated in response to a Joint Emergent Operational Need (JEON) Statement issued by U.S. Strategic Command. The program originated as a Rapid Deployment Capability (RDC). The RDC strategy introduced the employment of integrated C-UAS solution sets designed to protect high value or critical Naval assets, and support public safety against threats posed by the inadvertent or unlawful misuse of unmanned aircraft systems (UAS). More details available at a higher classification level.

FY20 funding is requested to manage, evaluate, verify and implement system assessments, strategies, improvements, program management, and systems engineering support.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: C-UAS System Development and Integration	0.000	0.000	5.500	0.000	5.500
Articles:	-	-	-	-	-
FY 2019 Plans: N/A					
FY 2020 Base Plans: Initiate to manage, evaluate, verify and implement system assessments, strategies, improvements, program management, and systems engineering support. Initiate initial design and system interface design. Begin capabilities development efforts through threat assessment analysis.					
FY 2020 OCO Plans: N/A					
FY 2019 to FY 2020 Increase/Decrease Statement: Program initiated in FY20, no prior year funding.					
Accomplishments/Planned Programs Subtotals	0.000	0.000	5.500	0.000	5.500

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604636N / *Counter Umanned Aircraft Systems (C-UAS)*	**Project (Number/Name)** 3241 / *Counter Unmanned Aircraft Systems (C-UAS)*

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

The Navy's acquisition strategy capitalizes on prior Rapid Development Capability efforts while leveraging existing program investments with the Government acting as Lead Systems Integrator. This acquisition strategy maintains commonality of current C-UAS solutions while continuing to evaluate, improve, and implement an integrated family of systems to meet evolving threats. More details available at a higher classification level.

E. Performance Metrics

Successfully provide C-UAS solutions for operational deployments, and the continued evaluation of current systems and future requirements to include the identification of material solutions for concept refinement, and analysis of architectures.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604636N / *Counter Umanned Aircraft Systems (C-UAS)*	Project (Number/Name) 3241 / *Counter Unmanned Aircraft Systems (C-UAS)*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
System Development	TBD	Not Specified : TBD	0.000	0.000		0.000		2.400	Jan 2020	-		2.400	Continuing	Continuing	Continuing
		Subtotal	0.000	0.000		0.000		2.400		-		2.400	Continuing	Continuing	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Material solutions and threat assessments	TBD	Not Specified : TBD	0.000	0.000		0.000		1.750	Dec 2019	-		1.750	Continuing	Continuing	Continuing
		Subtotal	0.000	0.000		0.000		1.750		-		1.750	Continuing	Continuing	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management	Various	Not Specified : Various	0.000	0.000		0.000		0.550	Oct 2019	-		0.550	Continuing	Continuing	Continuing
Government Engineering Support	WR	Not Specified : NAWC AD PAX	0.000	0.000		0.000		0.750	Oct 2019	-		0.750	Continuing	Continuing	Continuing
Travel	WR	Not Specified : Various	0.000	0.000		0.000		0.050	Oct 2019	-		0.050	Continuing	Continuing	Continuing
		Subtotal	0.000	0.000		0.000		1.350		-		1.350	Continuing	Continuing	N/A

	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	0.000		0.000		5.500		-		5.500	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604636N / *Counter Umanned Aircraft Systems (C-UAS)*	**Project (Number/Name)** 3241 / *Counter Unmanned Aircraft Systems (C-UAS)*

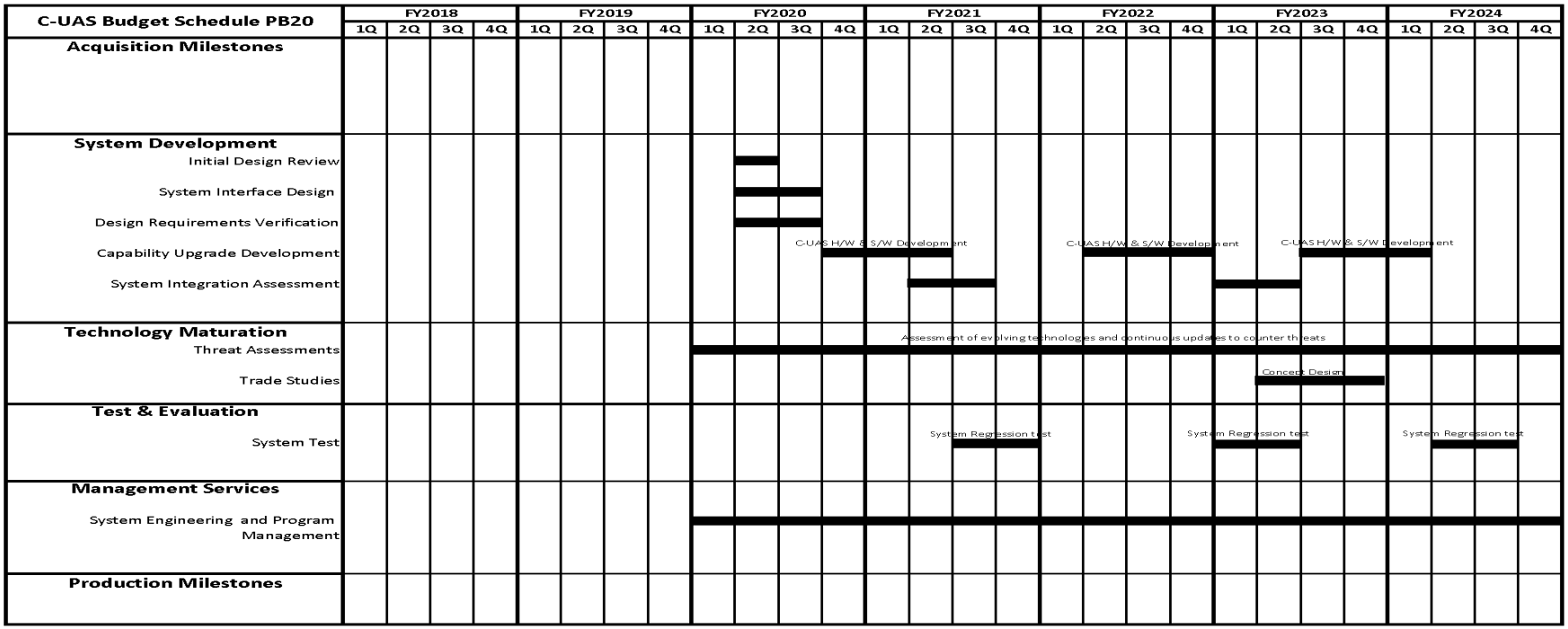


Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604636N / *Counter Umanned Aircraft Systems (C-UAS)*	**Project (Number/Name)** 3241 / *Counter Unmanned Aircraft Systems (C-UAS)*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 3241				
Initial Design Review	2	2020	3	2020
System Interface Design	2	2020	3	2020
Design Requirements Verification 1	4	2020	2	2021
Design Requirements Verification 2	2	2022	1	2023
Design Requirements Verification 3	3	2023	2	2024
System Integration Assessment 1	2	2021	4	2021
System Integration Assessment 2	1	2023	3	2023
Threat Assessments	1	2020	4	2024
Trade Studies	2	2023	3	2023
System Test 1	3	2021	1	2022
System Test 2	1	2023	3	2023
System Test 3	2	2024	4	2024
SEPM	1	2020	4	2024

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0604659N *I (U)Precision Strike Weapons Development Program*

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	12.495	20.279	91.833	718.148	-	718.148	1,169.920	1,404.290	1,462.656	994.888	Continuing	Continuing
3334: *Conventional Prompt Strike (CPS)*	0.000	0.000	11.250	593.120	-	593.120	1,061.629	1,303.884	1,387.045	899.420	Continuing	Continuing
3378: *Next Generation Land Attack Weapon (NGLAW)*	12.495	1.644	3.966	19.722	-	19.722	14.499	59.777	69.110	88.845	Continuing	Continuing
3407: *Air Launched Decoy Development*	0.000	18.635	76.617	105.306	-	105.306	93.792	40.629	6.501	6.623	Continuing	Continuing

A. Mission Description and Budget Item Justification

Initial and continuing development of strike weapons consisting of armament, munitions, and weapon subsystems to allow for the horizontal integration among current and future weapon system capabilities to provide enhanced anti-surface and land strike capabilities in a demanding Anti-Access Area-Denial environment. This program provides for the development of weapon and weapon system technologies to address future requirements for enhanced and alternative weapon system capability requirements that include selectable output weapons, low collateral damage weapons, precision lethality weapons, area weapons, alternative warhead technology, Insenstive Munitions (IM), scaled munitions, Department of Defense (DoD) fuzing systems, sensors, extended range weapons and precision guided training round technology.

Prior to FY 2019, Conventional Prompt Strike efforts were solely funded through Defense Wide Research and Development funding. In FY 2020, CPS efforts in this project are to support Navy integration efforts, conduct trade studies of system alternatives and risk reduction technology maturation efforts as the CPS program transitions to Navy in FY 2020.

In FY 2020, CPS efforts in this project are to support Navy integration efforts, conduct trade studies of system alternatives and risk reduction technology maturation efforts.

The Precision Strike Weapons Development Program Element supports the enhancement of Conventional Prompt Strike (CPS) war fighting capabilities. The current program emphasis is on demonstrating component and subsystem technology maturity with risk reduction initiatives highlighted by flight tests. The program funds the design, development, and experimentation of hypersonic subsystems including: boosters, conventional warheads, thermal protection systems, guidance systems, payload modules, launch systems, fire control systems, support equipment, underwater launch (UWL) facility updates, and hypersonic glide bodies. The development efforts shall lead to a flight system that: Is non-ballistic over the majority of the flight path; Controls stage drop; Provides positive control and precision accuracy from launch to impact; Provides adequate cross-range/maneuverability to avoid over-flight issues; and Provides prompt lethal effects on targets. To support these development activities, the program procures modeling and simulation capabilities, ground testing, command and control interfaces, test range support, and launch system infrastructure. Additionally, expert resources address strategic policy and treaty issues. Program timing will be driven by the outcome of flight and ground test events.

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0604659N *I (U)Precision Strike Weapons Development Program*

The Precision Strike Weapons Development Program Element (PE) supports the Next Generation Strike Weapon (NGSW) Family of Systems (FoS) based on the NGLAW Analysis of Alternatives (AoA) completed with results briefed out to OSD. NGSW FoS more accurately reflects the surface/submarine capabilities for land-attack and maritime strike that the AoA results identified for the most capable and economic solutions fielding incrementally between 2020 and 2032. NGSW FoS Increments I and II will leverage mature as well as emerging technologies vice developing a single weapon. NGSW funding will maintain the security environment (enclave), facility, and study team to enable continuing analysis efforts across the FoS. The NGSW enclave ensures the Navy is able to maintain the most up to date modeled threats and validate the effectiveness of current US weapons, offensive and defensive, as well as future systems and concepts developed by industry and other DoD organizations. Maintaining this capability allows expedited analysis of systems and fully informed investment decisions.

The Precision Strike Weapons Development Program Element (PE) supports the air-launched electronic warfare (EW) systems capability; through the integration of a Navy variant of the Miniature Air Launched Decoy (MALD). EW is an integral war-fighting effect supporting combatant commander integrated priorities, as well as Joint or Coalition operations. EW systems influence, deceive, disrupt, degrade, deny and destroy threats throughout the electromagnetic spectrum to airborne and air-launched systems and their operations. EW includes air-launched electronic attack (EA) as well as elements of electronic support (ES) and electronic protection (EP). EA provides self-protection capabilities to other weapon systems through active and passive measures that deceive threats to airborne and air-launched systems and their operations by using kinetic and non-kinetic means to defeat threats that rely on the electromagnetic spectrum (Radio Frequency (RF), Electro-Optical (EO), Infrared (IR). The ES capabilities support the collection, analysis, and dissemination of information related to the detection, geo-location, characterization, and identification of threats to airborne and air-launched systems and their operations. An air-launched EW system with stand-in capability increases the range and duration of EW systems while providing flexibility to commanders for employment.

MALD is integral to realizing the National Defense Strategy of combat-credible military forces to deter war, protect the security of our nation and to enable the Joint Force to win should deterrence fail. The development and acquisition of MALD has been structured to be fielded at a pace relevant to maintain overmatch against long-term strategic competition. Specifically MALD directly contributes to building a more lethal force and is a critical enabler for joint lethality in contested environments; deterring adversaries from aggression and evolves innovative operational concepts.

JUSTIFICATION FOR BUDGET ACTIVITY: This program is funded under ADVANCED COMPONENT DEVELOPMENT AND PROTOTYPES because it includes all efforts necessary to evaluate integrated technologies, representative models or prototype systems in a high fidelity and realistic operating environment.

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0604659N *I (U)Precision Strike Weapons Development Program*

B. Program Change Summary ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	31.315	132.818	455.970	-	455.970
Current President's Budget	20.279	91.833	718.148	-	718.148
Total Adjustments	-11.036	-40.985	262.178	-	262.178
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-40.985			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	0.250	0.000			
• SBIR/STTR Transfer	-0.554	0.000			
• Program Adjustments	0.000	0.000	262.211	-	262.211
• Rate/Misc Adjustments	0.000	0.000	-0.033	-	-0.033
• Congressional Directed Reductions Adjustments	-10.732	-	-	-	-

Change Summary Explanation

PU 3334

The CPS schedule has been updated to reflect Technology Maturation and Risk Reduction (TMRR) and Engineering Manufacturing and Development (EMD) associated with the design, development, and experimentation of boosters,
conventional warheads, thermal protection systems, guidance systems, test range modernization, and mission planning and enabling capabilities.

FY2020 program increase supports integration efforts associated with the CPS program which shifts from OSD to a Navy program of record as well as the design, development, and experimentation of hypersonic subsystems including:
boosters, conventional warheads, thermal protection systems, guidance systems, payload modules, launch systems, fire control systems, support equipment, underwater launch (UWL) facility updates, and hypersonic glide
bodies.

PU 3378

FY2020 was decreased to invest in offensive hypersonics reducing PB19 funding by $34.5 million in FY20.

PU 3407

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0604659N *I (U)Precision Strike Weapons Development Program*

The FY2020 funding request was reduced by $3.0M to account for the availability of prior year execution balances.

FY2020 will continue MALD EMD efforts. Funding includes all components of All Up Round (AUR).

Incorporate Test and Evaluation events.

The FY 2019 to FY 2020 increase of $28.689 provides for MALD-N integration activities and subsystem level testing in support of QRA efforts.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604659N / *(U)Precision Strike Weapons Development Program*	Project (Number/Name) 3334 / *Conventional Prompt Strike (CPS)*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
3334: *Conventional Prompt Strike (CPS)*	0.000	0.000	11.250	593.120	-	593.120	1,061.629	1,303.884	1,387.045	899.420	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Precision Strike Weapons Development Program Element supports the enhancement of Conventional Prompt Strike (CPS) war fighting capabilities. The current program emphasis is on demonstrating component and subsystem technology maturity with risk reduction initiatives highlighted by flight tests. The program funds the design, development, and experimentation of hypersonic subsystems including: boosters, conventional warheads, thermal protection systems, guidance systems, payload modules, launch systems, fire control systems, support equipment, underwater launch (UWL) facility updates, and hypersonic glide bodies. The development efforts shall lead to a flight system that: Is non-ballistic over the majority of the flight path; Controls stage drop; Provides positive control and precision accuracy from launch to impact; Provides adequate cross-range/maneuverability to avoid over-flight issues; and Provides prompt lethal effects on targets. To support these development activities, the program procures modeling and simulation capabilities, ground testing, command and control interfaces, test range support, and launch system infrastructure. Additionally, expert resources address strategic policy and treaty issues. Program timing will be driven by the outcome of flight and ground test events.

Prior to FY 2019, Conventional Prompt Strike efforts were solely funded through Defense Wide Research and Development funding. In FY 2020, CPS efforts in this project are to support Navy integration efforts, conduct trade studies of system alternatives and risk reduction technology maturation efforts as the CPS program transitions to Navy in FY 2020.
In FY 2020, CPS efforts in this project are to support Navy integration efforts, conduct trade studies of system alternatives and risk reduction technology maturation efforts.

The CPS schedule has been updated to reflect Technology Maturation and Risk Reduction (TMRR) and Engineering Manufacturing and Development (EMD) associated with the design, development, and experimentation of boosters, conventional warheads, thermal protection systems, guidance systems, test range modernization, and mission planning and enabling capabilities.

FY2020 program increase from FY19 to FY20 supports integration efforts associated with the CPS program which shifts from OSD to a Navy program of record. The FY19 to FY20 increase is largely associated with the design, development, and experimentation of hypersonic subsystems including: boosters, conventional warheads, thermal protection systems, guidance systems, payload modules, launch systems, fire control systems, support equipment, underwater launch (UWL) facility updates, and hypersonic glide bodies.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Conventional Prompt Strike (CPS)	0.000	11.250	593.120	0.000	593.120

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604659N / *(U)Precision Strike Weapons Development Program*	**Project (Number/Name)** 3334 / *Conventional Prompt Strike (CPS)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Articles:	-	-	-	-	-

Description: The Precision Strike Weapons Development Program Element supports the enhancement of Conventional Prompt Strike (CPS) warfighting capabilities. Program emphasis is on demonstrating component and subsystem technology maturity with risk reduction initiatives highlighted by flight tests. The program funds the design, development, and experimentation of boosters, payload delivery vehicles (PDVs), non-nuclear warheads, thermal protection systems, guidance systems, test range modernization, and mission planning and enabling capabilities. The development efforts shall lead to a flight system that is non-ballistic over the majority of the flight path, controlled stage drop over Broad Ocean Area, positive control from launch to impact, adequate cross-range/maneuverability to avoid overflight issues, and effects on targets in a very short-period of time from execution order. To support these development activities, the program procures modeling and simulation capabilities, ground testing, command and control interfaces, test range support, and launch system infrastructure. Additionally, expert resources address strategic policy and treaty issues. Program timing will be driven by the outcome of flight and ground test events. Prior to FY 2019, Conventional Prompt Strike efforts were solely funded through Defense Wide Research and Development funding. In FY 2020, CPS efforts in this project are to support Navy integration efforts, conduct trade studies of system alternatives and risk reduction technology maturation efforts as the CPS program begins to transition to Navy in FY 2020.

FY 2019 Plans:
(U) FY 2019 PLAN

(U) ($11.250M)

FY 2019 efforts include:

(U) Conduct trade studies of system alternatives. Evaluations to include: Architecture, Lethality, Survivability, Affordability, Maintainability, Facilitation needs, and sled tests.
(U) Conduct risk reduction technology maturation efforts including: Common weapons launcher integration activity, shipboard/flight systems trade space evaluation and sensitivity analyses, communications analysis, CONOPs evaluations and recommendations, warhead advancements and dual/use capability, and a range of survivability technology advancements.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604659N / *(U)Precision Strike Weapons Development Program*	**Project (Number/Name)** 3334 / *Conventional Prompt Strike (CPS)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
(U) Support platform integration activities as needed potentially for sub-surface and/or surface ships and other leading architectures. ***FY 2020 Base Plans:*** (U) FY 2020 PLAN (U) ($593.120M) FY 2020 efforts include: (U) Building off the success of FE-1 in FY 2018, conduct of Flight Experiment (FE-2) to advance the HGB design and aid in technology transition to industry. (U) Leveraging defense-wide research and development funds provided in FY19 (PE 0604165D8Z), FY20 weapon system development and integration activities include the design, development, and experimentation of hypersonic subsystems including: boosters; conventional warheads; thermal protection systems; guidance systems; payload modules; launch systems; fire control systems; support equipment; and UWL facility updates. These development efforts shall lead to a flight system that: Is non-ballistic over the majority of the flight path; Controls stage drop; Provides positive control and precision accuracy from launch to impact; Provides adequate cross-range/maneuverability to avoid over-flight issues; and Provides Prompt lethal effects on targets. (U) Begin missile procurement to support prototyping activities and hypersonic glide bodies (C-HGB). Includes identifying and procuring initial materials and parts for missile test assets required for Navy FE-3 and production ramp-up. FE-3 further enhances the capability of the C-HGB and includes the development and demonstration of the Hypersonic Booster Technology Demonstration (HBTD) booster and associated missile body hardware compatible with deployment from submerged platforms. (U) The program will continue to develop, model, and refine CPS architecture designs, including hardware, software, computer software and computer software documentation and operator requirement allocations and support of external system interfaces. (U) Further develop a CPS weapons systems performance requirements specification and an integrated verification plan. Includes the development, allocation, and verification of all performance, design, and operational requirements at the system, subsystem, element, and lower levels of the CPS weapon system.					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604659N / *(U)Precision Strike Weapons Development Program*	**Project (Number/Name)** 3334 / *Conventional Prompt Strike (CPS)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
(U) Continue to define and document all interfaces for the CPS weapon system and the sea-based platform and between internal Navy CPS weapon system subsystems/elements. (U) Continue to establish a comprehensive System Safety Program in accordance with MIL-STD-882E and develop a CPS System Safety Plan. (U) Continue to establish a comprehensive Integration and Test (I&T) Program that addresses all CPS test activities for component-level, subsystem-level,system-level, interface, integration, environmental, safety, security/cyber, logistics, and flight tests. (U) Conduct Critical Design Review of booster, missile, All-up Round (AUR), Advanced Payload Module (APM), and Weapon Control System in FY20. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** (U) The CPS schedule has been updated to reflect Technology Maturation and Risk Reduction (TMRR) and Engineering Manufacturing and Development (EMD) associated with the design, development, and experimentation of boosters, conventional warheads, thermal protection systems, guidance systems, test range modernization, and mission planning and enabling capabilities. (U) FY2020 program increase of $581.87M supports integration efforts associated with the CPS program which shifts from OSD to a Navy program of record. The FY19 to FY20 increase is largely associated with the design, development, and experimentation of hypersonic subsystems including: boosters, conventional warheads, thermal protection systems, guidance systems, payload modules, launch systems, fire control systems, support equipment, underwater launch (UWL) facility updates, and hypersonic glide bodies. Detailed additional information available at a higher classification.					
Accomplishments/Planned Programs Subtotals	0.000	11.250	593.120	0.000	593.120

C. Other Program Funding Summary ($ in Millions)

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604659N / *(U)Precision Strike Weapons Development Program*	**Project (Number/Name)** 3334 / *Conventional Prompt Strike (CPS)*

C. Other Program Funding Summary ($ in Millions)

Remarks

D. Acquisition Strategy

The acquisition strategy will be influenced through the completion of trade studies of system alternatives and risk reduction technology maturation efforts through various contracts and warfare centers.

E. Performance Metrics

Program reviews and assessments of R&D testing results.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604659N / *(U)Precision Strike Weapons Development Program*	Project (Number/Name) 3334 / *Conventional Prompt Strike (CPS)*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Conventional Prompt Strike Weapon System	WR	Naval Air Weapons Station : China Lake, CA	0.000	0.000		0.000		84.520	Dec 2019	-		84.520	Continuing	Continuing	Continuing
Conventional Prompt Strike Weapon System	C/CPFF	Systems Planning & Analysis : Alexandria, VA	0.000	0.000		0.000		2.700	Dec 2019	-		2.700	Continuing	Continuing	Continuing
Conventional Prompt Strike Weapon System	MIPR	Lawrence Livermore National Laboratory : Livermore, CA	0.000	0.000		4.610	Feb 2019	0.000		-		0.000	Continuing	Continuing	Continuing
Conventional Prompt Strike Weapon System	SS/CPFF	Lockheed Martin Corporation : Sunnyvale, CA	0.000	0.000		0.000		1.760	Dec 2019	-		1.760	Continuing	Continuing	Continuing
Conventional Prompt Strike Weapon System	MIPR	Missile and Space Intelligence Center : Huntsville, AL	0.000	0.000		0.000		1.040	Dec 2019	-		1.040	Continuing	Continuing	Continuing
Conventional Prompt Strike Weapon System	WR	Naval Undersea Warfare Division : Newport, RI	0.000	0.000		0.000		1.040	Dec 2019	-		1.040	Continuing	Continuing	Continuing
Conventional Prompt Strike Weapon System	C/CPFF	Hana Industries : Honolulu, HI	0.000	0.000		0.000		0.450	Dec 2019	-		0.450	Continuing	Continuing	Continuing
Conventional Prompt Strike Weapon System	MIPR	USAF - Holloman : Alamogordo, NM	0.000	0.000		1.100	Feb 2019	0.000		-		0.000	Continuing	Continuing	Continuing
Conventional Prompt Strike Weapon System	MIPR	United States Army : Various	0.000	0.000		0.000		26.940	Dec 2019	-		26.940	Continuing	Continuing	Continuing
Conventional Prompt Strike Weapon System	WR	Naval Surface Warfare Center Crane : Crane, IN	0.000	0.000		0.000		18.780	Dec 2019	-		18.780	Continuing	Continuing	Continuing
Conventional Prompt Strike Weapon System	SS/CPFF	Johns Hopkins Univ. Applied Physics Lab : Baltimore, MD	0.000	0.000		0.000		16.490	Dec 2019	-		16.490	Continuing	Continuing	Continuing
Conventional Prompt Strike Weapon System	Various	Various : Various	0.000	0.000		1.100	Feb 2019	11.410	Dec 2019	-		11.410	Continuing	Continuing	Continuing

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604659N / *(U)Precision Strike Weapons Development Program*	Project (Number/Name) 3334 / *Conventional Prompt Strike (CPS)*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Flight Subsystem	SS/CPFF	Lockheed Martin Corporation : Sunnyvale, CA	0.000	0.000		0.000		171.590	Dec 2019	-		171.590	Continuing	Continuing	Continuing
Flight Subsystem	MIPR	Sandia National Laboratory : Washington, DC	0.000	0.000		0.000		151.900	Dec 2019	-		151.900	Continuing	Continuing	Continuing
Flight Subsystem	C/CPFF	Dynetics : Huntsville, AL	0.000	0.000		0.000		15.850	Dec 2019	-		15.850	Continuing	Continuing	Continuing
Flight Subsystem	WR	Naval Surface Warfare Center : Crane, IN	0.000	0.000		0.000		10.670	Dec 2019	-		10.670	Continuing	Continuing	Continuing
Flight Subsystem	SS/CPFF	Charles Stark Draper Laboratories : Boston, MA	0.000	0.000		0.000		8.290	Dec 2019	-		8.290	Continuing	Continuing	Continuing
Flight Subsystem	WR	Naval Surface Warfare Center : Dahlgren, VA	0.000	0.000		0.000		4.930	Dec 2019	-		4.930	Continuing	Continuing	Continuing
Platform Subsystem	WR	NAVSEA : Washington, DC	0.000	0.000		1.870	Feb 2019	21.760	Dec 2019	-		21.760	Continuing	Continuing	Continuing
Platform Subsystem	SS/CPFF	Lockheed Martin Corporation : Sunnyvale, CA	0.000	0.000		0.000		8.280	Dec 2019	-		8.280	Continuing	Continuing	Continuing
Platform Subsystem	SS/CPFF	Johns Hopkins Univ. Applied Physics Lab : Baltimore, MD	0.000	0.000		0.000		2.590	Dec 2019	-		2.590	Continuing	Continuing	Continuing
Platform Subsystem	WR	Naval Surface Warfare Center : Dahlgren, VA	0.000	0.000		0.000		2.070	Dec 2019	-		2.070	Continuing	Continuing	Continuing
Advanced Research and Development	C/BA	Lawrence Livermore National Laboratory : Livermore, CA	0.000	0.000		2.570	Feb 2019	13.470	Dec 2019	-		13.470	Continuing	Continuing	Continuing
Advanced Research and Development	SS/CPFF	Charles Stark Draper Laboratories : Boston, MD	0.000	0.000		0.000		9.330	Dec 2019	-		9.330	Continuing	Continuing	Continuing

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604659N / *(U)Precision Strike Weapons Development Program*	**Project (Number/Name)** 3334 / *Conventional Prompt Strike (CPS)*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Advanced Research and Development	MIPR	Sandia National Laboratory : Washington, DC	0.000	0.000		0.000		6.220	Dec 2019	-		6.220	Continuing	Continuing	Continuing
Advanced Research and Development	SS/CPFF	Johns Hopkins Univ. Applied Physics Lab : Baltimore, MD	0.000	0.000		0.000		1.040	Dec 2019	-		1.040	Continuing	Continuing	Continuing
		Subtotal	0.000	0.000		11.250		593.120		-		593.120	Continuing	Continuing	N/A

	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	0.000		11.250		593.120		-		593.120	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604659N / *(U)Precision Strike Weapons Development Program*	**Project (Number/Name)** 3334 / *Conventional Prompt Strike (CPS)*

Fiscal Year	2018				2019				2020				2021				2022				2023				2024			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Project 3334					TMRR				EMD																			
Contract Awards									Δ Contract Award				Δ Contract Award				Δ Contract Award				Δ Contract Award				Δ Contract Award			
					Platform Integration efforts Perform Sled Test Perform Trade Studies				Continue C-HGB Design Conduct FE-2				Continue C-HGB Design Efforts In Air Launch Test				Start Prototyping Efforts For C-HGB UWL Tests Begin Conduct FE-3				Continue Prototyping Efforts For C-HGB Continue UWL Tests				Continue Prototyping Efforts For C-HGB Continue UWL Tests			

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604659N / *(U)Precision Strike Weapons Development Program*	**Project (Number/Name)** 3334 / *Conventional Prompt Strike (CPS)*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 3334				
Project 3334: Technology Maturation and Risk Reduction	1	2019	4	2019
Project 3334: Engineering and Manufacturing Development	4	2019	4	2024

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604659N / *(U)Precision Strike Weapons Development Program*	Project (Number/Name) 3378 / *Next Generation Land Attack Weapon (NGLAW)*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
3378: *Next Generation Land Attack Weapon (NGLAW)*	12.495	1.644	3.966	19.722	-	19.722	14.499	59.777	69.110	88.845	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Funding is provided for the Next Generation Strike Weapon (NGSW) Family of Systems (FoS) based on the NGLAW Analysis of Alternatives (AoA) completed with results briefed out to OSD. NGSW FoS more accurately reflects the surface/submarine capabilities for land-attack and maritime strike that the AoA results identified for the most capable and economic solutions fielding incrementally between 2020 and 2032. NGSW FoS Increments I and II will leverage mature as well as emerging technologies vice developing a single weapon. NGSW funding will maintain the security environment (enclave), facility, and study team to enable continuing analysis efforts across the FoS. The NGSW enclave ensures the Navy is able to maintain the most up to date modeled threats and validate the effectiveness of current US weapons, offensive and defensive, as well as future systems and concepts developed by industry and other DoD organizations. Maintaining this capability allows expedited analysis of systems and fully informed investment decisions. Further funding supports investment for technologies which enable Increment II capabilities (additional details are held at a higher classification).

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Next Generation Land Attack Weapon (NGLAW)	1.644	3.966	19.722	0.000	19.722
Articles:	-	-	-	-	-
FY 2019 Plans: Efforts include conducting analysis and other activities to refine requirements, identify cost, schedule, and technical risks associated with the concepts identified in the NGLAW Analysis of Alternatives (AoA), conducting analysis in support of DARPA efforts (Upper Cut), beginning efforts for execution of the SLCM-N AoA, and OASuW Integration study efforts. Concurrently, the NGSW Enclave efforts will include annual security and IT updates, and the study team will conduct the annual update of threat systems and US offensive and defensive systems to ensure the enclave remains fully informed to assist senior leadership in investment decisions.					
FY 2020 Base Plans: Continue annual enclave security and IT updates, annual DSS updates for latest threat data and ownship defense, multi-domain assessment, expanding the US capabilities database, mission integration, and lifecycle cost estimate updates as applicable. In support of NGSW FoS and continued Offensive Anti-Surface Warfare (OASUW) analysis, modify TACSITs and threat postures for air launched weapons, identify new launch points					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604659N / *(U)Precision Strike Weapons Development Program*	**Project (Number/Name)** 3378 / *Next Generation Land Attack Weapon (NGLAW)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
and concepts for employment, mission integration and cost estimate updates as applicable. Conduct an Analysis of Alternatives study in support of Nuclear Missile Sea-launched Cruise Missile (SLCM-N). Also, to support Increment II development, funding will be allocated for technologies to enable capabilities identified in the NGLAW AoA for integration in future systems. Additional details are held at a higher classification. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** FY 2020 has actually been decreased to invest in offensive hypersonics. However the FY2019 to FY2020 increase directly relates to NGLAW AoA results necessitating a plan/strategy change to NGSW FoS, maintaining the security environment for fully informed investment decisions, including supporting an Analysis of Alternatives for Nuclear Missile Sea-launched Cruise Missile (SLCM-N).					
Accomplishments/Planned Programs Subtotals	1.644	3.966	19.722	0.000	19.722

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

NGSW FoS more accurately reflects the multi-domain capabilities for land-attack and maritime strike that the NGLAW AoA results identified for the most capable and economic solutions fielding incrementally between 2020 and 2032. NGSW FoS Increments I and II will leverage mature as well as emerging technologies vice developing a single weapon. NGSW funding will maintain the security environment (enclave), facility, and study team to enable continuing analysis efforts across the FoS. The NGSW enclave ensures the Navy is able to maintain the most up to date modeled threats and validate the effectiveness of current US weapons, offensive and defensive, as well as future systems and concepts developed by industry and other DoD organizations. Maintaining the enclave allows expedited analysis of systems and fully informed investment decisions.

The SLCM-N recently completed the Navy R3B process and will shortly enter the Knowledge Management and Decision Support System (KMDS) for Joint Staff validation. OSD CAPE is refining their AoA guidance, but will likely direct Navy to investigate options derived from the NGLAW AoA and derivatives. Once approved and received, Navy will begin the AoA.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604659N / *(U)Precision Strike Weapons Development Program*	**Project (Number/Name)** 3378 / *Next Generation Land Attack Weapon (NGLAW)*

NGSW FoS funding will support Increment II development of technologies to enable capabilities identified in the NGLAW AoA for integration in future systems. Additional details are held at a higher classification.

E. Performance Metrics

Annual enclave security and IT updates, annual DSS updates for latest threat data and ownship defense, multi-domain assessment, expanding the US capabilities database, mission integration, and lifecycle cost estimate updates as applicable. Complete excursion studies and/or AoAs as required.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604659N / *(U)Precision Strike Weapons Development Program*	**Project (Number/Name)** 3378 / *Next Generation Land Attack Weapon (NGLAW)*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
INC II Technologies	C/CPFF	TBD : TBD	0.000	0.000		0.000		12.300	Mar 2020	-		12.300	0.000	12.300	-
		Subtotal	0.000	0.000		0.000		12.300		-		12.300	0.000	12.300	N/A

Remarks

Development of technologies/components to support NGSW Increment II capabilities for integration in future systems. Additional details are held at a higher classification.

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Development Support	WR	NAWC-WD : China Lake, CA	2.450	0.025	Nov 2017	0.000		0.112	Dec 2019	-		0.112	Continuing	Continuing	Continuing
Development Support- AIR 4.0M	WR	NAWC-AD : Patuxent River, MD	3.114	0.000		0.000		0.440	Nov 2019	-		0.440	Continuing	Continuing	Continuing
Development Support	SS/CPFF	JHU/APL : Laurel, MD	2.824	0.744	Nov 2017	2.016	Feb 2019	1.210	Dec 2019	-		1.210	Continuing	Continuing	Continuing
Weapons Control System	WR	NSWC-DD : Dahlgren, VA	0.025	0.025	Nov 2017	0.000		0.275	Dec 2019	-		0.275	0.000	0.325	Continuing
Development Support	WR	NSMA : JBAB, DC	3.488	0.825	Dec 2017	1.950	Feb 2019	5.018	Nov 2019	-		5.018	0.000	11.281	Continuing
Development Support	MIPR	NRO : Chantilly, VA	0.569	0.000		0.000		0.165	Jan 2020	-		0.165	0.000	0.734	Continuing
Development Support	WR	NSWC-NPT : Newport, RI	0.025	0.025	Nov 2017	0.000		0.180	Dec 2019	-		0.180	0.000	0.230	Continuing
		Subtotal	12.495	1.644		3.966		7.400		-		7.400	Continuing	Continuing	N/A

Remarks

Annual enclave updates, annual DSS updates, multi-domain assessment, mission integration, support OASUW analysis, conduct SLCM-N AoA study.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604659N / *(U)Precision Strike Weapons Development Program*	**Project (Number/Name)** 3378 / *Next Generation Land Attack Weapon (NGLAW)*

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Management Support	WR	NAWC-AD : Patuxent River, MD	0.000	0.000		0.000		0.022	Nov 2019	-		0.022	Continuing	Continuing	Continuing
		Subtotal	0.000	0.000		0.000		0.022		-		0.022	Continuing	Continuing	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	12.495	1.644		3.966		19.722		-		19.722	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604659N / *(U)Precision Strike Weapons Development Program*	**Project (Number/Name)** 3378 / *Next Generation Land Attack Weapon (NGLAW)*

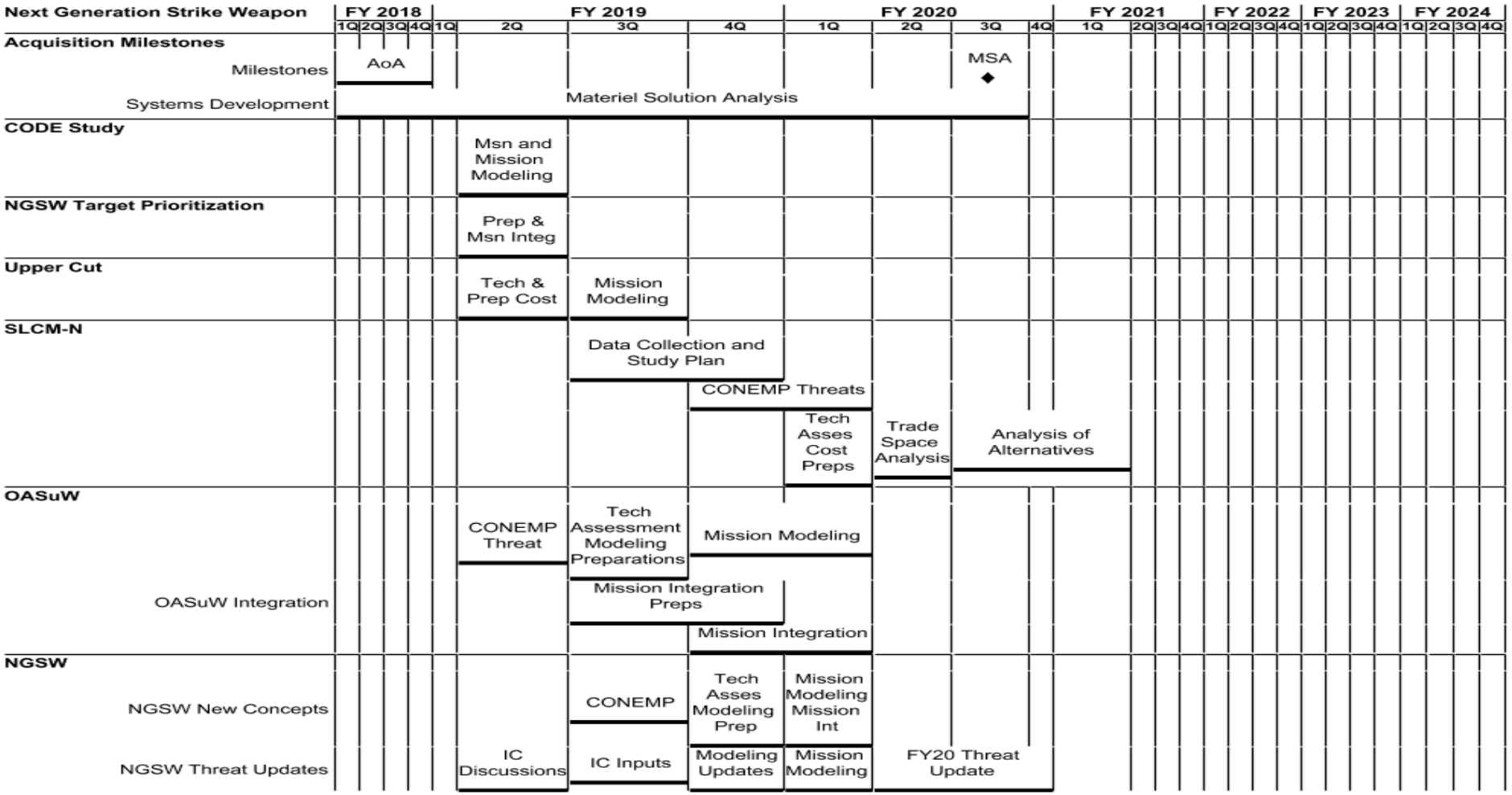
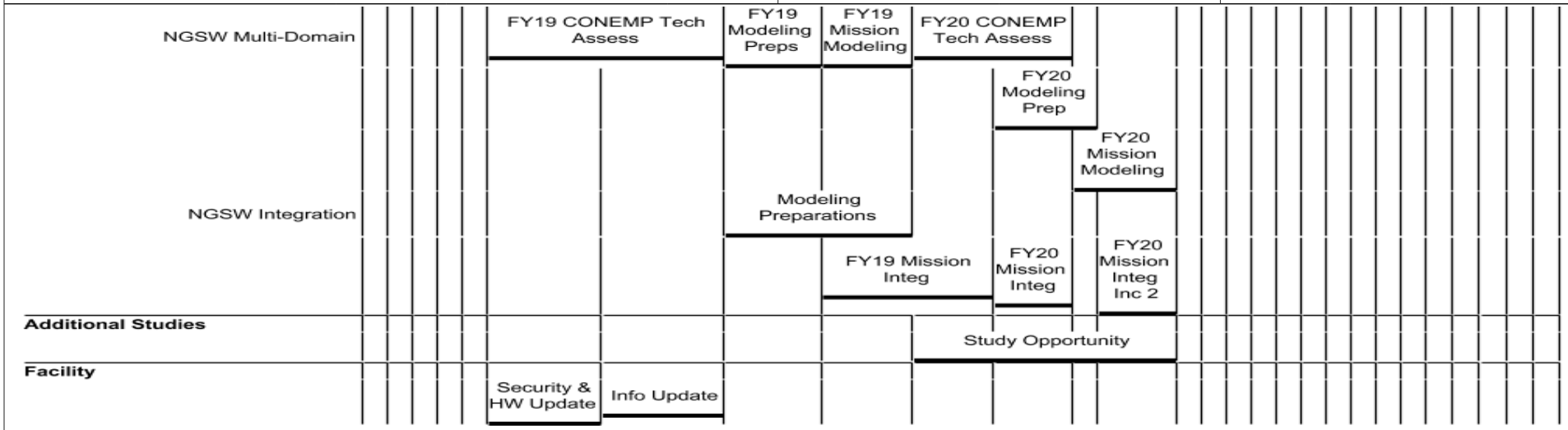


Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604659N / *(U)Precision Strike Weapons Development Program*	**Project (Number/Name)** 3378 / *Next Generation Land Attack Weapon (NGLAW)*



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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604659N / *(U)Precision Strike Weapons Development Program*	**Project (Number/Name)** 3378 / *Next Generation Land Attack Weapon (NGLAW)*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Next Generation Strike Weapon				
Acquisition Milestones: Milestones: Analysis of Alternatives	1	2018	4	2018
Acquisition Milestones: Milestones: Milestone A	3	2020	3	2020
Acquisition Milestones: Systems Development: Materiel Solution Analysis	1	2018	3	2020
CODE Study: Code Study Msn and Code Study Mission Modeling	2	2019	2	2019
NGSW Target Prioritization: NGSW Target Prioritization Prep and Msn Integ	2	2019	2	2019
Upper Cut: Upper Cut Tech and Prep Cost	2	2019	2	2019
Upper Cut: Upper Cut Mission Modeling	3	2019	3	2019
SLCM-N: SLCM-N CNA Data Collection and Study Plan	3	2019	4	2019
SLCM-N: SLCM-N CNA CONEMP Threats	4	2019	1	2020
SLCM-N: SLCM-N CNA Tech Asses Cost Preps	1	2020	1	2020
SLCM-N: SLCM-N Trade Space Analysis	2	2020	2	2020
SLCM-N: SLCM-N Analysis of Alternatives	3	2020	1	2021
OASuW: OASuW CONEMP Threat	2	2019	2	2019
OASuW: OASuW Tech Assessment Modeling Preparations	3	2019	3	2019
OASuW: OASuW Mission Modeling	4	2019	1	2020
OASuW: OASuW Integration: OASuW Integration Mission Integration Preps	3	2019	4	2019
OASuW: OASuW Integration: OASuW Integration Mission Integration	4	2019	1	2020
NGSW: NGSW New Concepts: NGSW New Concepts CONEMP	3	2019	3	2019
NGSW: NGSW New Concepts: NGSW New Concepts Tech Asses Modeling Prep	4	2019	4	2019
NGSW: NGSW New Concepts: NGSW New Concepts Mission Modeling Mission Int	1	2020	1	2020
NGSW: NGSW Threat Updates: NGSW Threat Updates IC Discussions	2	2019	2	2019

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604659N / *(U)Precision Strike Weapons Development Program*	**Project (Number/Name)** 3378 / *Next Generation Land Attack Weapon (NGLAW)*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
NGSW: NGSW Threat Updates: NGSW Threat Updates IC Inputs	3	2019	3	2019
NGSW: NGSW Threat Updates: NGSW Threat Updates Modeling Updates	4	2019	4	2019
NGSW: NGSW Threat Updates: NGSW Threat Updates Mission Modeling	1	2020	1	2020
NGSW: NGSW Threat Updates: NGSW FY20 Threat Update	2	2020	4	2020
NGSW: NGSW Multi-Domain: NGSW Multi-Domain FY19 Threats CONEMP Tech Assessment	2	2019	3	2019
NGSW: NGSW Multi-Domain: NGSW Multi-Domain FY19 Modeling Preparations	4	2019	4	2019
NGSW: NGSW Multi-Domain: NGSW Multi-Domain FY19 Mission Modeling	1	2020	1	2020
NGSW: NGSW Multi-Domain: NGSW Multi-Domain FY20 Threats CONEMP Tech Assessment	2	2020	3	2020
NGSW: NGSW Multi-Domain: NGSW Multi-Domain FY20 Modeling Preparations	3	2020	4	2020
NGSW: NGSW Multi-Domain: NGSW Multi-Domain FY20 Mission Modeling	4	2020	1	2021
NGSW: NGSW Integration: NGSW Integration Modeling Preparations	4	2019	1	2020
NGSW: NGSW Integration: NGSW Integration FY19 Mission Integration	1	2020	2	2020
NGSW: NGSW Integration: NGSW Integration FY20 Mission Integration	3	2020	3	2020
NGSW: NGSW Integration: NGSW Integration FY20 Mission Integration Increment 2	1	2021	1	2021
Additional Studies: Study Opportunity	2	2020	1	2021
Facility: Facility Security and HW Update	2	2019	2	2019
Facility: Facility Info Update	3	2019	3	2019

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604659N / *(U)Precision Strike Weapons Development Program*	Project (Number/Name) 3407 / *Air Launched Decoy Development*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
3407: *Air Launched Decoy Development*	0.000	18.635	76.617	105.306	-	105.306	93.792	40.629	6.501	6.623	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This project develops a Navy variant of the Miniature Air Launched Decoy (MALD). The variant will address current and future advanced Integrated Air Defense System (IADS) threats by bringing an air-launched, stand-in EW capability to Department of the Navy (DON) suppression of enemy air defenses/destruction of enemy air defenses (SEAD/DEAD) and standoff conventional land strike. A Navy variant of MALD with stand-in capability increases the range and duration of EW systems while providing flexibility to commanders for employment. To the maximum extent possible, the Navy will utilize existing technology from the current MALD-J production line and other common components (e.g. navigation, communication, guidance and control, payload) to reduce cost, shorten development timelines and promote interoperability. OPNAV approved requirements in a CDD 2Q2018.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Miniature Air Launched Decoy (MALD)	18.635	76.617	105.306	0.000	105.306
Articles:	-	-	-	-	-
FY 2019 Plans: Continue and complete technical maturation efforts. Begin Engineering, Manufacturing, and Development phase activities. FY 2019 builds upon the FY 2018 technical maturation effort, to take the program through SETR 2.0 and SETR 3.0, and begin planning for SETR 4.0. Component level development will continue into FY 2019, with power and distribution, airframe and container completing by the end of the FY. Tasks scheduled to continue in FY 2019 include but are not limited to: Aircraft Integration/ Air Worthiness to include wind tunnel testing and fit checks specific to F/A-18 E/F; software development of a MALD mission planning module hosted into Joint Mission Planning System (JMPS) and a Navy MALD unique "Airborne Electronic Attack" planning module and material purchases to support development activities. Material purchases in FY 2019 support development of test assets. Long Lead material procurements in FY 2019 support continued development and aircraft integration work and have an 18 month lead time for some AUR components and up to a 24 month lead time for Range Safety/Flight Termination Systems. Funding also provides for Engineering, Logistics and Program Management support.					
FY 2020 Base Plans: FY 2020 builds upon the FY 2019 EMD effort. FY 2020 will complete component maturation through SETR 4.0, Production Readiness Review, to verify production capability prior to Low Rate Initial Production decision and					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604659N / *(U)Precision Strike Weapons Development Program*	**Project (Number/Name)** 3407 / *Air Launched Decoy Development*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
prepare for SETR 5.0, Test Readiness Assessment, prior to first free flight test. FY 2020 will begin integration of IOC software. Integrated Test and Evaluation (IT&E) in support of Quick Reaction Assessment (QRA) will begin in FY 2020. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** FY 2019 to FY 2020 increase of $28.689 provides for increased EMD and I&T activities, subsystems level testing in support of QRA efforts, and integration of IOC software. The FY2020 funding request was reduced by $3.0M to account for the availability of prior year execution balances.					
Accomplishments/Planned Programs Subtotals	18.635	76.617	105.306	0.000	105.306

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• WPN/2285: *Drones and Decoys*	0.000	0.000	20.000	-	20.000	41.291	84.166	133.728	136.403	0.000	415.588

Remarks

D. Acquisition Strategy

The MALD-N Acquisition Category (ACAT) II program is an evolution from the previous United States Air Force (USAF) MALD-J program and is managed by Program Executive Office, Unmanned Aviation & Strike Weapons (PEO(U&W)), PMA-201 Precision Strike Weapons Program Office. PEO(U&W) has been delegated Milestone Decision Authority (MDA) and chairs monthly Executive Steering Boards which ensure timely communications. MALD-N is being implemented as a Model 4 acquisition program to expedite the fielding of capability to the Fleet. The MALD-N program will use event-driven "Knowledge Points" (KP) at key program strategic inflection points to brief progress to stakeholders throughout the program life-cycle. The program met the statutory requirements associated with Milestone B at Knowledge Point 2 (1Q FY2019). A Quick Reaction Assessment (QRA) will be conducted to support an Early Operational Capability (EOC) delivery of a small quantity of Low Rate Initial Production (LRIP) assets in FY 2021. Following EOC, Initial Operational Capabilities (IOC) will be achieved by Initial Operational Test and Evaluation (IOT&E) in FY 2022. MALD-N will use a capabilities-based acquisition approach to characterize performance and evolve an IOC system for Fleet integration.

MALD is integral to realizing the National Defense Strategy of combat-credible military forces to deter war, protect the security of our nation and to enable the Joint Force to win should deterrence fail. The development and acquisition of MALD has been structured to be fielded at a pace relevant to maintain overmatch against long-term strategic competition. Specifically MALD supports greater performance of the acquisition system and is demonstrating the delivery of performance at the speed of relevance; organizational structure that supports innovation with a rapid approach that dramatically decreases the timeline from development to fielding.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604659N / *(U)Precision Strike Weapons Development Program*	**Project (Number/Name)** 3407 / *Air Launched Decoy Development*

E. Performance Metrics

Knowledge Points are defined reviews with the Executive Steering Board comprised of PEO(U&W) (delegated MDA) and the appropriate stakeholders to make program decisions at key points in the program life cycle in place of milestone reviews, but tailored to support the accelerated process. The acquisition program baseline was established at Knowledge Point 2.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604659N / *(U)Precision Strike Weapons Development Program*	**Project (Number/Name)** 3407 / *Air Launched Decoy Development*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Product Development	SS/CPIF	Raytheon Missle Systems : Tucson, AZ	0.000	12.183	Aug 2018	48.670	Jan 2019	75.424	Nov 2019	-		75.424	Continuing	Continuing	Continuing
		Subtotal	0.000	12.183		48.670		75.424		-		75.424	Continuing	Continuing	N/A

Remarks

The award date on the R-3 identifies when the incrementally funded Product Development contract will be awarded, to includes efforts such as the Quick Reaction Assessment (QRA). The R-4 reflects the timeframe for which actual events/assessments will be performed.

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Government Support	WR	NAWC AD : Patuxent River, MD	0.000	2.000	Oct 2017	10.204	Nov 2018	10.622	Nov 2019	-		10.622	Continuing	Continuing	Continuing
Government Support	WR	NAWC WD : China Lake, CA	0.000	2.931	Oct 2017	13.677	Nov 2018	13.950	Nov 2019	-		13.950	Continuing	Continuing	Continuing
Government Support	WR	NAWC WD : Point Mugu, CA	0.000	0.515	Oct 2017	3.270	Nov 2018	4.184	Nov 2019	-		4.184	Continuing	Continuing	Continuing
		Subtotal	0.000	5.446		27.151		28.756		-		28.756	Continuing	Continuing	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Government Support	WR	NAWC AD : Patuxent River, MD	0.000	0.500	Oct 2017	0.333	Nov 2018	0.564	Nov 2019	-		0.564	Continuing	Continuing	Continuing
Government Support	WR	NAWC WD : China Lake, CA	0.000	0.256	Oct 2017	0.171	Nov 2018	0.170	Nov 2019	-		0.170	Continuing	Continuing	Continuing
Project Management Support	C/CPFF	NAWC AD : Patuxent River, MD	0.000	0.200	Mar 2018	0.212	Nov 2018	0.312	Mar 2020	-		0.312	Continuing	Continuing	Continuing

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604659N / *(U)Precision Strike Weapons Development Program*	**Project (Number/Name)** 3407 / *Air Launched Decoy Development*

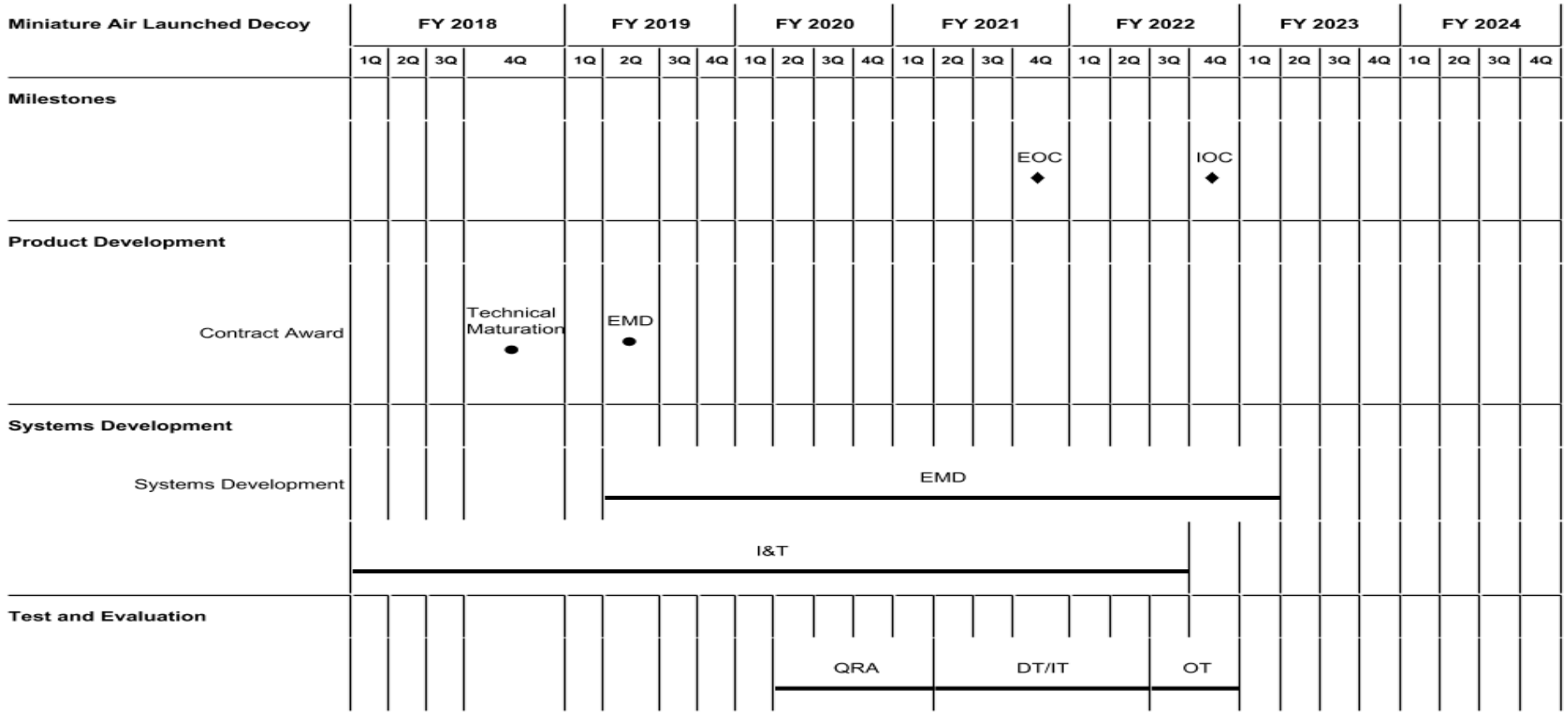
Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Travel	Various	NAVAIR : Patuxent River, MD	0.000	0.050	Oct 2017	0.080	Nov 2018	0.080	Nov 2019	-		0.080	Continuing	Continuing	Continuing
		Subtotal	0.000	1.006		0.796		1.126		-		1.126	Continuing	Continuing	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	18.635		76.617		105.306		-		105.306	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604659N / *(U)Precision Strike Weapons Development Program*	**Project (Number/Name)** 3407 / *Air Launched Decoy Development*



2020PB - 0604659N - 3407

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604659N / *(U)Precision Strike Weapons Development Program*	**Project (Number/Name)** 3407 / *Air Launched Decoy Development*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Miniature Air Launched Decoy				
Milestones: Early Operational Capability (EOC)	4	2021	4	2021
Milestones: Initial Operational Capablity	4	2022	4	2022
Product Development: Contract Award: Technical Maturation Contract Award	4	2018	4	2018
Product Development: Contract Award: EMD Contract Award	2	2019	2	2019
Systems Development: Systems Development: Engineering and Manufacturing Development	2	2019	1	2023
Systems Development: Systems Development: I&T	1	2018	3	2022
Test and Evaluation: QRA	2	2020	1	2021
Test and Evaluation: DT/IT	2	2021	2	2022
Test and Evaluation: OT	3	2022	4	2022

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy											Date: March 2019	
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0604707N / *SEW Architecture/Eng Support*							
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
Total Program Element	284.288	41.214	7.230	5.263	-	5.263	8.662	9.179	9.407	9.595	Continuing	Continuing
0798: *Allied/Coalition Maritime Environment (ACME)*	33.551	1.081	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	34.632
2144: *Space & Elec Warfare Engineering*	222.046	33.238	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	255.284
2147: *ISR Architecture*	1.482	0.689	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	2.171
2356: *Maritime Concept Generation & Development*	27.209	6.206	7.230	5.263	-	5.263	8.662	9.179	9.407	9.595	Continuing	Continuing

Note

Beginning in FY19, Allied/Coalition Interoperability and Information Dominance (ACIID) (now called Allied/Coalition Maritime Environment (ACME)) Project 0798, Space & Electronic Warfare (SEW) Engineering Project 2144, and Intelligence, Surveillance, and Reconnaissance (ISR) Architecture Project 2147 were realigned from PE 0604707N SEW Architecture/ENG Support to PE 0606355N Warfare Innovation Management.

A. Mission Description and Budget Item Justification

The Maritime Concept Generation & Development (MCGD) project (2356) focuses on the generation, development and validation of warfighting concepts, Concept of Operations (CONOPS) and doctrine in order to eliminate war fighting gaps. Naval Warfare Development Command (NWDC) also manages the Fleet Experimentation program (formerly Sea Trial). In FY2019 the project will execute a number of new experimentations in the areas of Electromagnetic Maneuver Warfare (EMW), Mine Warfare, Naval Integrated Fires, and Unmanned systems and conduct experiments (war simulations, Modeling & Simulation (M&S), at-sea events) to develop emerging Naval concepts.

The ACIID project (0798), now called ACME, promotes interoperability with allied and coalition forces by facilitating maritime interoperability in both processes and communication systems, including emerging capabilities, to counter growing high-end asymmetric threats.

The SEW Engineering project (2144) is a systems engineering non-acquisition program to develop, test, implement Technical Authority (TA) products, and validate Naval Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance (C4ISR), Business Information Technology (IT), and Space System architectures to support naval, Joint and Coalition missions across normal, contested, and degraded cyber/operational environments. The objective of this project is carried out by multiple tasks that ensure development and delivery of naval Information Warfare (IW) capabilities that are well-integrated, interoperable, secure, and resilient to meet validated warfighting requirements.

The Intelligence, Surveillance, and Reconnaissance (ISR) Architecture project (2147) is intended to guide system of systems capability development and promote interoperability across Navy ISR programs, as well as interoperability and alignment with Department of Defense (DoD)-wide enterprise initiatives including Joint

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0604707N / *SEW Architecture/Eng Support*

Information Environment (JIE) and Intelligence Community (IC) Information Technology Environment (ITE). This effort to develop integrated ISR architectures will also help instill systems engineering discipline and standardization across the Navy ISR Enterprise and provide a means by which to assess ISR Program of Record (PoR) progress in conforming to a single Navy architecture.

B. Program Change Summary ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	42.851	7.230	8.160	-	8.160
Current President's Budget	41.214	7.230	5.263	-	5.263
Total Adjustments	-1.637	0.000	-2.897	-	-2.897
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-0.001	0.000			
• SBIR/STTR Transfer	-0.748	0.000			
• Program Adjustments	0.000	0.000	-2.897	-	-2.897
• Rate/Misc Adjustments	0.000	0.000	0.000	-	0.000
• Congressional Directed Reductions Adjustments	-0.888	-	-	-	-

Change Summary Explanation

The FY2020 Project 2356 funding request was reduced by $1.897 million to account for the availability of prior year execution balances. Further decreases are due to the implementation of major concepts experiments during FY19 which will shift focus to continuous concept generation/concept development efforts for FY20 resulting in less resources required.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604707N / *SEW Architecture/Eng Support*	Project (Number/Name) 0798 / *Allied/Coalition Maritime Environment (ACME)*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
0798: *Allied/Coalition Maritime Environment (ACME)*	33.551	1.081	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	34.632
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Note

Project title changed as follows: Allied/Coalition Maritime Environment (ACME) (Previously called Allied/Coalition Interoperability and Information Dominance (ACIID) in FY19 and prior.)

Beginning in FY19, the ACME profile transferred to PE 0606355N.

A. Mission Description and Budget Item Justification

The ACME program advances Information Warfare (IW) (to include Command, Control, Communications, Computers; Intelligence, Surveillance and Reconnaissance (C4ISR); Electronic Warfare (EW); and Cyber Warfare), interoperability with Australia, Canada, New Zealand, United Kingdom, United States (AUSCANNZUKUS), North Atlantic Treaty Organization (NATO), and other Allied and Coalition partners. The program determines maritime operational gaps with our allies, identifies Doctrine, Organization, Training, Material, Leadership, Personnel, and Facilities (DOTMLPF) solutions with the potential to fill those gaps, and assesses these solutions and associated concepts of operation in laboratory and at-sea environments. The ACME program includes integration and testing in support of joint and Allied war fighting capabilities, including interoperability testing of IW equipment. Allied and joint interoperability is critical for future maritime operations, especially as the United States Navy (USN) expands Internet Protocol (IP) networking throughout the fleet via Consolidated Afloat Networks and Enterprise Services (CANES), Next Generation Networks (NGEN), Mission Partner Environment/ Future Mission Networking (MPE/FMN), the U.S. Battlefield Information Collection and Exploitation System - eXtended (BICES-X), and with the Joint Information Environment (JIE).

Currently, IP connectivity with AUSCANNZUKUS and other Allied/Coalition forces is limited, requiring extensive backhaul through ashore infrastructure. Higher bandwidth solutions suitable for use over tactical networks require development and assessment for emerging coalition and joint interoperability requirements, such as Maritime Domain Awareness (MDA), Network Operations Without Shore (NOWS), Satellite Communications (SATCOM) Denied, Degraded, Intermittent and Low-bandwidth (DDIL) operations, and to counter Anti-Access Area Denial (A2/AD) threats. Increases in data throughput are required for the effective exchange of rich IW data sets and services via Service Oriented Architectures (SOA) within the limitations of High Frequency (HF), Ultra-High Frequency (UHF), and other portions of the radio frequency spectrum, coupled with appropriate Information Assurance and Computer Network Defense (IA/CND) mechanisms. Development and assessment of potential solutions will integrate improved IP capabilities with the Advanced Digital Network Systems (ADNS) and existing international standards (e.g. Allied Communications Publication 200, NATO Standardization Agreements 5066 and 4691). The continued development and refinement of advanced tactical networking technologies and protocols, to include Low Probability of Intercept (LPI), Low Probability of Detection (LPD), and Anti-Jam (AJ) capabilities as well as Automatic Link Establishment (ALE) standards, will provide for a significant improvement in secure data sharing within, and between, coalition maritime elements.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604707N / *SEW Architecture/Eng Support*	**Project (Number/Name)** 0798 / *Allied/Coalition Maritime Environment (ACME)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Advanced Relay Capabilities	1.081	0.000	0.000	0.000	0.000
Articles:	-	-	-	-	-
FY 2019 Plans: FY19 Allied/Coalition Maritime Environment (ACME) funding resides under PE 0606355N Warfare Innovation Management.					
FY 2020 Base Plans: FY20 Allied/Coalition Maritime Environment (ACME) funding resides under PE 0606355N Warfare Innovation Management.					
FY 2020 OCO Plans: N/A					
Accomplishments/Planned Programs Subtotals	1.081	0.000	0.000	0.000	0.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Allied/Coalition Maritime Environment (ACME) is a non-acquisition program that promotes United States Navy interoperability with allied and coalition forces to achieve the Chief of Naval Operations (CNO) vision by facilitating maritime interoperability in both processes and communications systems, including emerging capabilities, to counter growing high-end asymmetric threats, and is a key enabler of the force multiplying benefits achieved through cooperation among the Australia, Canada, New Zealand, United Kingdom, United States (AUSCANNZUKUS), North Atlantic Treaty Organization (NATO), and other partner nations. Activities include acquiring intellectual capital in emerging technical areas through contracts providing technical engineering expertise and surge capacity for emerging tasks.

E. Performance Metrics

Advanced Relay Capabilities: The ACME program will employ laboratory testing and at-sea demonstrations to assess specific technologies, operational concepts, and integrated Doctrine, Organization, Training, Materiel, Leadership and Education, Personnel and Facilities (DOTMLPF) solutions pertaining to Denied, Degraded, Intermittent and Low-bandwidth (DDIL) operational environments, Network Operations Without Shore (NOWS), Maritime Domain Awareness (MDA), Mission Partner Environment/ Future Mission Networking (MPE/FMN), Joint Information Environment (JIE), and other aspects of Information Warfare (IW). These assessments will report on identified capability gaps, link capability gaps to technology/DOTMLPF gaps, identify technologies and DOTMLPF solutions considered ready for deployment, transition to a program of record to enhance Fleet war fighting capability, and enhance Allied interoperability.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604707N / *SEW Architecture/Eng Support*	Project (Number/Name) 0798 / *Allied/Coalition Maritime Environment (ACME)*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Advanced Relay Capabilities	C/CPFF	SAIC : McLean, VA	0.110	0.126	Jan 2018	0.000		0.000		-		0.000	0.000	0.236	Continuing
		Subtotal	0.110	0.126		0.000		0.000		-		0.000	0.000	0.236	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Advanced Relay Capabilities	Various	Various : Various	31.248	0.135	Jan 2018	0.000		0.000		-		0.000	0.000	31.383	Continuing
Advanced Relay Capabilities	WR	SSC PAC : San Diego	0.716	0.820	Jan 2018	0.000		0.000		-		0.000	0.000	1.536	Continuing
		Subtotal	31.964	0.955		0.000		0.000		-		0.000	0.000	32.919	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Management Services	Various	Various : Various	1.477	0.000		0.000		0.000		-		0.000	0.000	1.477	-
		Subtotal	1.477	0.000		0.000		0.000		-		0.000	0.000	1.477	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	33.551	1.081		0.000		0.000		-		0.000	0.000	34.632	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604707N / *SEW Architecture/Eng Support*	**Project (Number/Name)** 0798 / *Allied/Coalition Maritime Environment (ACME)*

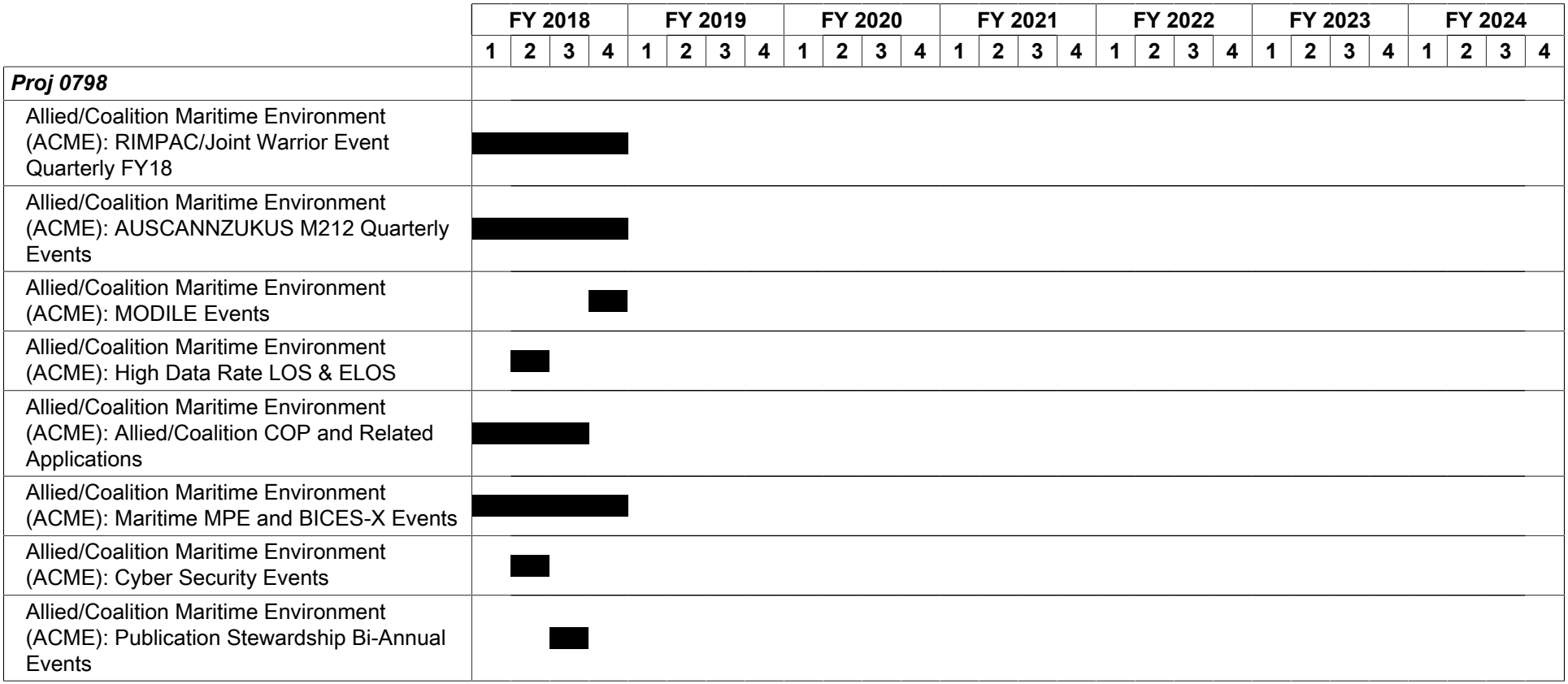


Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604707N / *SEW Architecture/Eng Support*	**Project (Number/Name)** 0798 / *Allied/Coalition Maritime Environment (ACME)*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 0798				
Allied/Coalition Maritime Environment (ACME): RIMPAC/Joint Warrior Event Quarterly FY18	1	2018	4	2018
Allied/Coalition Maritime Environment (ACME): AUSCANNZUKUS M212 Quarterly Events	1	2018	4	2018
Allied/Coalition Maritime Environment (ACME): MODILE Events	4	2018	4	2018
Allied/Coalition Maritime Environment (ACME): High Data Rate LOS & ELOS	2	2018	2	2018
Allied/Coalition Maritime Environment (ACME): Allied/Coalition COP and Related Applications	1	2018	3	2018
Allied/Coalition Maritime Environment (ACME): Maritime MPE and BICES-X Events	1	2018	4	2018
Allied/Coalition Maritime Environment (ACME): Cyber Security Events	2	2018	2	2018
Allied/Coalition Maritime Environment (ACME): Publication Stewardship Bi-Annual Events	3	2018	3	2018

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604707N / *SEW Architecture/Eng Support*	Project (Number/Name) 2144 / *Space & Elec Warfare Engineering*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
2144: *Space & Elec Warfare Engineering*	222.046	33.238	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	255.284
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Note

Beginning in FY19, Space and Electronic Warfare Engineering(SEW) funding profile transferred to PE 0606355N.

A. Mission Description and Budget Item Justification

To support Navy objectives in advancing Information Warfare (IW) capabilities, the Space and Electronic Warfare (SEW) Engineering project provides five main functions:

(1) Develop the architectures, specifications and standards, tools, and processes to support a single integrated Navy plan for cybersecurity. These engineering artifacts provide Navy specific guidance to drive common and consistent implementation of security controls across current and future Navy Programs of Record/projects. This eliminates redundancies and inefficiencies characteristic of previous stove-pipe development efforts in which each system addressed security individually. These efforts enable a standardized approach to move out faster to improve the Navy's cyber resiliency.

(2) Provide the cybersecurity vulnerability and functional test capability which supports cybersecurity test requirements and the Command, Control, Communications, Computers, Intelligence (C4I) components of USS Secure. USS Secure is a cyber assessment program within the Navy. This System of Systems (SoS) (Afloat, Aloft, C4I & Shore) capability in a test laboratory environment provides a rapidly re-configurable capability that integrates maritime hardware systems into a virtual platform. This platform level SoS provides cybersecurity research, development, test and evaluation, and training, not otherwise possible. This combination of Systems Commands (SYSCOM) laboratories, cyber ranges, and Red Teams simulating Navy platforms in operational maritime environments is critical for effectively evaluating cyber threats against specified mission threads.

(3) Define an integrated Enterprise Architecture to support design, development and delivery of integrated Navy Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance (C4ISR), Business Information Technology (IT), and Space System capabilities. This architecture reflects current (as-is) and future (target) end states to support technical analyses, program planning, and enterprise-level investment decisions across IW capabilities. Perform mission based system of systems analysis to ensure integration and interoperability, and validate end-to-end warfighting capabilities to quickly address emerging threats.

(4) Provides engineering tools and processes to drive rigorous Systems Engineering discipline across the acquisition lifecycle to support rapid development and delivery of secure and interoperable C4ISR, Business IT, and Space Systems capabilities that meet Fleet requirements. Conduct Systems Engineering Technical Reviews (SETRs) to provide independent, objective assessments of technical maturity and compliance with applicable architectures, specifications and standards across IW capabilities.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604707N / *SEW Architecture/Eng Support*	**Project (Number/Name)** 2144 / *Space & Elec Warfare Engineering*

(5) The Coalition Warrior Interoperability eXploration, eXperimentation, eXamination, eXercise (CWIX) provides a means to demonstrate and evaluate the interoperability of United States (US), North Atlantic Treaty Organization (NATO), and coalition information sharing systems.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Cybersecurity Architecture, Specifications and Standards	8.460	0.000	0.000	0.000	0.000
Articles:	-	-	-	-	-
FY 2019 Plans: FY19 Cybersecurity Architecture, Specifications and Standards funding resides under PE 0606355N Warfare Innovation Management.					
FY 2020 Base Plans: FY20 Cybersecurity Architecture, Specifications and Standards funding resides under PE 0606355N Warfare Innovation Management.					
FY 2020 OCO Plans: N/A					
Title: Cybersecurity Vulnerability & Functional Test Capability	20.833	0.000	0.000	0.000	0.000
Articles:	2	-	-	-	-
FY 2019 Plans: FY19 Cybersecurity Vulnerability & Functional Test Capability funding resides under PE 0606355N Warfare Innovation Management.					
FY 2020 Base Plans: FY20 Cybersecurity Vulnerability & Functional Test Capability funding resides under PE 0606355N Warfare Innovation Management.					
FY 2020 OCO Plans: N/A					
Title: Enterprise Architecture	0.716	0.000	0.000	0.000	0.000
Articles:	-	-	-	-	-
FY 2019 Plans: FY19 Enterprise Architecture funding resides under PE 0606355N Warfare Innovation Management.					
FY 2020 Base Plans:					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604707N / *SEW Architecture/Eng Support*	**Project (Number/Name)** 2144 / *Space & Elec Warfare Engineering*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
FY20 Enterprise Architecture funding resides under PE 0606355N Warfare Innovation Management. ***FY 2020 OCO Plans:*** N/A					
Title: SYSCOM Systems Engineering ***Articles:*** ***FY 2019 Plans:*** FY19 SYSCOM Systems Engineering funding resides under PE 0606355N Warfare Innovation Management. ***FY 2020 Base Plans:*** FY20 SYSCOM Systems Engineering funding resides under PE 0606355N Warfare Innovation Management. ***FY 2020 OCO Plans:*** N/A	2.197 -	0.000 -	0.000 -	0.000 -	0.000 -
Title: Coalition Warrior Interoperability eXploration, eXperimentation, eXamination, eXercise (CWIX) ***Articles:*** ***FY 2019 Plans:*** FY19 CWIX funding resides under PE 0606355N Warfare Innovation Management. ***FY 2020 Base Plans:*** FY20 CWIX funding resides under PE 0606355N Warfare Innovation Management. ***FY 2020 OCO Plans:*** N/A	1.032 -	0.000 -	0.000 -	0.000 -	0.000 -
Accomplishments/Planned Programs Subtotals	33.238	0.000	0.000	0.000	0.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Space and Electronic Warfare (SEW) Engineering is a non-acquisition program that develops, tests, implements technical authority, and validates naval Navy Command, Control, Communications, Computers, Intelligence,

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604707N / *SEW Architecture/Eng Support*	**Project (Number/Name)** 2144 / *Space & Elec Warfare Engineering*

Surveillance, and Reconnaissance (C4ISR); provides integrated Architecture products and supports C4ISR systems engineering processes and standards. Activities include acquiring intellectual capital in emerging technical areas through contracts providing technical engineering expertise and surge capacity for emerging tasks.

E. Performance Metrics

The SEW engineering program will employ rigorous and consistent system engineering practices in an evolving value model to support development and deployment of shipboard, undersea, and land based capabilities based on mission and performance requirements, integrated enterprise architectures, model-validated solutions, and sustainment and supportability needs for the Command and Control (C2), Intelligence, Networks, Communications, Space, and Business Information Technology (IT) domains.

Coalition Warrior Interoperability eXploration, eXperimentation, eXamination, eXercise (CWIX) Performance Metrics: Three key metrics: (1) Interoperability and compliance with Naval (Navy and Marine Corps), joint, coalition and other non-governmental organization architectures, systems and equipment; (2) Compliance with Defense Information Services Agency (DISA), National Security Agency (NSA), and other joint and coalition information assurance and security standards; and (3) warfighter utility assessment across the joint and coalition spectrum. Specific metrics validate performance of individual technologies participating in CWIX as well as in other venues as appropriate.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604707N / *SEW Architecture/Eng Support*	Project (Number/Name) 2144 / *Space & Elec Warfare Engineering*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Cybersecurity Architecture, Specifications and Standards	Various	Various : Various	8.667	0.000		0.000		0.000		-		0.000	0.000	8.667	-
Cybersecurity Architecture, Specifications and Standards	C/CPFF	AUSGAR : San Diego, CA	5.667	1.164	Mar 2018	0.000		0.000		-		0.000	0.000	6.831	-
Cybersecurity Architecture, Specifications and Standards	WR	SSC LANT : Charleston, SC	4.145	1.270	Feb 2018	0.000		0.000		-		0.000	0.000	5.415	-
Cybersecurity Architecture, Specifications and Standards	WR	SSC PAC : San Diego, CA	10.502	3.090	Feb 2018	0.000		0.000		-		0.000	0.000	13.592	-
Cybersecurity Architecture, Specifications and Standards	C/CPFF	BAH : McLean, VA	7.631	2.936	Jul 2018	0.000		0.000		-		0.000	0.000	10.567	-
Cybersecurity Vulnerability & Functional Test Capability	C/CPFF	Various : Various	0.000	4.452	Jun 2018	0.000		0.000		-		0.000	0.000	4.452	-
Cybersecurity Vulnerability & Functional Test Capability	WR	SSC PAC` : San Diego, CA	0.000	2.932	Mar 2018	0.000		0.000		-		0.000	0.000	2.932	-
Cybersecurity Vulnerability & Functional Test Capability	C/CPFF	SSC LANT : Charleston, SC	0.000	4.638	Jun 2018	0.000		0.000		-		0.000	0.000	4.638	-
Cybersecurity Vulnerability & Functional Test Capability.	C/CPFF	SSC PAC : San Diego, CA	0.000	6.986	Jun 2018	0.000		0.000		-		0.000	0.000	6.986	-
Cybersecurity Vulnerability & Functional Test Capability	WR	SSC LANT' : Charleston, SC	0.000	1.825	Mar 2018	0.000		0.000		-		0.000	0.000	1.825	-
		Subtotal	36.612	29.293		0.000		0.000		-		0.000	0.000	65.905	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604707N / *SEW Architecture/Eng Support*	Project (Number/Name) 2144 / *Space & Elec Warfare Engineering*	

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
SEW Development Support/Systems Engineering	Various	Various : Various	78.537	0.000		0.000		0.000		-		0.000	0.000	78.537	-
SEW/C4I Technology Integration	Various	Various : Various	12.985	0.000		0.000		0.000		-		0.000	0.000	12.985	-
MDA Prototype SE Support	Various	Various : Various	17.376	0.000		0.000		0.000		-		0.000	0.000	17.376	-
Enterprise Architecture	Various	Various : Various	3.630	0.000		0.000		0.000		-		0.000	0.000	3.630	-
Enterprise Architecture	C/CPFF	AUSGAR : San Diego, CA	2.120	0.322	Mar 2018	0.000		0.000		-		0.000	0.000	2.442	-
Enterprise Architecture	WR	SSC LANT : Charleston, SC	1.121	0.107	Feb 2018	0.000		0.000		-		0.000	0.000	1.228	-
Enterprise Architecture	WR	SSC PAC : San Diego, CA	2.765	0.287	Feb 2018	0.000		0.000		-		0.000	0.000	3.052	-
SYSCOM Systems Engineering	C/CPFF	AUSGAR : San Diego, CA	4.645	1.297	Mar 2018	0.000		0.000		-		0.000	0.000	5.942	-
SYSCOM Systems Engineering	WR	SSC PAC : San Diego, CA	6.239	0.638	Feb 2018	0.000		0.000		-		0.000	0.000	6.877	-
SYSCOM Systems Engineering	C/CPFF	SAIC : McLean, VA	0.940	0.262	Jan 2018	0.000		0.000		-		0.000	0.000	1.202	-
		Subtotal	130.358	2.913		0.000		0.000		-		0.000	0.000	133.271	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
SEW Eng/CWIX/JRAE	Various	Various : Various	48.685	0.000		0.000		0.000		-		0.000	0.000	48.685	-
SEW Eng/CWIX	MIPR	Defense Information Systems Agency : Arlington, VA	0.709	0.115	Apr 2018	0.000		0.000		-		0.000	0.000	0.824	-
SEW Eng/CWIX	WR	SSC PAC : San Diego, CA	4.526	0.576	Dec 2017	0.000		0.000		-		0.000	0.000	5.102	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604707N / *SEW Architecture/Eng Support*	**Project (Number/Name)** 2144 / *Space & Elec Warfare Engineering*

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
SEW Eng/CWIX	C/CPFF	SAIC : McLean, VA	0.711	0.223	Jan 2018	0.000		0.000		-		0.000	0.000	0.934	-
SEW Eng/CWIX	C/CPFF	AUSGAR : San Diego, CA	0.374	0.118	Mar 2018	0.000		0.000		-		0.000	0.000	0.492	-
		Subtotal	55.005	1.032		0.000		0.000		-		0.000	0.000	56.037	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
ACQ Workforce Fund	Various	Various : Various	0.071	0.000		0.000		0.000		-		0.000	0.000	0.071	-
		Subtotal	0.071	0.000		0.000		0.000		-		0.000	0.000	0.071	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	222.046	33.238		0.000		0.000		-		0.000	0.000	255.284	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604707N / *SEW Architecture/Eng Support*	**Project (Number/Name)** 2144 / *Space & Elec Warfare Engineering*

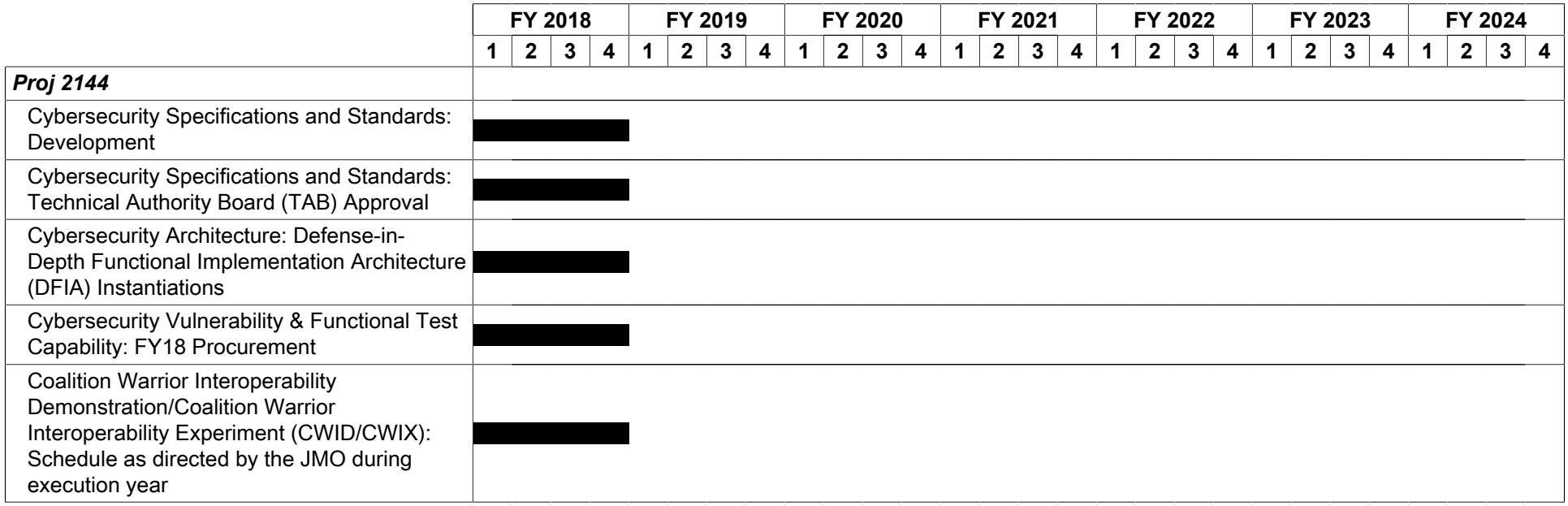


Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604707N / *SEW Architecture/Eng Support*	**Project (Number/Name)** 2144 / *Space & Elec Warfare Engineering*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 2144				
Cybersecurity Specifications and Standards: Development	1	2018	4	2018
Cybersecurity Specifications and Standards: Technical Authority Board (TAB) Approval	1	2018	4	2018
Cybersecurity Architecture: Defense-in-Depth Functional Implementation Architecture (DFIA) Instantiations	1	2018	4	2018
Cybersecurity Vulnerability & Functional Test Capability: FY18 Procurement	1	2018	4	2018
Coalition Warrior Interoperability Demonstration/Coalition Warrior Interoperability Experiment (CWID/CWIX): Schedule as directed by the JMO during execution year	1	2018	4	2018

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604707N / *SEW Architecture/Eng Support*	Project (Number/Name) 2147 / *ISR Architecture*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
2147: *ISR Architecture*	1.482	0.689	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	2.171
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Note

Beginning in FY19, the Intelligence, Surveillance, and Reconnaissance (ISR) funding profile transferred to PE 0606355N.

A. Mission Description and Budget Item Justification

Integrated architectures provide a technical framework for assessing capability gaps and performance of individual systems and System of Systems (SoS) and their ability to effectively provide the desired effects to support warfighting missions. They also serve as a means to influence and drive Programs of Record (PoR) toward a common, more efficient state that promotes interoperability and security.

The Naval Intelligence, Surveillance, and Reconnaissance (ISR) Reference Architecture project is intended to guide system of systems capability development and promote interoperability across Navy ISR programs, as well as interoperability and alignment with Department of Defense (DoD)-wide enterprise initiatives including Joint Information Environment and Intelligence Community Information Technology Environment and Space & Naval Warfare Systems Command-wide Enterprise Architecture policies. This effort to develop integrated ISR architectures will also help instill systems engineering discipline and standardization across the Navy ISR Enterprise and provide a means by which to assess ISR PoR progress in conforming to a single Navy architecture. These efforts will help reduce Information Technology/ISR infrastructure complexity and variances, making it easier to manage, operate and defend our ISR capabilities, and help inform investment decisions across the Navy's ISR enterprise to support Assured Command and Control, Battlespace Awareness and Integrated Fires.

This effort encompasses the documentation and analysis of current ISR enterprise architectures to inform and guide requirements for target architecture development and performance requirements to support full use and incorporation of ISR capabilities to advance Navy operations afloat. The associated studies will produce both technical and non-technical implementation guidance across the Doctrine, Organization, Training, Material, Leadership, Personnel and Facilities spectrum.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Intelligence, Surveillance, and Reconnaissance (ISR) Architecture	0.689	0.000	0.000	0.000	0.000
Articles:	-	-	-	-	-
FY 2019 Plans: FY19 ISR Architecture funding resides under PE 0606355N Warfare Innovation Management.					
FY 2020 Base Plans: FY20 ISR Architecture funding resides under PE 0606355N Warfare Innovation Management.					
FY 2020 OCO Plans:					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604707N / *SEW Architecture/Eng Support*	**Project (Number/Name)** 2147 / *ISR Architecture*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
N/A					
Accomplishments/Planned Programs Subtotals	0.689	0.000	0.000	0.000	0.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

The Naval ISR Architecture project is a non-acquisition program that provides integrated architecture products, engineering analysis of current and target/future capabilities to identify capability gaps and shortfalls, and provides solution recommendations. These combined efforts support the ability to articulate risks, and align/ prioritize investment decision recommendations within the ISR domain for the Navy.

E. Performance Metrics

The Naval (Navy and Marine Corps) ISR Reference Architecture effort will use consistent systems engineering practices to support development of integrated ISR enterprise architectures, and model-validated solution recommendations against quantified technical and operational performance parameters.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604707N / *SEW Architecture/Eng Support*	Project (Number/Name) 2147 / *ISR Architecture*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
ISR Architecture	C/CPFF	METRON : Reston, VA	1.382	0.582	Dec 2017	0.000		0.000		-		0.000	0.000	1.964	-
ISR Architecture	WR	SSC PAC : San Diego, CA	0.100	0.107	Dec 2017	0.000		0.000		-		0.000	0.000	0.207	-
		Subtotal	1.482	0.689		0.000		0.000		-		0.000	0.000	2.171	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	1.482	0.689		0.000		0.000		-		0.000	0.000	2.171	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604707N / *SEW Architecture/Eng Support*	**Project (Number/Name)** 2147 / *ISR Architecture*

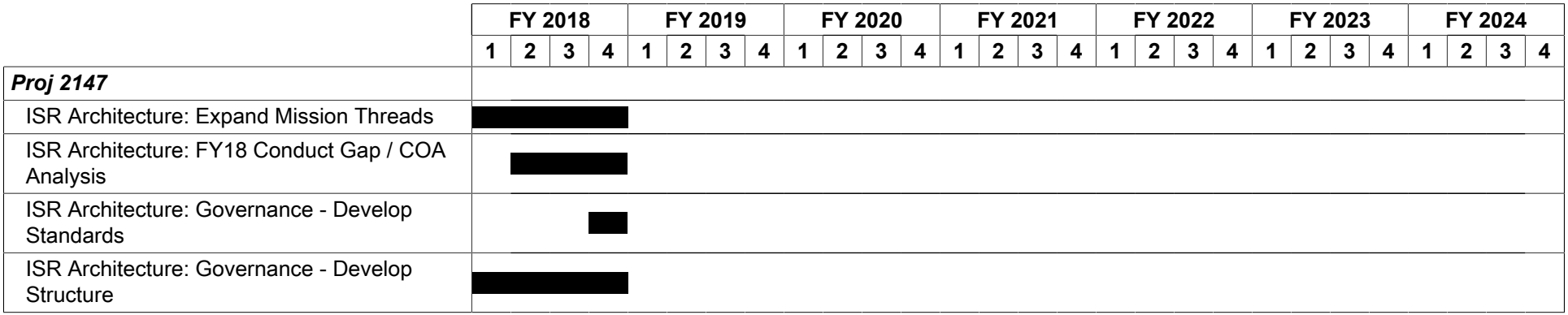


Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604707N / *SEW Architecture/Eng Support*	**Project (Number/Name)** 2147 / *ISR Architecture*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 2147				
ISR Architecture: Expand Mission Threads	1	2018	4	2018
ISR Architecture: FY18 Conduct Gap / COA Analysis	2	2018	4	2018
ISR Architecture: Governance - Develop Standards	4	2018	4	2018
ISR Architecture: Governance - Develop Structure	1	2018	4	2018

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy											Date: March 2019	
Appropriation/Budget Activity 1319 / 4					R-1 Program Element (Number/Name) PE 0604707N / *SEW Architecture/Eng Support*				Project (Number/Name) 2356 / *Maritime Concept Generation & Development*			
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
2356: *Maritime Concept Generation & Development*	27.209	6.206	7.230	5.263	-	5.263	8.662	9.179	9.407	9.595	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Maritime Concept Generation and Development (MCGD) funding provides naval warfare subject matter expertise, experiment planning expertise, Modeling and Simulation (M&S) support, and analysis expertise to enable execution of the planned experiment efforts (and the individual experiment initiatives contained within) in the areas of Electromagnetic Maneuver Warfare (EMW), Mine Warfare, Naval Force Integration, Operational Level of War/Tactical Level of War Integration, and emerging Naval concepts.

Typical deliverables for each experimental effort include:

- Experiment control plan
- Data Collection and Analysis Plan (DCAP)
- Experiment Analysis Summary Reference Document
- Experiment Engineering Plan
- Final Experiment Report (with Doctrine, Organization, Training, Materiel, Leadership, and Personnel (DOTMLP) recommendations)
- New/refined doctrine/Tactics, Techniques and Procedures (TTP)

The Maritime Concept Generation and Concept Development project funds four main efforts:

(1) Provides critical concept development and experimentation manpower and warfighting subject matter expertise aligned with the Concept Generation/Concept Development (CG/CD) program. The priorities for the CG/CD program are to develop concept/concept of operations and explore near/far-term technological and non-technological solutions to war fighting gaps across all naval warfare areas. The associated experimentation efforts include planning, systems engineering and integration, modeling and simulation support, event execution,
data collection, analysis, and assessment for a wide-range of experimentation efforts including the examination of prototypes, tactical development and evaluation, support for Science and Technology (S&T) innovation, and program of record system development; venues such as workshops, seminars, war games, limited objective experiments, limited technical experiments, and live at-sea events are used to execute these experimentation efforts.

(2) Provides naval warfare subject matter expertise, experiment planning expertise, and analysis expertise to plan, execute, and assess experimentation for the fleets and warfighting development centers (WDC) at the operational and tactical levels. This includes a focus on WDC integration role, maritime command and control (C2), advanced cross-domain warfighting, and maritime operations centers (MOCS)/operational level of war (OLW) lines of operations. Seeks to solve fleet-identified warfighting gaps (referenced within the Integrated Prioritized Capability Lists (IPCL), Urgent Operational Needs Statements (UONS), Fleet Commander's Guidance, etc.). The experimentation and prototyping efforts support the "last tactical mile" of many Navy S&T programs by supporting those programs where the technology is mature enough, but requires evaluation on or by a "fleet asset" - ships, airplanes, submarines, and sailors.

(3) Provides modeling and simulation (M&S) support to Navy experimentation efforts. M&S is used to stimulate decision making during seminar-style and system war gaming experiments and provides the simulated operational environment and capabilities with high-fidelity models such as the Joint Semi-Automated Force (JSAF)

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604707N / *SEW Architecture/Eng Support*	**Project (Number/Name)** 2356 / *Maritime Concept Generation & Development*

program. Additionally, where applicable, the Navy Simulation System (NSS) "Monte Carlo" model is also used to give high confidence solutions and outcomes to complex warfighting problems.
(4) Provides for focused, solution-driven tactics development and evaluation through experimentation. This effort is focused on developing near-term doctrine solutions to address specific fleet-identified tactical issues.

Maritime Concept Generation and Concept Development products include:
- Concepts (signed by the CNO that influence future funding and technological development)
- Enabling concepts
- Concepts of operations (CONOPS)
- Final experimentation reports (including findings, insights, and recommendations and DOTMLPF change recommendations and plans for action)
- Experiment Analysis Summary Reference Documents
- New/revised doctrinal and Tactics/Techniques/Procedures publications
- White papers (think pieces) intended to generate further discussion within Navy leadership

Specific products are listed in the Accomplishments/Plans section of this exhibit.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Maritime Concept Generation and Development	6.206	7.230	5.263	0.000	5.263
Articles:	-	-	-	-	-
FY 2019 Plans: Through FY19 Maritime Concept Generation and Development (MDGD) experiment efforts, Navy will continue to provide experiment, analytical and naval mission subject matter expertise support throughout the planning and execution process; identify fleet warfighting deficiencies through experimentation; identify and capture innovative solutions for fleet experiments that address prioritized fleet warfighting gaps; and identify suitable events to support the execution of the following Experimentation Campaigns: FLEET DESIGN EXPERIMENTS In keeping with the CNO's Design for Maintaining Maritime Superiority, the Fleet Design concept has been developed and approved. Continuing the development of the supporting doctrine, Tactics, Techniques and Procedures (TTP), command and control (C2) as well as the integration and interoperability required between weapon systems and decision makers requires a methodical experimental approach. FY19 experiments (both at-sea and via war simulations) will strive to achieve the objectives as laid out in the Fleet Design campaign plan.					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604707N / *SEW Architecture/Eng Support*	**Project (Number/Name)** 2356 / *Maritime Concept Generation & Development*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
HUMAN-MACHINE INTEGRATION (HMI) OF ARTIFICIAL INTELLIGENCE (AI) EXPERIMENTATION - This effort will examine the incorporation of AI capabilities into Naval technologies, TTPs, and C2 processes such as the development of AI-enabled Tactical Decision Aids that autonomously transition data into information. ELECTROMAGNETIC MANEUVER WARFARE (EMW) EXPERIMENTATION Navy will conduct multiple events designed to synchronize and align experiment initiatives with electromagnetic maneuver warfare (EMW) tasks to provide solutions to EMW capability gaps and to ensure development of doctrine and TTP is synchronized with the introduction of new technology and provides the Fleet and Fleet trainers with required doctrine tools at the tactical and operational levels. Specific events planned for FY19 include: FLEET TACTICAL GRID ENABLERS At-Sea Experiment - This effort will examine and enhance the integration and interoperability of sensors, networks, data fusion, and analytic capabilities across national, theater, and organic platforms to explore the vision for a Fleet Tactical Grid. OFFICE OF NAVAL RESEARCH (ONR) TECHNOLOGY INNOVATION GAMES (TIGS). This series of workshops executed in conjunction with ONR will give Fleet operators the opportunity to examine emerging capabilities and determine potential concepts of employment to effectively incorporate innovative capabilities into Fleet warfighting missions and tasks. Four workshops are planned for FY19 to examine Cross-Platform Integration and Vector Assessment, Arctic Mobile Observing System, Expeditionary Maneuver/Mine Warfare, and Fast Agile Naval Technology Munition Supercavitating Torpedo Prototype (F-STEP). MARITIME CYBERSPACE EXPERIMENT - This classified effort builds upon prior year experiments to further examine U.S. Navy vulnerabilities to adversary cyber capabilities. PANDARRA WAVE 19 At-Sea Experiment - This classified effort builds upon prior year experiments to further examine U.S. Navy vulnerabilities to adversary Intelligence, Surveillance, and Reconnaissance (ISR) capabilities. RED NITRUM 19 At-Sea Experiment - This classified effort builds upon prior year experiments to further examine U.S. Navy vulnerabilities to adversary capabilities.					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604707N / *SEW Architecture/Eng Support*	**Project (Number/Name)** 2356 / *Maritime Concept Generation & Development*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
COUNTER-UNMANNED SYSTEMS (C-UXS) EXPERIMENT SERIES - This effort will build upon prior year experimentation by examining emerging TTPs and technologies to counter the proliferation of unmanned undersea, surface, and air vehicles. The series will consist of workshops focused on countering various types of unmanned systems culminating in an at-sea cross domain Counter-Unmanned Systems (C-UxS) experiment. NAVAL FORCE INTEGRATION EXPERIMENTATION Naval Force Integration experiments (workshops, war simulations, and at-sea events) will examine integration and interoperability issues associated with coordinated USN-USMC operations. The primary goal of the campaign is to reexamine Navy and Marine Corps organizational and command relationships in order to enable effective Naval operations across the maritime domain. Specific events planned for FY19 include: LARGE SCALE EXERCISE (LSE) 2020 - In FY19, this planning effort will support the execution of LSE 2020 early in calendar year 2020; a Naval exercise at the Operational to Tactical Level of War in a maritime theater with assigned live and synthetic assets in stressing competitor conditions to provide a comprehensive assessment of the three enabling components of fleet design. MINE WARFARE (MIW) EXPERIMENTATION Through workshops, war simulations and at-sea events, the FY 19 efforts will continue to examine TTP and C2 construct for our future Mine Counter Measures (MCM) force as new programs of record and unmanned systems come on line, and legacy systems begin to decommission. Specific events planned for FY19 include: MCM ADAPTIVE FORCE PACKAGES (AFP) At-Sea Experiment - This effort will examine the employment of USN MCM AFPs from alternative platforms. OPERATIONAL LEVEL OF WAR/TACTICAL LEVEL OF WAR (OLW/TLW) INTEGRATION EXPERIMENTATION OLW/TLW Integration experiments (workshops, war simulations and at-sea events) will examine current and emerging tactics, techniques, and procedures (TTPs) and current and emerging technologies with a goal of identifying innovative solutions that will support the capstone naval concept of a Fleet Design based on integration, distribution, and maneuver. Specific events planned for FY19 include: DISTRIBUTED MARITIME OPERATIONS (DMO) Experimentation - This effort will address key Distributed Maritime Operations (DMO) concept action plan items such as a DMO War Simulation, a Fleet Organization					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604707N / *SEW Architecture/Eng Support*	**Project (Number/Name)** 2356 / *Maritime Concept Generation & Development*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
War Simulation, an examination of Fleet Command and Maritime Operation Center (MOC) capabilities, and the employment of unmanned systems in support of DMO. SPACE EXPERIMENT SERIES - This effort will build upon prior year experimentation on the employment of space-based capabilities and will focus on SATCOM Agility and MOC Space Integration through a series of workshops and at-sea events leveraging fleet exercises such as Pacific Sentry and Austere Challenge. EMERGING CONCEPTS WAR SIMULATIONS - This effort will employ multiple seminar war simulations to examine emerging concepts such as Fleet Design, Distributed Maritime Operations, and multiple feeder concepts. FOR FY19 CONCEPT GENERATION/CONCEPT DEVELOPMENT (CG/CD) Continue Concept Generation/Concept Development (CG/CD) development efforts that carry-over from FY 2018: Navy will finish enabling concepts for Fleet Design. This includes implementation of the Distributed Maritime Operations (DMO) concept Action Plan. Additional concepts and CONOPs to be developed in FY19 will be determined through the CG/CD development process and additional external factors. Concepts under consideration include Unmanned Systems in support of DMO, Command and Control in support of DMO, Offensive Mine Warfare, Targeting in support of DMO, and Advanced Autonomous/Semi-autonomous Sustainment Systems.					
FY 2020 Base Plans: Through FY20 Maritime Concept Generation and Development (MDGD) experiment efforts, Navy will continue to provide experiment, analytical and naval mission subject matter expertise support throughout the planning and execution process; identify fleet warfighting deficiencies through experimentation; identify and capture innovative solutions for fleet experiments that address prioritized fleet warfighting gaps; and identify suitable events to support the execution of the following Experimentation Campaigns: FLEET DESIGN EXPERIMENTS In keeping with the CNO's Design for Maintaining Maritime Superiority, the emerging concept ""Fleet Design"" has been developed. Continuing the development of the supporting doctrine, TTP, Command and control (C2) as well as the integration and interoperability required between weapon systems and decision makers requires a					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604707N / *SEW Architecture/Eng Support*	**Project (Number/Name)** 2356 / *Maritime Concept Generation & Development*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
methodical experimental approach. FY20 experiments (both at-sea and via war games) will strive to achieve the objectives as laid out in the accompanying action/implementation plan. Specific events planned for FY20 include: HUMAN-MACHINE INTEGRATION (HMI) OF ARTIFICIAL INTELLIGENCE (AI) EXPERIMENTATION - This effort will examine the incorporation of AI capabilities into Naval technologies, TTPs, and C2 processes such as the development of AI-enabled Tactical Decision Aids that autonomously transition data into information. ELECTROMAGNETIC MANEUVER WARFARE (EMW) EXPERIMENTATION Navy will conduct multiple events designed to synchronize and align experiment initiatives with EMW tasks to provide solutions to EMW capability gaps and to ensure development of doctrine and TTP is synchronized with the introduction of new technology and provides the Fleet and Fleet trainers with required doctrine tools at the tactical and operational levels. OFFICE OF NAVAL RESEARCH (ONR) TECHNOLOGY INNOVATION GAMES (TIGS). This series of workshops executed in conjunction with ONR will give Fleet operators the opportunity to examine emerging capabilities and determine potential concepts of employment to effectively incorporate innovative capabilities into Fleet warfighting missions and tasks. Potential technology to be examined in FY20 is not yet determined. MARITIME CYBERSPACE EXPERIMENT - This classified effort builds upon prior year experiments to further examine U.S. Navy vulnerabilities to adversary cyber capabilities. PANDARRA WAVE 20 At-Sea Experiment - This classified effort builds upon prior year experiments to further examine U.S. Navy vulnerabilities to adversary ISR capabilities. RED NITRUM 20 At-Sea Experiment - This classified effort builds upon prior year experiments to further examine U.S. Navy vulnerabilities to adversary electronic attack capabilities. COUNTER-UNMANNED SYSTEMS (C-UXS) EXPERIMENT SERIES - This effort will build upon prior year experimentation by examining emerging TTPs and technologies to counter the proliferation of unmanned undersea, surface, and air vehicles. The series will consist of workshops focused on countering various types of unmanned systems culminating in an at-sea cross domain C-UxS experiment. NAVAL FORCE INTEGRATION EXPERIMENTATION					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604707N / *SEW Architecture/Eng Support*	**Project (Number/Name)** 2356 / *Maritime Concept Generation & Development*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Naval Force Integration experiments (workshops, War games, and at-sea events) will examine integration and interoperability issues associated with coordinated USN-USMC operations. The primary goal of the campaign is to reexamine Navy and Marine Corps organizational and command relationships in order to enable effective Naval operations across the maritime domain. Specific events currently planned for FY20 include: LARGE SCALE EXERCISE (LSE) 2020 - This Naval exercise at the Operational to Tactical Level of War in a maritime theater with assigned live and synthetic assets in stressing competitor conditions will provide a comprehensive assessment of the three enabling components of fleet design - Integration, Distribution, and Maneuver. MINE WARFARE (MIW) EXPERIMENTATION Through workshops, war games and at-sea events, the FY20 efforts will continue to examine TTP and C2 construct for our future MCM force as new programs of record and unmanned systems come on line, and legacy systems begin to decommission. OPERATIONAL LEVEL OF WAR/TACTICAL LEVEL OF WAR (OLW/TLW) INTEGRATION EXPERIMENTATION OLW/TLW Integration experiments (workshops, war games and at-sea events) will examine current and emerging TTPs and current and emerging technologies with a goal of identifying innovative solutions that will support the capstone naval concept of a Fleet Design based on integration, distribution, and maneuver. Specific events planned for FY20 include: DISTRIBUTED MARITIME OPERATIONS (DMO) Experimentation - This effort will address key DMO concept action plan items such as the examination of Fleet Command and Maritime Operation Center (MOC) capabilities, and the employment of unmanned systems in support of DMO. SPACE EXPERIMENT SERIES - This effort will build upon prior year experimentation on the employment of space-based capabilities at the OLW/TLW. EMERGING CONCEPTS WAR GAMES - This effort will employ multiple seminar war games to examine emerging concepts such as Fleet Design, Distributed Maritime Operations, and multiple feeder concepts. FOR FY20 CONCEPT GENERATION/CONCEPT DEVELOPMENT (CG/CD)					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604707N / *SEW Architecture/Eng Support*	**Project (Number/Name)** 2356 / *Maritime Concept Generation & Development*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Continue CG/CD development efforts that carry-over from FY19: Additional concepts and CONOPs to be developed in FY20 will be determined through the CG/CD development process and additional external factors. Concepts under consideration include Unmanned Systems in support of DMO, Command and Control in support of DMO, Offensive Mine Warfare, Targeting in support of DMO, and Advanced Autonomous/Semi-autonomous Sustainment Systems. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** The FY2020 Project 2356 funding request was reduced by $1.897 million to account for the availability of prior year execution balances. Further decreases are due to the implementation of major concepts experiments during FY19 which will shift focus to continuous concept generation/concept development efforts for FY20 resulting in less resources required.					
Accomplishments/Planned Programs Subtotals	6.206	7.230	5.263	0.000	5.263

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

This funding is used to acquire intellectual capital in emerging conceptual and technical areas through contracts providing expertise in concepts and experiment design, execution and analysis to mitigate fleet-identified current and future war fighting gaps.

E. Performance Metrics

Maritime Concept Generation and Development/Related Experimentation:
- Integrate emergent concepts and technologies, leading to rapid introduction of needed war fighting capabilities.
- Rapidly mature concepts, technologies, and doctrine.
- Develop near-term doctrine solutions to address specific fleet-identified tactical level / operation level issues.
- Develop recommended Doctrine, Organization, Training, Materiel, Leadership, and Personnel (DOTMLP) changes required to introduce emergent technology and tactics.
- Refine concepts and identify key performance levels necessary for implementation.
- Demonstrate feasibility and discriminate among competing concepts and implementation alternatives.
- Identify potential military effectiveness and risk.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604707N / *SEW Architecture/Eng Support*	**Project (Number/Name)** 2356 / *Maritime Concept Generation & Development*

- Evaluate how much of the new capability and attendant force structure is needed.
- Identify how to operate the new force and combine it with the legacy force.
- Focus on near, mid and long term war fighting challenges to realize increased war fighting effectiveness.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604707N / *SEW Architecture/Eng Support*	Project (Number/Name) 2356 / *Maritime Concept Generation & Development*	

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
System Test and Evaluation	C/CPFF	Defense Technical Information Center : Ft Belvoir VA	12.713	3.780	Dec 2017	4.148	Jan 2019	2.315	Jun 2020	-		2.315	Continuing	Continuing	Continuing
System Test and Evaluation	Various	SPAWARSYSCEN : Charleston, SC	2.734	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
System Test and Evaluation	Various	ONR : Washington, DC	1.370	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
System Test and Evaluation	Various	NAVSEA : Washington, DC	1.334	0.000		0.000		0.000		-		0.000	0.000	1.334	-
System Test and Evaluation	PO	Naval Underwater Warfare Center : Newport RI	0.500	0.000		0.000		0.000		-		0.000	0.000	0.500	-
System Test and Evaluation	C/CPFF	NAVSUP : Norfolk VA	5.694	2.426	Dec 2017	3.082	Jan 2019	2.948	Jun 2020	-		2.948	0.000	14.150	-
Center for Naval Analysis	IA	Center for Naval Analysis : Norfolk, VA	0.154	0.000		0.000		0.000		-		0.000	0.000	0.154	-
		Subtotal	24.499	6.206		7.230		5.263		-		5.263	Continuing	Continuing	N/A

Remarks

The vast majority of the contract costs are for contract labor; primarily on two large Multi-Award contracts, one through DTIC (Defense Services MAC) and one through Joint Staff J-7 MAC. Task orders on the DS MAC contract provide the majority of the Modeling & Simulation support for experimentation and some of the experiment planner support. Task orders on the JS J-7 MAC provide the majority of the experiment design, planner, and execution support.

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management	C/FFP	Navy Warfare Development Command : Norfolk, VA	2.710	0.000		0.000		0.000		-		0.000	0.000	2.710	-
		Subtotal	2.710	0.000		0.000		0.000		-		0.000	0.000	2.710	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604707N / *SEW Architecture/Eng Support*	Project (Number/Name) 2356 / *Maritime Concept Generation & Development*	

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	27.209	6.206		7.230		5.263		-		5.263	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604707N / *SEW Architecture/Eng Support*	**Project (Number/Name)** 2356 / *Maritime Concept Generation & Development*

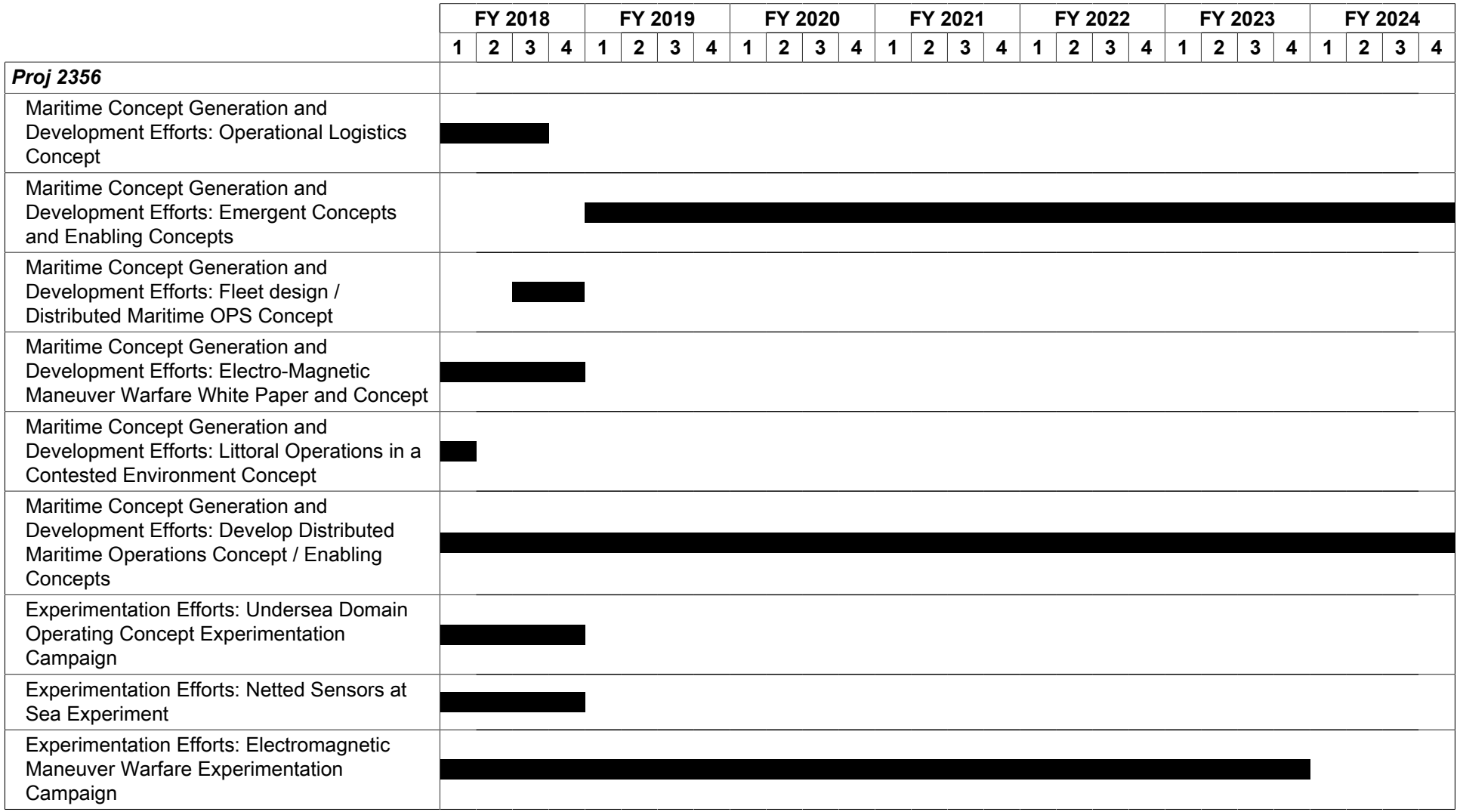


Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604707N / *SEW Architecture/Eng Support*	**Project (Number/Name)** 2356 / *Maritime Concept Generation & Development*

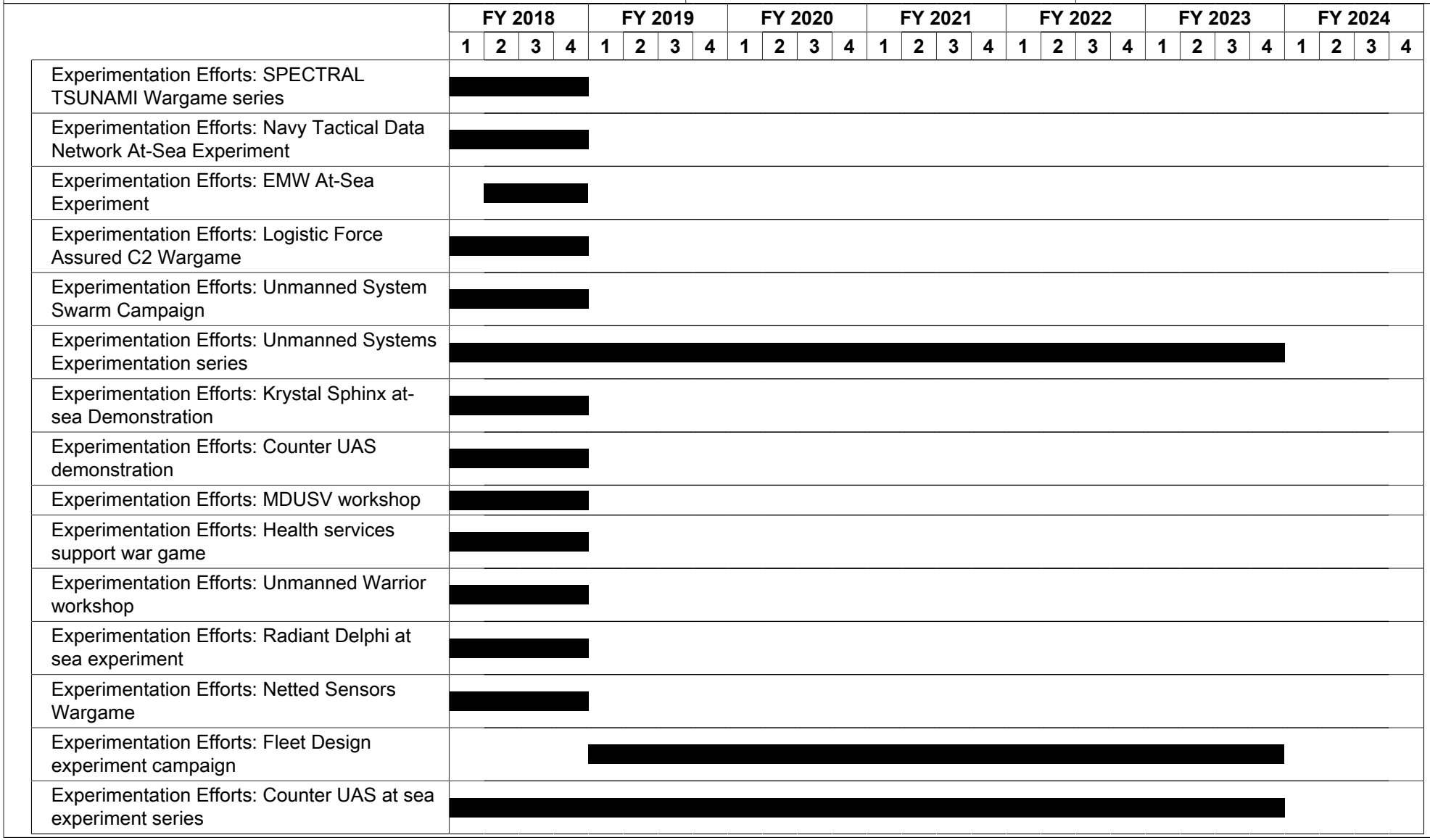


Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604707N / *SEW Architecture/Eng Support*	**Project (Number/Name)** 2356 / *Maritime Concept Generation & Development*

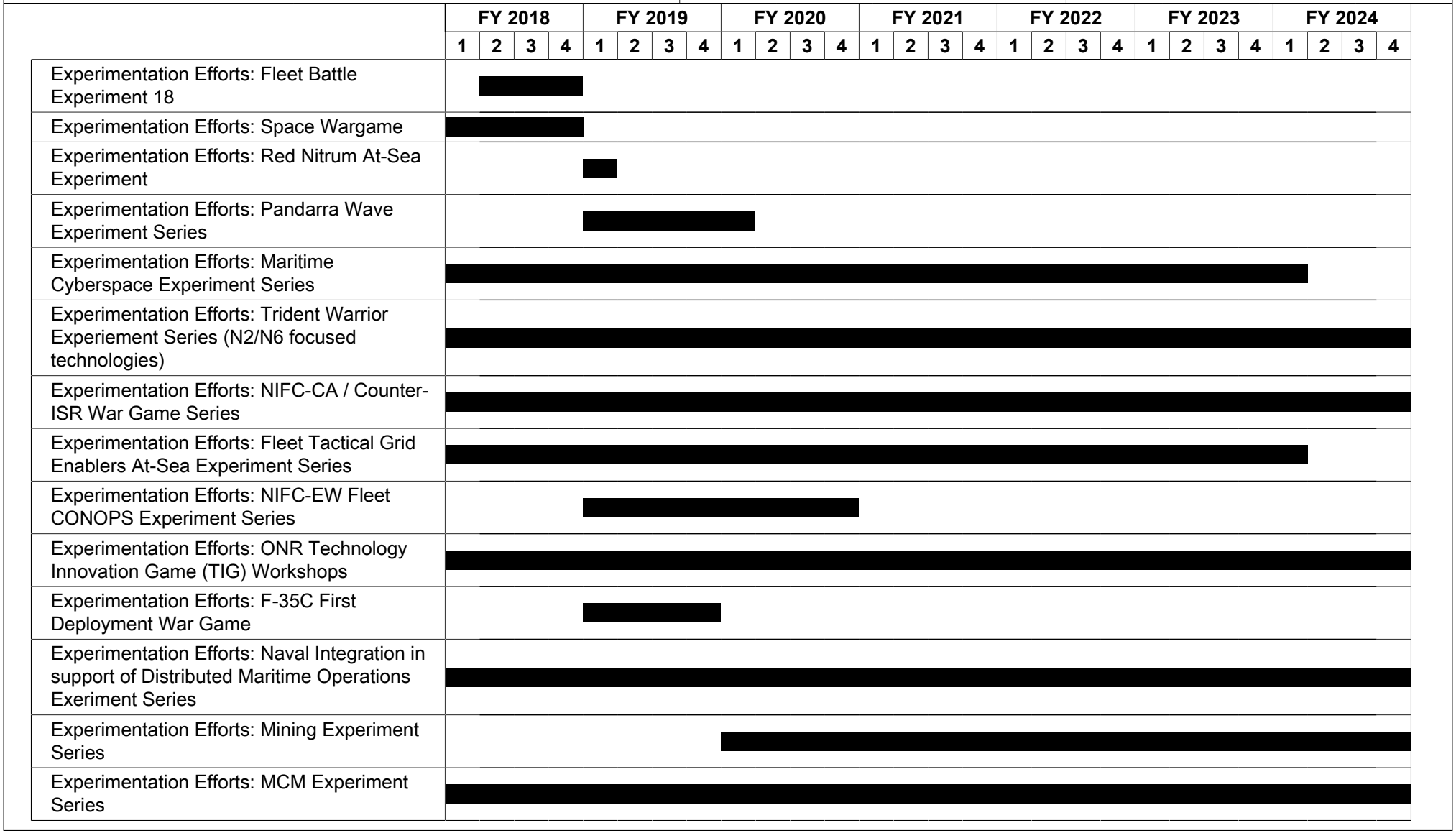


Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604707N / *SEW Architecture/Eng Support*	**Project (Number/Name)** 2356 / *Maritime Concept Generation & Development*

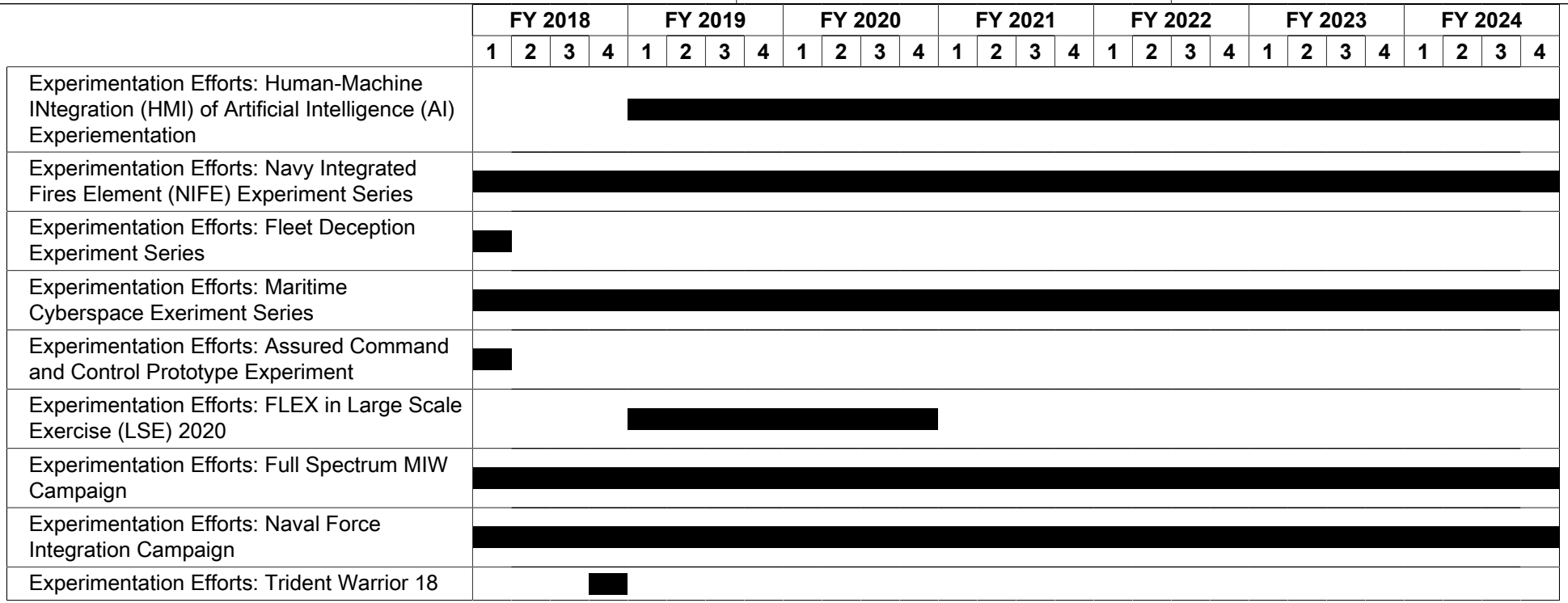


Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604707N / *SEW Architecture/Eng Support*	**Project (Number/Name)** 2356 / *Maritime Concept Generation & Development*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 2356				
Maritime Concept Generation and Development Efforts: Operational Logistics Concept	1	2018	3	2018
Maritime Concept Generation and Development Efforts: Emergent Concepts and Enabling Concepts	1	2019	4	2024
Maritime Concept Generation and Development Efforts: Fleet design / Distributed Maritime OPS Concept	3	2018	4	2018
Maritime Concept Generation and Development Efforts: Electro-Magnetic Maneuver Warfare White Paper and Concept	1	2018	4	2018
Maritime Concept Generation and Development Efforts: Littoral Operations in a Contested Environment Concept	1	2018	1	2018
Maritime Concept Generation and Development Efforts: Develop Distributed Maritime Operations Concept / Enabling Concepts	1	2018	4	2024
Experimentation Efforts: Undersea Domain Operating Concept Experimentation Campaign	1	2018	4	2018
Experimentation Efforts: Netted Sensors at Sea Experiment	1	2018	4	2018
Experimentation Efforts: Electromagnetic Maneuver Warfare Experimentation Campaign	1	2018	4	2023
Experimentation Efforts: SPECTRAL TSUNAMI Wargame series	1	2018	4	2018
Experimentation Efforts: Navy Tactical Data Network At-Sea Experiment	1	2018	4	2018
Experimentation Efforts: EMW At-Sea Experiment	2	2018	4	2018
Experimentation Efforts: Logistic Force Assured C2 Wargame	1	2018	4	2018
Experimentation Efforts: Unmanned System Swarm Campaign	1	2018	4	2018
Experimentation Efforts: Unmanned Systems Experimentation series	1	2018	4	2023
Experimentation Efforts: Krystal Sphinx at-sea Demonstration	1	2018	4	2018

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604707N / *SEW Architecture/Eng Support*	**Project (Number/Name)** 2356 / *Maritime Concept Generation & Development*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Experimentation Efforts: Counter UAS demonstration	1	2018	4	2018
Experimentation Efforts: MDUSV workshop	1	2018	4	2018
Experimentation Efforts: Health services support war game	1	2018	4	2018
Experimentation Efforts: Unmanned Warrior workshop	1	2018	4	2018
Experimentation Efforts: Radiant Delphi at sea experiment	1	2018	4	2018
Experimentation Efforts: Netted Sensors Wargame	1	2018	4	2018
Experimentation Efforts: Fleet Design experiment campaign	1	2019	4	2023
Experimentation Efforts: Counter UAS at sea experiment series	1	2018	4	2023
Experimentation Efforts: Fleet Battle Experiment 18	2	2018	4	2018
Experimentation Efforts: Space Wargame	1	2018	4	2018
Experimentation Efforts: Red Nitrum At-Sea Experiment	1	2019	1	2019
Experimentation Efforts: Pandarra Wave Experiment Series	1	2019	1	2020
Experimentation Efforts: Maritime Cyberspace Experiment Series	1	2018	1	2024
Experimentation Efforts: Trident Warrior Experiement Series (N2/N6 focused technologies)	1	2018	4	2024
Experimentation Efforts: NIFC-CA / Counter-ISR War Game Series	1	2018	4	2024
Experimentation Efforts: Fleet Tactical Grid Enablers At-Sea Experiment Series	1	2018	1	2024
Experimentation Efforts: NIFC-EW Fleet CONOPS Experiment Series	1	2019	4	2020
Experimentation Efforts: ONR Technology Innovation Game (TIG) Workshops	1	2018	4	2024
Experimentation Efforts: F-35C First Deployment War Game	1	2019	4	2019
Experimentation Efforts: Naval Integration in support of Distributed Maritime Operations Exeriment Series	1	2018	4	2024
Experimentation Efforts: Mining Experiment Series	1	2020	4	2024
Experimentation Efforts: MCM Experiment Series	1	2018	4	2024
Experimentation Efforts: Human-Machine INtegration (HMI) of Artificial Intelligence (AI) Experiementation	1	2019	4	2024

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604707N / *SEW Architecture/Eng Support*	**Project (Number/Name)** 2356 / *Maritime Concept Generation & Development*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Experimentation Efforts: Navy Integrated Fires Element (NIFE) Experiment Series	1	2018	4	2024
Experimentation Efforts: Fleet Deception Experiment Series	1	2018	1	2018
Experimentation Efforts: Maritime Cyberspace Exeriment Series	1	2018	4	2024
Experimentation Efforts: Assured Command and Control Prototype Experiment	1	2018	1	2018
Experimentation Efforts: FLEX in Large Scale Exercise (LSE) 2020	1	2019	4	2020
Experimentation Efforts: Full Spectrum MIW Campaign	1	2018	4	2024
Experimentation Efforts: Naval Force Integration Campaign	1	2018	4	2024
Experimentation Efforts: Trident Warrior 18	4	2018	4	2018

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0604786N *I (U)Offensive Anti-Surface Warfare Weapon Dev*

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	996.273	163.843	139.261	65.419	-	65.419	40.438	24.642	0.000	0.000	0.000	1,429.876
3337: *Offensive Anti-Surface Warfare (OASuW) Weapon*	996.273	163.843	119.261	65.419	-	65.419	40.438	24.642	0.000	0.000	0.000	1,409.876
9999: *Congressional Adds*	0.000	0.000	20.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	20.000

Program MDAP/MAIS Code:
Project MDAP/MAIS Code(s): P449

A. Mission Description and Budget Item Justification

Offensive Anti-Surface Warfare (OASuW) will be an offensive weapon system that can be air, surface, and subsurface launched in the maritime battle space environment. OASuW is a vital component of the Joint Force Anti-Surface Warfare capability and incorporate new and emergent technologies to support an increased offensive strike capability. Due to emerging threats, the fleet issued an Urgent Operational Needs Statement (UONS) that identified a capability gap for a long-range anti-ship missile to be filled by 2018. Directly supporting this UONS and significantly reducing Joint Force warfighting risks, the U.S. Navy initiated OASuW Increment 1 (OASuW-1), which leverages the Defense Advanced Research Projects Agency(DARPA)/Office of Naval Research Long Range Anti-Ship Missile (LRASM) demonstration program to deliver an Early Operational Capability (EOC) in the required timeframe. LRASM fills the most urgent air-launched capability gap to complement existing ASuW weapon systems and positions the Department of Defense to address evolving surface warfare threats. LRASM is integral to realizing the National Defense Strategy of combat-credible military forces to deter war, protect the security of our nation and to enable the Joint Force to win should deterrence fail. The development and acquisition of LRASM has been structured to be fielded at a pace relevant to maintain overmatch against long-term strategic competition. Specifically, LRASM directly contributes to building a more lethal force and is a critical enabler for joint lethality in contested environments; deterring adversaries from aggression; ensuring common domains remain open and maintaining favorable regional balances of power.

The OASuW program is part of the Navy's Integrated Fire Control (IFC) approach to address advanced threat capabilities in the Anti-Access/Area-Denial (A2AD) environment. IFC solutions enable individual system capabilities to be leveraged across an effects chain, placing the full spectrum of tactical capability in the hands of the warfighter. IFC solutions that push engagement distances beyond the launch platform's radar horizon and allows the U.S. Navy to operate in, and control, contested battle space in littoral waters and A2/AD environments are increasingly critical as more and more scenarios require compressed and coordinated fire control timelines.

Budget Item Justification: OASuW-1
Funding supports the delivery of an EOC of OASuW-1 LRASM weapon system, including the transition of the LRASM demonstration design into a fielded air-launched weapon system, using an accelerated acquisition approach, with streamlined governance. The program is leveraging DoDI 5000.02i Model 4 to structure the acquisition strategy, which includes a highly integrated and concurrent transition design, integration, and developmental / operational test program to meet the EOC schedule required by the UONS. To manage the accelerated timeline and resulting concurrency, the program uses a structured Knowledge Point review process that support decisions regarding significant program events such as transition from design to integration phase and contract awards. These reviews also provide senior DoD leadership the opportunity to provide focused support and active management of technical and acquisition risk and are chaired by the Service Acquisition Executive,

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0604786N *I (U)Offensive Anti-Surface Warfare Weapon Dev*

ASN(RDA). The knowledge points are similar to acquisition milestone reviews, but occur more frequently and are tailored to program-specific milestone events. Of note, the OASuW Increment I knowledge points are defined differently than GAO defines the same term and are tailored to program-specific milestone events. The program met statutory requirements associated with Milestone B at Knowledge Point 3. In addition to the Knowledge Point reviews, Executive Steering Board reviews, chaired by the MDA, are held at least monthly. Supporting these reviews, the associated engineering approach is designed to mitigate resulting risk by implementing a rolling-wave engineering progression based on the NAVAIR Systems Engineering Technical Review (SETR) process to enable detailed planning and decisions as the system matures. This process includes capstone SETR events that are tailored reviews using standard design review criteria. The Technology Maturation efforts in FY 2015 through FY 2017 culminated in a system level Critical Design Review (CDR) level review at SETR 4.0. SETR 3.0 in 4QFY 2015 provided a CDR-level review to support the Knowledge Point 3 decision to initiate the Integration and Test phase for the All Up Round components. SETR 5.0 held in 1QFY 2017 to support Knowledge Point 4 obtained MDA to enter into production. Subsequent to baseline OASuW Increment 1, the LRASM capability improvements program which was initiated in FY 2019 includes continued reviews and test events to achieve incorporation of those improvements in future production units.

This program is funded under ADVANCED COMPONENT DEVELOPMENT AND PROTOTYPES because it includes all efforts necessary to evaluate integrated technologies, representative models or prototype systems in a high fidelity and realistic operating environment.

B. Program Change Summary ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	160.694	143.062	51.051	-	51.051
Current President's Budget	163.843	139.261	65.419	-	65.419
Total Adjustments	3.149	-3.801	14.368	-	14.368
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-23.801			
• Congressional Rescissions	-	-			
• Congressional Adds	-	20.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	8.037	0.000			
• SBIR/STTR Transfer	-4.888	0.000			
• Program Adjustments	0.000	0.000	14.338	-	14.338
• Rate/Misc Adjustments	0.000	0.000	0.030	-	0.030

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2018	FY 2019
Project: 9999: *Congressional Adds*		
Congressional Add: *Operational Test Requirements for Additional Capabilities*	0.000	20.000
Congressional Add Subtotals for Project: 9999	0.000	20.000
Congressional Add Totals for all Projects	0.000	20.000

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0604786N *I (U)Offensive Anti-Surface Warfare Weapon Dev*

Change Summary Explanation

Baseline planned OASuW Increment 1 development ramped down in FY 2019. LRASM capability improvements initiated in FY 2019 are planned to continue in FY 2020 through FY 2022 to ensure tactical dominance for the warfighter over a longer period of time by providing sanctuary employment against capital warships. The additional funding supports development of capability enhancements to include range increase, improved communication capabilities, increased survivability and associated testing for LRASM to incorporate into future production units.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy											Date: March 2019	
Appropriation/Budget Activity 1319 / 4					R-1 Program Element (Number/Name) PE 0604786N / *(U)Offensive Anti-Surface Warfare Weapon Dev*				Project (Number/Name) 3337 / *Offensive Anti-Surface Warfare (OASuW) Weapon*			
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
3337: *Offensive Anti-Surface Warfare (OASuW) Weapon*	996.273	163.843	119.261	65.419	-	65.419	40.438	24.642	0.000	0.000	0.000	1,409.876
Quantity of RDT&E Articles	13	-	-	-	-	-	-	-	-	-		

Project MDAP/MAIS Code: P449

A. Mission Description and Budget Item Justification

Offensive Anti-Surface Warfare (OASuW) will be an offensive weapon system that can be air, surface, and subsurface launched in the maritime battle space environment. OASuW is a vital component of the Joint Force Anti-Surface Warfare capability and incorporate new and emergent technologies to support an increased offensive strike capability. Due to emerging threats, the fleet issued an Urgent Operational Needs Statement (UONS) that identified a capability gap for a long-range anti-ship missile to be filled by 2018. Directly supporting this UONS and significantly reducing Joint Force warfighting risks, the U.S. Navy initiated OASuW Increment 1 (OASuW-1), which leverages the Defense Advanced Research Projects Agency(DARPA)/Office of Naval Research Long Range Anti-Ship Missile (LRASM) demonstration program to deliver an Early Operational Capability (EOC) in the required timeframe. LRASM fills the most urgent air-launched capability gap to complement existing ASuW weapon systems and positions the Department of Defense to address evolving surface warfare threats. LRASM is integral to realizing the National Defense Strategy of combat-credible military forces to deter war, protect the security of our nation and to enable the Joint Force to win should deterrence fail. The development and acquisition of LRASM has been structured to be fielded at a pace relevant to maintain overmatch against long-term strategic competition. Specifically, LRASM directly contributes to building a more lethal force and is a critical enabler for joint lethality in contested environments; deterring adversaries from aggression; ensuring common domains remain open and maintaining favorable regional balances of power.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**
Title: OASuW Development Program	163.843	119.261	65.419	0.000	65.419
Articles:	-	-	-	-	-
FY 2019 Plans: The Integration and Test phase of the program will continue in FY 2019. The program will complete Knowledge Point 7 in support of the Lot 3 procurement. USN EOC will be achieved on the F/A-18 (SETR 8.0) with Knowledge Point 8. Continued OASuW Increment 1 development (LRASM capability improvements) added to ensure tactical dominance for the warfighter over a longer period of time by providing sanctuary employment against capital warships. This continued development expands the mission set to address evolving, persistent and dynamic threats and continues to fill gaps in strike warfare.					
FY 2020 Base Plans: The Integration and Test phase of the program will continue in FY 2020 for the Long Range Anti-Shape Missile (LRASM) capability improvements efforts. Baseline OASuW Increment 1 development ramped down in FY					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604786N / *(U)Offensive Anti-Surface Warfare Weapon Dev*	**Project (Number/Name)** 3337 / *Offensive Anti-Surface Warfare (OASuW) Weapon*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
2019, however continued development for LRASM capability improvements is programmed to ensure tactical dominance for the warfighter over a longer period of time by providing sanctuary employment against capital warships. This continued development expands the mission set to address evolving, persistent and dynamic threats and continues to fill gaps in strike warfare. The development and follow-on test efforts added include range increase, improved communication capabilities, and increased survivability. These expanded mission set efforts will integrate into future Lot procurements. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Decreasing due to progression in developmental efforts.					
Accomplishments/Planned Programs Subtotals	163.843	119.261	65.419	0.000	65.419

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• WPN/2291: *LRASM*	107.733	111.190	143.200	-	143.200	143.999	143.999	143.999	143.999	0.000	995.062
• MPAF/8010: *LRASM*	61.728	54.385	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	187.524

Remarks

U.S. Navy WP,N funding supports the following quantities:

FY17 - 15 (FY17 funding procures 14 Lot 1 units and 1 unit that is priced at and part of the Lot 2 procurement)
FY18 - 34 (Lot 2)
FY19 - 35 (Lot 3)
FY20 - 48 (Lot 4)
FY21 - 48 (Lot 5)
FY22 - 48 (Lot 6)
FY23 - 48 (Lot 7)
FY24 - 48 (Lot 8)

U.S. Air Force MP,AF funding supports the following quantities:

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604786N / *(U)Offensive Anti-Surface Warfare Weapon Dev*	**Project (Number/Name)** 3337 / *Offensive Anti-Surface Warfare (OASuW) Weapon*

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
FY17 - 19 (Lot 1)											
FY18 - 16 (1 unit is priced at and part of FY 2017 Lot 1 procurement to achieve 20 total Air Force units in Lot 1; 15 units are with the FY 2018 Lot 2 procurement)											
FY19 - 15 (Lot 3)											

D. Acquisition Strategy

OASuW-1 is using an accelerated acquisition approach, with streamlined governance to transition the DARPA/ONR-demonstrated Long Range Anti-Ship Missile (LRASM) for use as an air-launched weapon from USAF and USN platforms. LRASM is integral to realizing the National Defense Strategy of combat-credible military forces to deter war, protect the security of our nation and to enable the Joint Force to win should deterrence fail. The development and acquisition of LRASM has been structured to be fielded at a pace relevant to maintain overmatch against long-term strategic competition. Specifically, LRASM supports greater performance of the acquisition system and is demonstrating the delivery of performance at the speed of relevance; organizational structure that supports innovation with a rapid approach that dramatically decreases the timeline from development to fielding. The program is leveraging DoDI 5000.02i Model 4 to structure the acquisition strategy, which includes a highly integrated and concurrent transition design, integration, and developmental / operational test program which successfully met the Early Operation Capability (EOC) fielding schedule required by an Urgent Operational Need Statement (UONS) issued by the fleet. The program is structured in three phases: Technology Maturation, Integration and Test, and Procurement. To manage the accelerated timeline and resulting concurrency, the program uses a structured Knowledge Point review process that support decisions regarding significant program events such as transition from design to integration phase and contract awards. These reviews also provide senior DoD leadership the opportunity to provide focused support and active management of technical and acquisition risk and are chaired by the Service Acquisition Executive, ASN(RDA) (delegated MDA), and the Deputy Director of DARPA. The knowledge points are similar to acquisition milestone reviews, but occur more frequently. Of note, the OASuW-1 knowledge points are defined differently than GAO defines the same term. Knowledge Point 1 supported program initiation and approval of the acquisition strategy ; Knowledge Point 2 supported evaluation of the preliminary design of the weapon system as well as release of the Request for Proposal for the Integration and Test phase; Knowledge Point 3 supported evaluation of the final (critical design review level) weapon system design and initiation of/contract award for the Integration and Test phase; Knowledge Point 4 supports the procurement decision for Lot 1 EOC units; and Knowledge Point 5 supports Lot 2 procurement, Knowledge Point 6 supports USAF EOC decision, Knowledge Point 7 supports Lot 3 procurement and Knowledge Point 8 supports USN EOC decision. The program met the statutory requirements associated with Milestone B at Knowledge Point 3. In addition to the Knowledge Point reviews, Executive Steering Board reviews (also chaired by the MDA) are held at least monthly. Supporting these reviews, the associated engineering approach is designed to mitigate resulting risk by implementing a rolling-wave engineering progression based on the NAVAIR Systems Engineering Technical Review (SETR) process to enable detailed planning and decisions as the system matures. This process includes capstone SETR events that are tailored reviews using standard design review criteria. SETR 1.0 in FY 2014 provided a Systems Requirements Review. SETR 2.0 in FY 2015 provided a Preliminary Design Review level review of the system and supported Knowledge Point 2. SETR 3.0 in late 2015 provided a Critical Design Review (CDR) level review of the All Up Round in support of Knowledge Point 3, while SETR 4.0 in FY 2016 provided a CDR level review of the entire weapon system in support of Knowledge Point 4 in early FY 2017, along with flight test information. The LRASM capability improvements program, which was initiated in FY 2019, includes continued reviews and test events to achieve incorporation of those improvements on future production units.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604786N / *(U)Offensive Anti-Surface Warfare Weapon Dev*	**Project (Number/Name)** 3337 / *Offensive Anti-Surface Warfare (OASuW) Weapon*

E. Performance Metrics

The Knowledge Points are defined reviews with the Executive Steering Board comprised of Service Acquisition Executive, ASN(RDA) (delegated MDA) and the Deputy Director of DARPA to make program decisions at key points in the program life cycle in place of milestone reviews, but tailored to support the accelerated process. The acquisition program baseline was established at Knowledge Point 3.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604786N / *(U)Offensive Anti-Surface Warfare Weapon Dev*	**Project (Number/Name)** 3337 / *Offensive Anti-Surface Warfare (OASuW) Weapon*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Product Development	C/CPIF	Lockheed Martin Missile and Fire Control : Orlando, FL	732.978	113.819	Oct 2017	71.251	Oct 2018	42.066	Oct 2019	-		42.066	21.950	982.064	978.393
Product Development	C/CPFF	Boeing : St. Louis, MO	59.863	0.676	Mar 2018	0.964	Mar 2019	0.630	Mar 2020	-		0.630	0.680	62.813	62.813
		Subtotal	792.841	114.495		72.215		42.696		-		42.696	22.630	1,044.877	N/A

Remarks

Lockheed Martin Company (LMCO) costs includes all integration and test efforts, including the increase for LRASM capability improvements development initiated in FY 2019 by LMCO and associated sub-contractors to complete Knowledge Points 7 and 8 and the tailored qualification/flight test program. Software development tests on F/A-18 E/F and Systems Engineering Technical Review (SETR) 8.0 (USN EOC Readiness Review). FY 2020 primarily includes product development for LRASM capability improvements.

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Government Support	WR	NAWC AD : Patuxent River,MD	6.770	1.807	Nov 2017	1.413	Nov 2018	1.245	Nov 2019	-		1.245	2.650	13.885	-
Government Support	WR	NAWC WD : China Lake, CA	39.547	11.142	Nov 2017	10.555	Nov 2018	2.640	Nov 2019	-		2.640	4.250	68.134	-
Government Support	WR	NSWC : Various	3.398	0.092	Nov 2017	0.189	Nov 2018	0.065	Nov 2019	-		0.065	0.000	3.744	-
Government Support	WR	NSA : Ft. Meade, MD	0.000	0.000		0.250	Dec 2018	0.000		-		0.000	0.000	0.250	-
Development Support	C/FFP	NSMA : Washington, DC	17.552	5.435	Dec 2017	8.676	Dec 2018	1.015	Nov 2019	-		1.015	2.100	34.778	32.864
Development Support	MIPR	USAF : Various	0.971	0.190	Oct 2017	0.040	Feb 2019	0.000		-		0.000	0.000	1.201	-
Integrated Logistics Support	WR	NAWC AD : Patuxent River, MD	0.505	0.058	Nov 2017	0.031	Nov 2018	0.020	Nov 2019	-		0.020	0.000	0.614	-
Integrated Logistics Support	WR	NAWC AD : Lakehurst, NJ	0.411	0.560	Dec 2017	0.000		0.000		-		0.000	0.000	0.971	-
Contractor Support	C/CPFF	JHU/APL : Laurel, MD	11.831	0.425	Jul 2018	0.480	Jul 2019	0.500	Jul 2020	-		0.500	1.000	14.236	14.236

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
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Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Contractor Support	C/FFP	Schafer Corporation : Arlington, VA	18.371	2.373	Jun 2018	2.736	Jun 2019	3.140	Jun 2020	-		3.140	3.200	29.820	32.377
Mission Planning Support	C/CPFF	Northrup Grumman : Bethpage, NY	9.588	0.400	Oct 2017	0.969	Oct 2018	0.000		-		0.000	0.000	10.957	11.088
Contractor Support	Various	Various : Various	8.118	0.717	Oct 2017	0.730	Oct 2018	0.743	Oct 2019	-		0.743	1.650	11.958	-
Development Support	Various	NRL : Various	1.576	0.575	Nov 2017	0.228	Nov 2018	0.250	Nov 2019	-		0.250	0.000	2.629	-
Contractor Support	C/FFP	Engility : Patuxent River, MD	0.000	0.936	Jun 2018	1.051	Jun 2019	1.100	Jun 2020	-		1.100	2.419	5.506	6.506
Prior Yr Supp no longer funded in the FYDP	Various	Various : Various	2.800	0.000		0.000		0.000		-		0.000	0.000	2.800	-
		Subtotal	121.438	24.710		27.348		10.718		-		10.718	17.269	201.483	N/A

Remarks

Support costs consist of support from Government offices and Contractor Support experts associated with threat analysis, CONOPs, and Training and Tactical assessments in support of Knowledge Points 7 and 8, the integrated test program and Quick Reaction Assessment (QRA), and tactics development supporting USN EOC. FY 2020 includes continued support for the development efforts for LRASM capability improvements.

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Development Support	WR	NAWC WD : China Lake, CA	34.150	16.126	Nov 2017	12.174	Nov 2018	6.455	Nov 2019	-		6.455	13.531	82.436	-
Development Support	WR	NAWC AD : Patuxent River, MD	24.203	5.334	Nov 2017	4.357	Nov 2018	2.608	Nov 2019	-		2.608	3.750	40.252	-
Development Support	WR	NSWC : Various	0.341	0.000		0.000		0.000		-		0.000	0.000	0.341	-
Development Support	WR	COTF : Norfolk, VA	0.207	0.015	Sep 2018	0.182	Sep 2019	0.182	Sep 2020	-		0.182	2.200	2.786	-
Development Support	MIPR	USAF : Various	5.302	0.517	Oct 2017	0.077	Oct 2018	0.475	Oct 2019	-		0.475	0.650	7.021	-
Contractor Eng Support	C/CPFF	NAVSUP : Port Hueneme, CA	0.000	0.075	Apr 2018	0.000		0.075	Apr 2020	-		0.075	0.000	0.150	-
Wind Tunnel Testing	MIPR	AEDC : Arnolds AFB, TN	4.153	0.000		0.000		0.000		-		0.000	0.000	4.153	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604786N / *(U)Offensive Anti-Surface Warfare Weapon Dev*	Project (Number/Name) 3337 / *Offensive Anti-Surface Warfare (OASuW) Weapon*	

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
		Subtotal	68.356	22.067		16.790		9.795		-		9.795	20.131	137.139	N/A

Remarks

Test and Evaluation costs support flight testing, system qualifications, range time, and target costs needed for the F/A-18 E/F to support Knowledge Points 7 and 8, the integrated DT/OT test program and Quick Reaction Assessment (QRA). FY 2020 includes LRASM capability improvements testing.

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Government Support	WR	NAWC AD : Patuxent River, MD	6.934	1.754	Nov 2017	1.839	Nov 2018	1.100	Nov 2019	-		1.100	2.850	14.477	-
Government Support	WR	NAWC WD : China Lake, CA	3.879	0.677	Nov 2017	0.924	Nov 2018	0.960	Nov 2019	-		0.960	1.800	8.240	-
Project Management Support	C/CPFF	NAWC AD : Patuxent River, MD	1.600	0.000		0.000		0.000		-		0.000	0.000	1.600	1.600
Travel	Various	NAWC AD : Patuxent River, MD	1.225	0.140	Nov 2017	0.145	Oct 2018	0.150	Oct 2019	-		0.150	0.400	2.060	-
		Subtotal	13.638	2.571		2.908		2.210		-		2.210	5.050	26.377	N/A

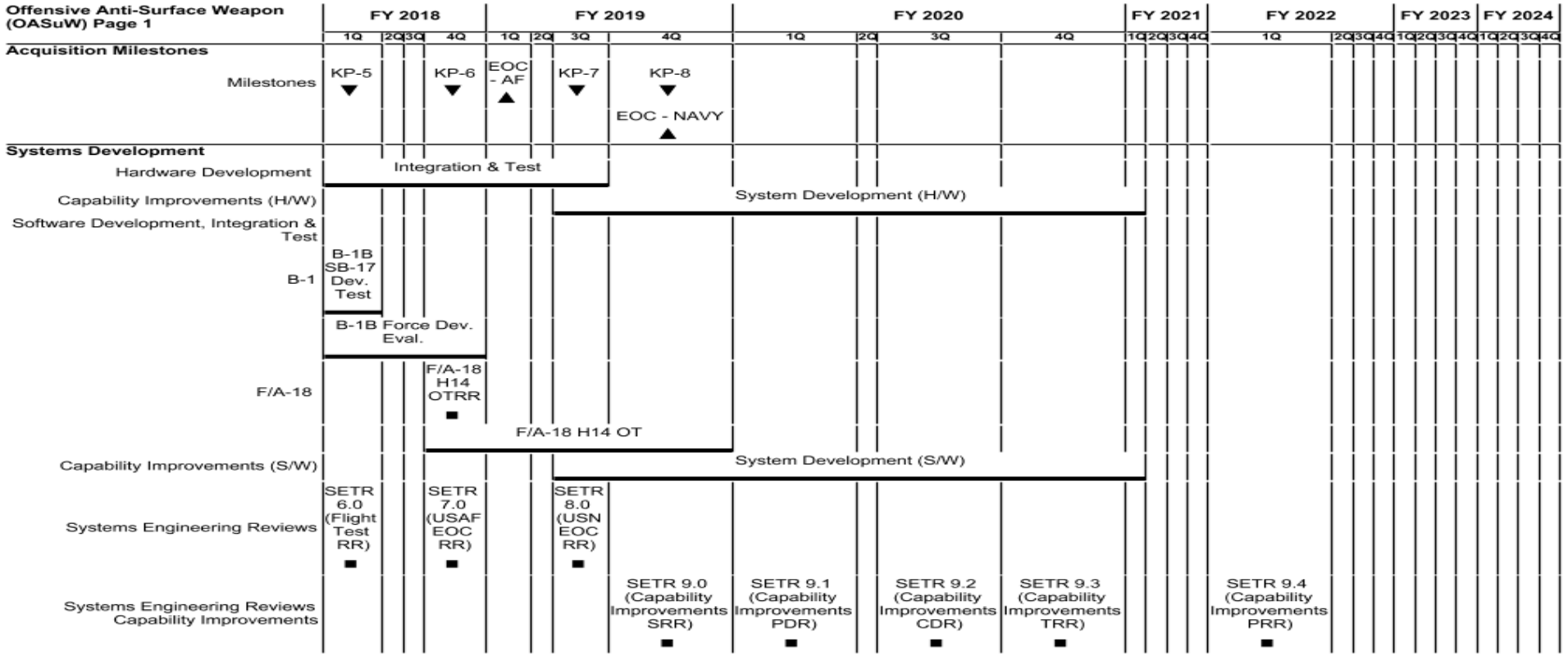
Remarks

Management Services costs consist of Non-Headquarters Program Office Management team (Government labor and Contractor support services) required for the management of the program. FY 2020 continues management services to support the LRASM capability improvements.

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	996.273	163.843		119.261		65.419		-		65.419	65.080	1,409.876	N/A

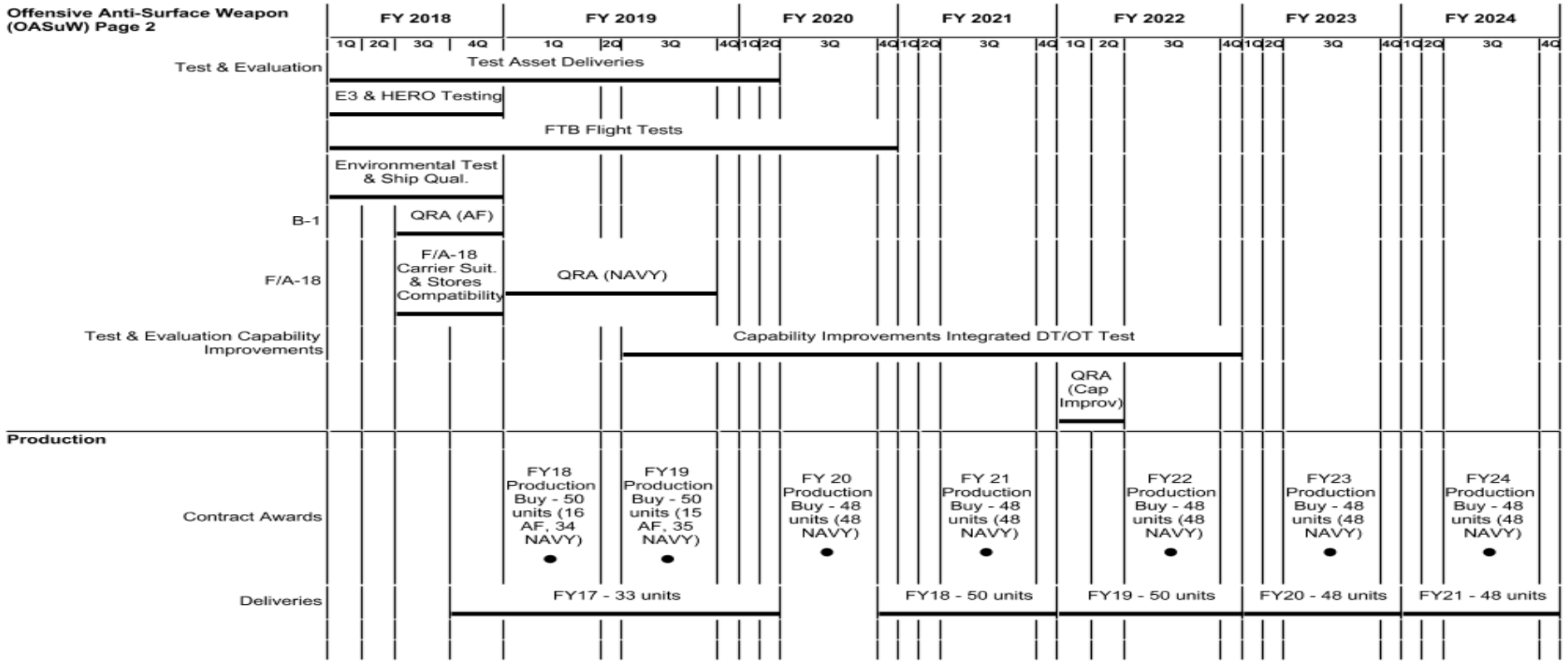
Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604786N / *(U)Offensive Anti-Surface Warfare Weapon Dev*	**Project (Number/Name)** 3337 / *Offensive Anti-Surface Warfare (OASuW) Weapon*



2020PB - 0604786N - 3337

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604786N / *(U)Offensive Anti-Surface Warfare Weapon Dev*	**Project (Number/Name)** 3337 / *Offensive Anti-Surface Warfare (OASuW) Weapon*



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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604786N / *(U)Offensive Anti-Surface Warfare Weapon Dev*	**Project (Number/Name)** 3337 / *Offensive Anti-Surface Warfare (OASuW) Weapon*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Offensive Anti-Surface Weapon (OASuW) Page 1				
Acquisition Milestones: Milestones: Knowledge Point 5	1	2018	1	2018
Acquisition Milestones: Milestones: Knowledge Point 6	4	2018	4	2018
Acquisition Milestones: Milestones: Knowledge Point 7	3	2019	3	2019
Acquisition Milestones: Milestones: Knowledge Point 8	4	2019	4	2019
Acquisition Milestones: Milestones: Early Operational Capability (EOC) Air Force	1	2019	1	2019
Acquisition Milestones: Milestones: Early Operational Capability (EOC) Navy	4	2019	4	2019
Systems Development: Hardware Development: Integration & Test	1	2018	3	2019
Systems Development: Capability Improvements (H/W): Capability Improvements (H/W)	3	2019	1	2021
Systems Development: B-1: B-1 SB-17 Software Development Test	1	2018	1	2018
Systems Development: B-1: B-1 Force Development Evaluation	1	2018	4	2018
Systems Development: F/A-18: F/A-18 H14 Operational Test Readiness Review	4	2018	4	2018
Systems Development: F/A-18: F/A-18 H14 Operational Test	4	2018	4	2019
Systems Development: Capability Improvements (S/W): Capability Improvements (S/W)	3	2019	1	2021
Systems Development: Systems Engineering Reviews: System Engineering Technical Review 6.0 (Flight Test Readiness Review)	1	2018	1	2018
Systems Development: Systems Engineering Reviews: System Engineering Technical Review 7.0 (USAF EOC Readiness Review)	4	2018	4	2018
Systems Development: Systems Engineering Reviews: System Engineering Technical Review 8.0 (USN EOC Readiness Review)	3	2019	3	2019

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604786N / *(U)Offensive Anti-Surface Warfare Weapon Dev*	**Project (Number/Name)** 3337 / *Offensive Anti-Surface Warfare (OASuW) Weapon*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Systems Development: Systems Engineering Reviews Capability Improvements: System Engineering Technical Review 9.0 (Capability Improvements System Requirements Review)	4	2019	4	2019
Systems Development: Systems Engineering Reviews Capability Improvements: System Engineering Technical Review 9.1 (Capability Improvements Preliminary Design Review)	1	2020	1	2020
Systems Development: Systems Engineering Reviews Capability Improvements: System Engineering Technical Review 9.2 (Capability Improvements Critical Design Review)	3	2020	3	2020
Systems Development: Systems Engineering Reviews Capability Improvements: System Engineering Technical Review 9.3 (Capability Improvements Test Readiness Review)	4	2020	4	2020
Systems Development: Systems Engineering Reviews Capability Improvements: System Engineering Technical Review 9.4 (Capability Improvements Production Readiness Review)	1	2022	1	2022
Offensive Anti-Surface Weapon (OASuW) Page 2				
Test & Evaluation: Test Asset Deliveries	1	2018	2	2020
Test & Evaluation: E3 & HERO Testing	1	2018	4	2018
Test & Evaluation: FTB Flight Tests	1	2018	4	2020
Test & Evaluation: Environmental Test & Ship Qualification	1	2018	4	2018
B-1: Quick Reaction Assessment Testing (AF)	3	2018	4	2018
F/A-18: Quick Reaction Assessment Testing (Navy)	1	2019	3	2019
F/A-18: F/A-18 Carrier Suitability & Stores Compatibility	3	2018	4	2018
Test & Evaluation Capability Improvements: Capability Improvements	3	2019	4	2022
Test & Evaluation Capability Improvements: Capability Improvement QRA	1	2022	2	2022
Production: Contract Awards: FY18 Production Buy - 50 units (16 AF, 34 NAVY)	1	2019	1	2019
Production: Contract Awards: FY19 Production Buy - 50 units (15 AF, 35 NAVY)	3	2019	3	2019
Production: Contract Awards: FY20 Production Buy - 48 units (48 NAVY)	3	2020	3	2020

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604786N / *(U)Offensive Anti-Surface Warfare Weapon Dev*	**Project (Number/Name)** 3337 / *Offensive Anti-Surface Warfare (OASuW) Weapon*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Production: Contract Awards: FY21 Production Buy - 48 units (48 NAVY)	3	2021	3	2021
Production: Contract Awards: FY22 Production Buy - 48 units (48 NAVY)	3	2022	3	2022
Production: Contract Awards: FY23 Production Buy - 48 units (48 NAVY)	3	2023	3	2023
Production: Contract Awards: FY24 Production Buy - 48 units (48 NAVY)	3	2024	3	2024
Production: Deliveries: FY17 Deliveries - 33 units	4	2018	2	2020
Production: Deliveries: FY18 Deliveries - 50 units	4	2020	4	2021
Production: Deliveries: FY19 Deliveries - 50 units	1	2022	4	2022
Production: Deliveries: FY20 Deliveries - 48 units	1	2023	4	2023
Production: Deliveries: FY21 Deliveries - 48 units	1	2024	4	2024

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604786N / *(U)Offensive Anti-Surface Warfare Weapon Dev*	Project (Number/Name) 9999 / *Congressional Adds*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
9999: *Congressional Adds*	0.000	0.000	20.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	20.000
Quantity of RDT&E Articles		-	3	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Offensive Anti-Surface Warfare (OASuW) will be an offensive weapon system that can be air, surface, and subsurface launched in the maritime battle space environment. OASuW is a vital component of the Joint Force Anti-Surface Warfare capability and incorporate new and emergent technologies to support an increased offensive strike capability. Due to emerging threats, the fleet issued an Urgent Operational Needs Statement (UONS) that identified a capability gap for a long-range anti-ship missile to be filled by 2018. Directly supporting this UONS and significantly reducing Joint Force warfighting risks, the U.S. Navy initiated OASuW Increment 1 (OASuW-1), which leverages the Defense Advanced Research Projects Agency(DARPA)/Office of Naval Research Long Range Anti-Ship Missile (LRASM) demonstration program to deliver an Early Operational Capability (EOC) in the required timeframe. LRASM fills the most urgent air-launched capability gap to complement existing ASuW weapon systems and positions the Department of Defense to address evolving surface warfare threats. LRASM is integral to realizing the National Defense Strategy of combat-credible military forces to deter war, protect the security of our nation and to enable the Joint Force to win should deterrence fail. The development and acquisition of LRASM has been structured to be fielded at a pace relevant to maintain overmatch against long-term strategic competition. Specifically, LRASM directly contributes to building a more lethal force and is a critical enabler for joint lethality in contested environments; deterring adversaries from aggression; ensuring common domains remain open and maintaining favorable regional balances of power.

Budget Item Justification: Operational Test (OT) requirements for additional capabilities
Funding in this project unit is for OASuW Increment I / LRASM capability improvements OT requirements.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019
Congressional Add: Operational Test Requirements for Additional Capabilities	0.000	20.000
FY 2018 Accomplishments: N/A		
FY 2019 Plans: N/A		
Congressional Adds Subtotals	0.000	20.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604786N / *(U)Offensive Anti-Surface Warfare Weapon Dev*	**Project (Number/Name)** 9999 / *Congressional Adds*

D. Acquisition Strategy

OASuW-1 is using an accelerated acquisition approach, with streamlined governance to transition the DARPA/ONR-demonstrated Long Range Anti-Ship Missile (LRASM) for use as an air-launched weapon from USAF and USN platforms. LRASM is integral to realizing the National Defense Strategy of combat-credible military forces to deter war, protect the security of our nation and to enable the Joint Force to win should deterrence fail. The development and acquisition of LRASM has been structured to be fielded at a pace relevant to maintain overmatch against long-term strategic competition. Specifically, LRASM supports greater performance of the acquisition system and is demonstrating the delivery of performance at the speed of relevance; organizational structure that supports innovation with a rapid approach that dramatically decreases the timeline from development to fielding. The program is leveraging DoDI 5000.02i Model 4 to structure the acquisition strategy, which includes a highly integrated and concurrent transition design, integration, and developmental / operational test which successfully met the Early Operation Capability (EOC) fielding schedule required by an Urgent Operational Need Statement (UONS) issued by the fleet. The program is structured in three phases: Technology Maturation, Integration and Test, and Procurement. To manage the accelerated timeline and resulting concurrency, the program uses a structured Knowledge Point review process that support decisions regarding significant program events such as transition from design to integration phase and contract awards. These reviews also provide senior DoD leadership the opportunity to provide focused support and active management of technical and acquisition risk and are chaired by the Service Acquisition Executive, ASN(RDA) (delegated MDA), and the Deputy Director of DARPA. The knowledge points are similar to acquisition milestone reviews, but occur more frequently. Of note, the OASuW-1 knowledge points are defined differently than GAO defines the same term. Knowledge Point 1 supported program initiation and approval of the acquisition strategy ; Knowledge Point 2 supported evaluation of the preliminary design of the weapon system as well as release of the Request for Proposal for the Integration and Test phase; Knowledge Point 3 supported evaluation of the final (critical design review level) weapon system design and initiation of/ contract award for the Integration and Test phase; Knowledge Point 4 supports the procurement decision for Lot 1 EOC units; and Knowledge Point 5 supports Lot 2 procurement, Knowledge Point 6 supports USAF EOC decision, Knowledge Point 7 supports Lot 3 procurement and Knowledge Point 8 supports USN EOC decision. The program met the statutory requirements associated with Milestone B at Knowledge Point 3. In addition to the Knowledge Point reviews, Executive Steering Board reviews (also chaired by the MDA) are held at least monthly. Supporting these reviews, the associated engineering approach is designed to mitigate resulting risk by implementing a rolling-wave engineering progression based on the NAVAIR Systems Engineering Technical Review (SETR) process to enable detailed planning and decisions as the system matures. This process includes capstone SETR events that are tailored reviews using standard design review criteria. SETR 1.0 in FY 2014 provided a Systems Requirements Review. SETR 2.0 in FY 2015 provided a Preliminary Design Review level review of the system and supported Knowledge Point 2. SETR 3.0 in late 2015 provided a Critical Design Review (CDR) level review of the All Up Round in support of Knowledge Point 3, while SETR 4.0 in FY 2016 provided a CDR level review of the entire weapon system in support of Knowledge Point 4 in early FY 2017, along with flight test information. The LRASM capability improvements program which was initiated in FY 2019 includes continued reviews and test events to achieve incorporation of those improvements in future production units.

E. Performance Metrics

The Knowledge Points are defined reviews with the Executive Steering Board comprised of Service Acquisition Executive, ASN(RDA) (delegated MDA) and the Deputy Director of DARPA to make program decisions at key points in the program life cycle in place of milestone reviews, but tailored to support the accelerated process. The acquisition program baseline was established at Knowledge Point 3.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604786N / *(U)Offensive Anti-Surface Warfare Weapon Dev*	Project (Number/Name) 9999 / *Congressional Adds*	

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Development Support (OT)	C/CPIF	Lockheed Martin Missile and Fire Control : Orlando, FL	0.000	0.000		19.925	Apr 2019	0.000		-		0.000	0.000	19.925	-
Contractor Eng Support (OT)	C/CPFF	NAVSUP : Port Hueneme, CA	0.000	0.000		0.075	Apr 2019	0.000		-		0.000	0.000	0.075	-
		Subtotal	0.000	0.000		20.000		0.000		-		0.000	0.000	20.000	N/A

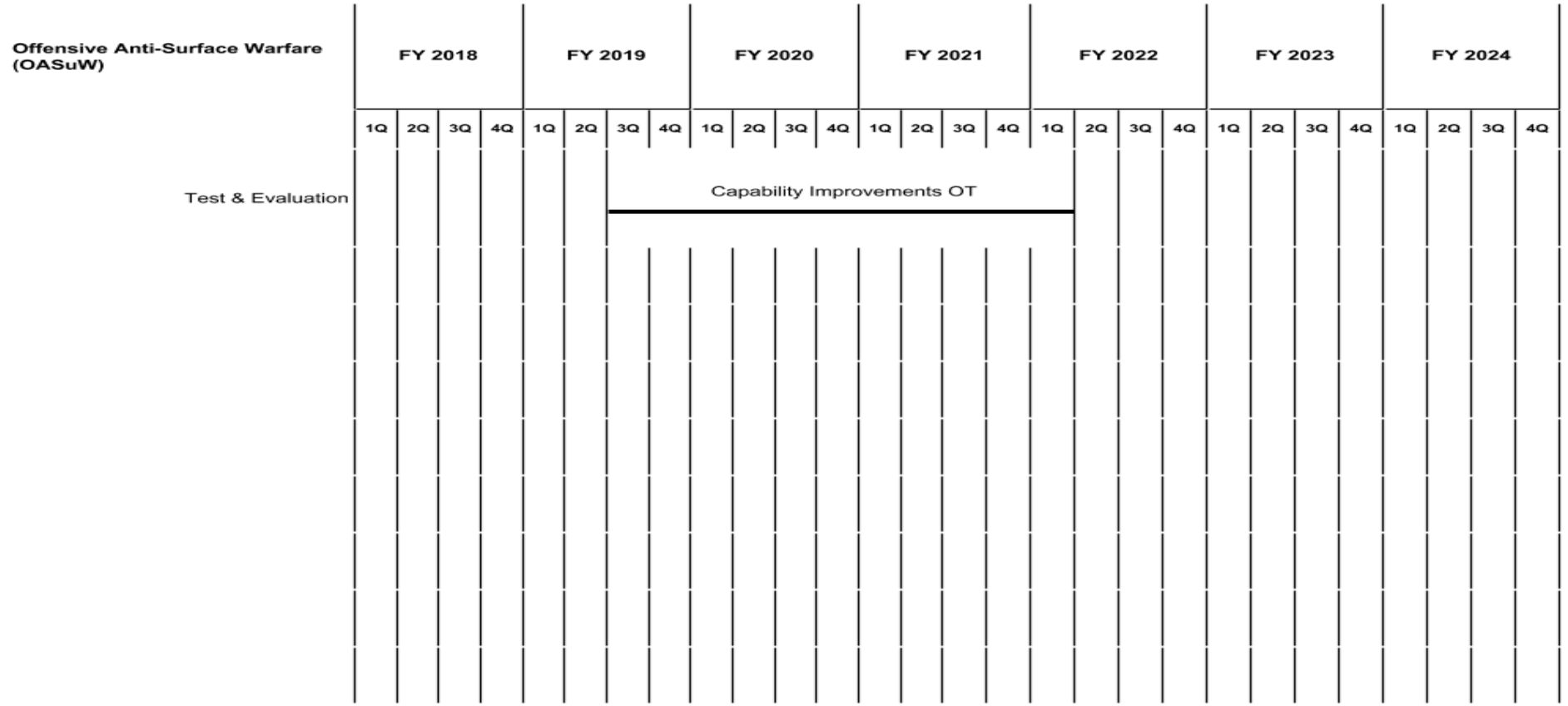
Remarks

FY 2019 Congressional direction for $20M to be utilized for Offensive Anti-Surface Warfare (OASuW) Increment I / Long Range Anti-Ship Missile (LRASM) to fund operational test requirements for additional capabilities.

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	0.000		20.000		0.000		-		0.000	0.000	20.000	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604786N / *(U)Offensive Anti-Surface Warfare Weapon Dev*	**Project (Number/Name)** 9999 / *Congressional Adds*



2020PB - 0604786N - 9999

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0604786N / *(U)Offensive Anti-Surface Warfare Weapon Dev*	**Project (Number/Name)** 9999 / *Congressional Adds*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Offensive Anti-Surface Warfare (OASuW)				
Test & Evaluation: Operational Testing (OT)	3	2019	1	2022

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy											Date: March 2019	
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0303354N *I ASW Systems Development - MIP*							
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
Total Program Element	45.653	8.278	8.889	9.991	-	9.991	9.158	9.341	10.728	10.943	Continuing	Continuing
0490: *Airborne Acoustic Intelligence (AAI)*	45.653	8.278	8.889	9.991	-	9.991	9.158	9.341	10.728	10.943	Continuing	Continuing

A. Mission Description and Budget Item Justification

The mission of Airborne ASW Intelligence (AAI) (CNO Project K-0416) is to provide advanced Anti-Submarine Warfare (ASW) capabilities through rapid development of new technology and prototype mechanisms for the collection of ASW related intelligence. This includes full spectrum intelligence collections and cataloging of current targets of interest. The program develops and swiftly deploys disruptive innovation to counter emerging threats in order to maintain the United States' current undersea warfare superiority. AAI employs the capability to quickly reconstruct and analyze passive and active measurements of submarine vulnerabilities providing actionable intelligence to fleet commanders. The AAI data collection program provides full spectrum intelligence data essential for the design and development of advanced sensors, weapon systems, environmental models, and tactical decision aids. AAI collection systems are installed and employed on uniquely configured aircraft, specially configured ground support facilities, ships, and other assets as required for the collection, processing, exfiltration, and dissemination of undersea intelligence. AAI includes recording systems, advanced detection and tracking systems, specially designed sensors, advanced processing systems and techniques, and specially derived tactics.

Furious Krypton is a Line of Sight (LOS) and Over the Horizon (OTH) data link utilizing a Naval Research Laboratory (NRL) communications payload onboard the Broad Area Maritime Surveillance-Demonstrator (BAMS-D) and Triton platform. The demonstration will show utilization of the payload to collect and retransmit sonobuoy data to both LOS and OTH receivers.

This is a Military Intelligence Program (MIP).

JUSTIFICATION FOR BUDGET ACTIVITY: This program is funded under ADVANCED COMPONENT DEVELOPMENT AND PROTOTYPES because it includes all efforts necessary to evaluate integrated technologies, representative models or prototype systems in a high fidelity and realistic operating environment.

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy					Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*			R-1 Program Element (Number/Name) PE 0303354N *I ASW Systems Development - MIP*		
B. Program Change Summary ($ in Millions)	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**
Previous President's Budget	8.278	8.889	10.007	-	10.007
Current President's Budget	8.278	8.889	9.991	-	9.991
Total Adjustments	0.000	0.000	-0.016	-	-0.016
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Rate/Misc Adjustments	0.000	0.000	-0.016	-	-0.016

Change Summary Explanation

Technical: Not Applicable

Schedule:

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0303354N / *ASW Systems Development - MIP*	Project (Number/Name) 0490 / *Airborne Acoustic Intelligence (AAI)*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
0490: *Airborne Acoustic Intelligence (AAI)*	45.653	8.278	8.889	9.991	-	9.991	9.158	9.341	10.728	10.943	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The mission of Airborne ASW Intelligence (AAI)(CNO Project K-0416) is to provide advanced Anti-Submarine Warfare (ASW) capabilities through rapid development of new technology and prototype mechanisms for the collection of ASW related intelligence. This includes full spectrum intelligence collections and cataloging of current targets of interest. The program develops and swiftly deploys disruptive innovation to counter emerging threats in order to maintain the United States' current undersea warfare superiority. AAI employs the capability to quickly reconstruct and analyze passive and active measurements of submarine vulnerabilities providing actionable intelligence to fleet commanders. The AAI data collection program provides full spectrum intelligence data essential for the design and development of advanced sensors, weapon systems, environmental models, and tactical decision aids. AAI collection systems are installed and employed on uniquely configured aircraft, specially configured ground support facilities, ships, and other assets as required for the collection, processing, exfiltration, and dissemination of undersea intelligence. AAI includes recording systems, advanced detection and tracking systems, specially designed sensors, advanced processing systems and techniques, and specially derived tactics.

Furious Krypton is a Line of Sight (LOS) and Over the Horizon (OTH) data link utilizing a Naval Research Laboratory (NRL) communications payload onboard the Broad Area Maritime Surveillance-Demonstrator (BAMS-D) and Triton platform. The demonstration will show utilization of the payload to collect and retransmit sonobuoy data to both LOS and OTH receivers.

This is a Military Intelligence Program (MIP).

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Systems Engineering / Aircraft Mods Active Acoustic Program	1.551	1.399	1.399	0.000	1.399
Articles:	-	-	-	-	-
FY 2019 Plans: Engineering support of Acoustic Intelligence (ACINT) Collection Suites (ACS) for certified AAI collection platforms and management of full spectrum database. Engineering support for design upgrades to ACINT Collection Suites for certified AAI collection platforms. Evaluate additional P-8 aircraft sensor station for in-flight analysis of ACINT. Continue evaluation of Fleet software releases for Office of Naval Intelligence(ONI)					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0303354N / *ASW Systems Development - MIP*	**Project (Number/Name)** 0490 / *Airborne Acoustic Intelligence (AAI)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
certification aboard ASW collection platforms. Continue upgrades and development for unique airborne avionics and sensors. Continue fielding ACS kits in support of P-8A deployments. ***FY 2020 Base Plans:*** Engineering support of Acoustic Intelligence (ACINT) Collection Suites for certified AAI collection platforms and management of full spectrum database. Engineering support for design upgrades to ACINT Collection Suites for certified AAI collection platforms. Evaluate additional P-8 aircraft sensor station for in-flight analysis of ACINT. Continue evaluation of Fleet software releases for Office of Naval Intelligence(ONI) certification aboard ASW collection platforms. Continue upgrades and development for unique airborne avionics and sensors. Continue fielding ACS kits in support of P-8A deployments. ***FY 2020 OCO Plans:*** N/A					
Title: Data Collection and Analysis	1.035	1.044	1.098	0.000	1.098
Articles:	-	-	-	-	-
FY 2019 Plans: Data collection support at Operational Wings. Ongoing collection of high interest acoustic and non-acoustic data in support of MASINT/ONI threat assessment requirements. Characterization, analysis and certification of the upgraded Fleet MASINT collection assets. Reduction, Analysis and Fleet Rapid Feedback. Conduct special operations support. Essential performance modeling and evaluation for advanced technology sensor systems design and Fleet tactics development. Develop post mission analysis hardware, software and processes in response to evolving enemy capabilities. ***FY 2020 Base Plans:*** Data collection support at Operational Wings. Ongoing collection of high interest acoustic and non-acoustic data in support of MASINT/ONI threat assessment requirements. Characterization, analysis and certification of the upgraded Fleet MASINT collection assets. Reduction, Analysis and Fleet Rapid Feedback. Conduct special operations support. Essential performance modeling and evaluation for advanced technology sensor systems design and Fleet tactics development. Develop post mission analysis hardware, software and processes in response to evolving enemy capabilities. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:***					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0303354N / *ASW Systems Development - MIP*	**Project (Number/Name)** 0490 / *Airborne Acoustic Intelligence (AAI)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Increase is due to refined cost estimates.					
Title: Active Measurement Validation	0.138	0.143	0.146	0.000	0.146
Articles:	-	-	-	-	-
FY 2019 Plans: Active Measurement Validation of targets of interest. Provides the acoustic analysis of echo characterization (which includes: signal excess measurements, peak frequency, trend analysis and pulse duration measurements) and target strength.					
FY 2020 Base Plans: Active Measurement Validation of targets of interest. Provides the acoustic analysis of echo characterization (which includes: signal excess measurements, peak frequency, trend analysis and pulse duration measurements) and target strength.					
FY 2020 OCO Plans: N/A					
FY 2019 to FY 2020 Increase/Decrease Statement: Increase is due to inflation.					
Title: Navy Underwater Active Multiple Ping (NUAMP) Product Development	5.554	5.103	5.144	0.000	5.144
Articles:	-	-	-	-	-
FY 2019 Plans: Continue sonic frequency design, development, integration and test for remaining sonic frequencies of the NUAMP sonobuoy family.					
FY 2020 Base Plans: Continue sonic frequency design, development, integration and test for remaining sonic frequencies of the NUAMP sonobuoy family.					
FY 2020 OCO Plans: N/A					
FY 2019 to FY 2020 Increase/Decrease Statement: Increase is due to inflation.					
Title: Passive Extended Range Sonobuoy System (PERSS) Product Development	0.000	1.200	1.225	0.000	1.225

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0303354N / *ASW Systems Development - MIP*	**Project (Number/Name)** 0490 / *Airborne Acoustic Intelligence (AAI)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Articles:	-	-	-	-	-
FY 2019 Plans: Continue development of disruptive innovative sensors by experimenting and prototyping in a high fidelity and realistic operating environment. Transition various laboratory sonobuoy subsystems by proving the subsystems maturity in real world environments. Perform risk reduction technology demonstration efforts using high gain beamforming sonobuoy transducer assemblies. ***FY 2020 Base Plans:*** Continue development of disruptive innovative sensors by experimenting and prototyping in a high fidelity and realistic operating environment. Transition various laboratory sonobuoy subsystems by proving the subsystems maturity in real world environments. Perform risk reduction technology demonstration efforts using high gain beamforming sonobuoy transducer assemblies. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increase is due to refined cost estimates.					
Title: Furious Krypton	0.000	0.000	0.979	0.000	0.979
Articles:	-	-	-	-	-
FY 2019 Plans: N/A ***FY 2020 Base Plans:*** Develop and demonstrate a disruptive innovative method to provide Tactical Anti-Submarine Warfare data to multiple users both Beyond Line of Sight and via Satellite Communications (SATCOM). ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Funds Furious Krypton demonstration.					
Accomplishments/Planned Programs Subtotals	8.278	8.889	9.991	0.000	9.991

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0303354N / *ASW Systems Development - MIP*	**Project (Number/Name)** 0490 / *Airborne Acoustic Intelligence (AAI)*

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Airborne ASW Intelligence (AAI) is a CNO Special Project. The included technology developments are primarily in-house with contractor participation through existing vehicles.

E. Performance Metrics

Provide engineering to support Sound Pressure Level (SPL) recording. Provide data collection support at Operation Wings. Perform Active Measurement Validation of targets of interest.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0303354N / *ASW Systems Development - MIP*	Project (Number/Name) 0490 / *Airborne Acoustic Intelligence (AAI)*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Active Measurement Validation	WR	NAWCAD : PATUXENT RIVER, MD	1.893	0.138	Dec 2017	0.143	Dec 2018	0.146	Dec 2019	-		0.146	Continuing	Continuing	Continuing
Ancillary Hdw Development	WR	NAWCAD : PATUXENT RIVER, MD	6.014	0.500	Dec 2017	0.500	Dec 2018	0.515	Dec 2019	-		0.515	Continuing	Continuing	Continuing
Ancillary Hdw Development Cont	Various	VARIOUS : VARIOUS	1.546	0.585	Dec 2017	0.593	Dec 2018	0.600	Dec 2019	-		0.600	Continuing	Continuing	Continuing
Systems Eng	WR	NAWCAD : PATUXENT RIVER, MD	5.818	0.665	Dec 2017	0.676	Dec 2018	0.690	Dec 2019	-		0.690	Continuing	Continuing	Continuing
Systems Eng	Various	VARIOUS : VARIOUS	2.265	0.793	Dec 2017	0.723	Dec 2018	0.717	Dec 2019	-		0.717	Continuing	Continuing	Continuing
Primary Hdw Development	SS/CPIF	ERAPSCO : FT. WAYNE IN	23.793	5.347	Dec 2017	6.004	Dec 2018	7.069	Dec 2019	-		7.069	Continuing	Continuing	Continuing
		Subtotal	41.329	8.028		8.639		9.737		-		9.737	Continuing	Continuing	N/A

Management Services ($ in Millions)

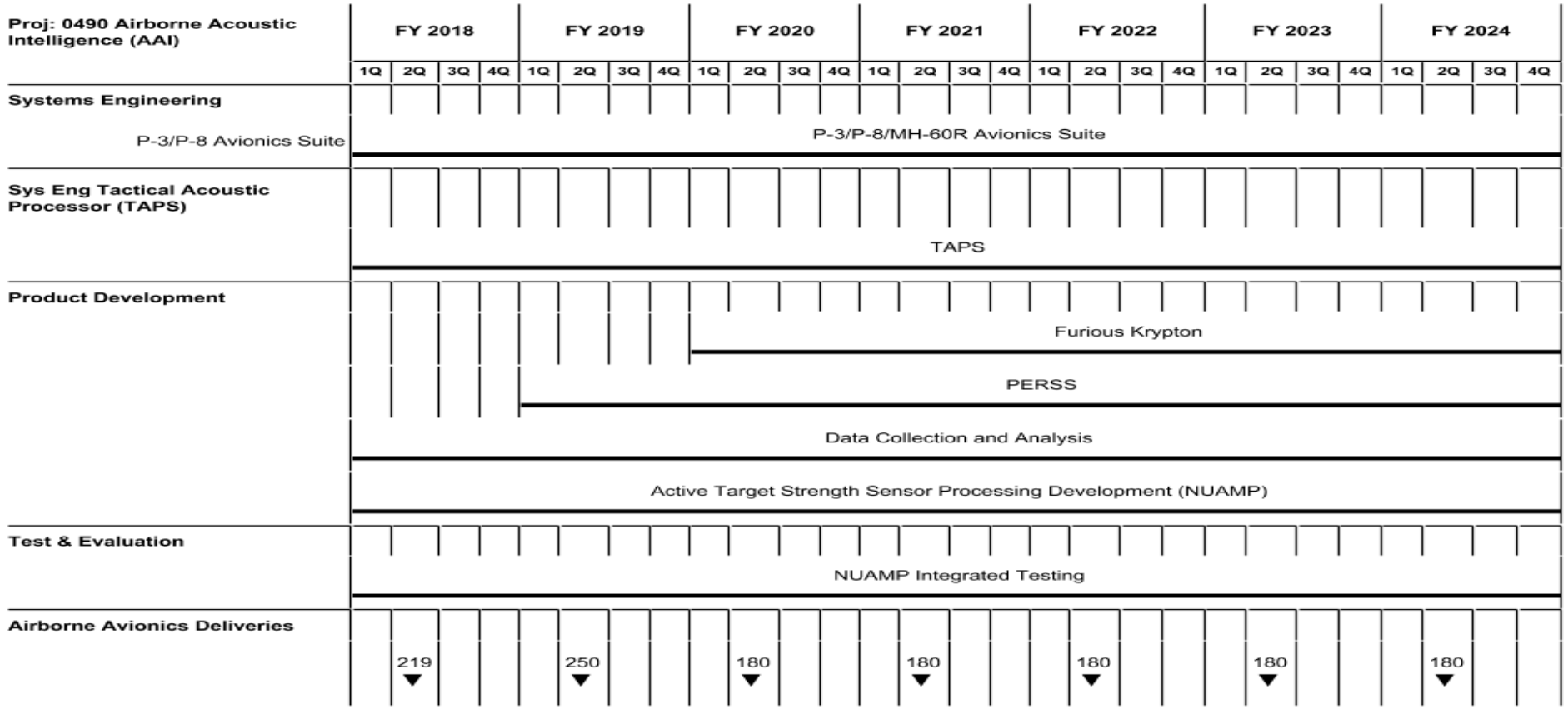
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Mgt & Prof Spt Svcs (Non-FFRDC)	Various	VARIOUS : VARIOUS	3.473	0.202	Dec 2017	0.205	Dec 2018	0.209	Dec 2019	-		0.209	Continuing	Continuing	Continuing
Contractor Eng Spt	Various	VARIOUS : VARIOUS	0.588	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Travel	Various	VARIOUS : VARIOUS	0.232	0.048	Dec 2017	0.045	Dec 2018	0.045	Dec 2019	-		0.045	Continuing	Continuing	Continuing
Prior year Mgmt Svcs no longer funded in the FYDP	Various	VARIOUS : VARIOUS	0.031	0.000		0.000		0.000		-		0.000	0.000	0.031	-
		Subtotal	4.324	0.250		0.250		0.254		-		0.254	Continuing	Continuing	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0303354N / *ASW Systems Development - MIP*	Project (Number/Name) 0490 / *Airborne Acoustic Intelligence (AAI)*	

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	45.653	8.278		8.889		9.991		-		9.991	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0303354N / *ASW Systems Development - MIP*	**Project (Number/Name)** 0490 / *Airborne Acoustic Intelligence (AAI)*



2020DON - 0303354N - 0490

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0303354N / *ASW Systems Development - MIP*	**Project (Number/Name)** 0490 / *Airborne Acoustic Intelligence (AAI)*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj: 0490 Airborne Acoustic Intelligence (AAI)				
Systems Engineering: P-3/P-8 Avionics Suite: P-3/P-8/MH-60R Avionics Suite	1	2018	4	2024
Sys Eng Tactical Acoustic Processor (TAPS): Sys Eng Tactical Acoustic Processor (TAPS)	1	2018	4	2024
Product Development: Furious Krypton Development	1	2020	4	2024
Product Development: Passive Extended Range Sonic Sensor	1	2019	4	2024
Product Development: Data Collection and Analysis	1	2018	4	2024
Product Development: Active Target Strength sensor processing development	1	2018	4	2024
Test & Evaluation: Technical Evaluation	1	2018	4	2024
Airborne Avionics Deliveries: Prototype 5	2	2018	2	2018
Airborne Avionics Deliveries: Prototype 6	2	2019	2	2019
Airborne Avionics Deliveries: Prototype 7	2	2020	2	2020
Airborne Avionics Deliveries: Prototype 8	2	2021	2	2021
Airborne Avionics Deliveries: Prototype 9	2	2022	2	2022
Airborne Avionics Deliveries: Prototype 10	2	2023	2	2023
Airborne Avionics Deliveries: Prototype 11	2	2024	2	2024

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0304240M *I (U)Advanced Tactical Unmanned Aircraft System*

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	0.000	5.200	17.561	21.157	-	21.157	26.649	24.510	61.725	62.959	Continuing	Continuing
3135: *USMC MUX Medium Altitude - Long Endurance (MALE) Group 5 UAV*	0.000	4.978	12.708	21.157	-	21.157	26.649	24.510	61.725	62.959	Continuing	Continuing
3427: *KMAX Experimentation and Support*	0.000	0.222	4.853	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	5.075

A. Mission Description and Budget Item Justification

This program element provides for development and capability requirements for Advanced Tactical Unmanned Aerial Vehicles in support of expeditionary efforts Projects are Joint Military Intelligence Programs.

Project 3135 - This project provides technical concept maturation and experimentation for the Marine Air Ground Task Force (MAGTF) Unmanned Aircraft System (UAS) Expeditionary (MUX) with Vertical/Short Take-Off and Vertical Landing (V/STOVL) capability. MUX is determined to be a critical capability for current and future USMC expeditionary operations. These MUX efforts will include development of system architectures and rapid prototyping of critical system components to inform a future MUX program of record. Resulting work products will mitigate technical risks through analysis, modeling and simulation matched with refined CONOPS development, Analysis of Alternative development, prototype development, and testing at the component-level and will leverage real-time data used on deployed USMC MQ-9. Threshold capabilities will include, Airborne Early Warning, Intelligence Surveillance Reconnaissance, Electronic Warfare and Communications Control. Objective capabilities will include strike, airborne escort, and cargo resupply. Provides USMC with MUX operational capability in FY26.

Project 3427 - This project provides for experimentation and support of the CQ-24A Cargo UAS (commonly referred to as KMAX). CQ-24A will be used for experimentation to specifically inform the unmanned cargo resupply requirements of future programs of record, to include MUX and other unmanned air programs. Experimentation includes payloads/sensor integration, control station integration, Concept of Operations (CONOPS) and Tactics, Techniques, and Procedures (TTP) development. These experimentation efforts inform program capability documents, support other military exercises, and advance technologies needed for the future MUX Program Of Record. Additionally, this program allows for government, industry teams, and other stakeholders to collaboratively develop key sensor technologies used to inform future VTOL aircraft. These efforts will include continued development of autonomous obstacle avoidance systems that have dual military-commercial use, such as natural disaster response and combatting wild fires, enabling cargo delivery in austere environments.

Cost estimate for Cost to Complete and Total Cost for both project units are being developed and will be promulgated in a future budget request.

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0304240M *I (U)Advanced Tactical Unmanned Aircraft System*

B. Program Change Summary ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	7.979	25.291	26.770	-	26.770
Current President's Budget	5.200	17.561	21.157	-	21.157
Total Adjustments	-2.779	-7.730	-5.613	-	-5.613
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-7.730			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Program Adjustments	0.000	0.000	-5.602	-	-5.602
• Rate/Misc Adjustments	0.000	0.000	-0.011	-	-0.011
• Congressional Directed Reductions Adjustments	-2.779	-	-	-	-

Change Summary Explanation

The FY 2020 funding request was reduced by $1.00M to account for the availability of prior year execution balances.

Decrease in FY 2020 due to KMAX Experimentation and Support project which will not be used as a method for concept of operations (CONOPS) development.

Schedule:
Project 3135 - Updated to reflect MUX experimentation requirements.
Project 3427 - Not applicable

Technical: Not applicable

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0304240M / *(U)Advanced Tactical Unmanned Aircraft System*	Project (Number/Name) 3135 / *USMC MUX Medium Altitude - Long Endurance (MALE) Group 5 UAV*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
3135: *USMC MUX Medium Altitude - Long Endurance (MALE) Group 5 UAV*	0.000	4.978	12.708	21.157	-	21.157	26.649	24.510	61.725	62.959	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Funding provides for the development of system architectures, Analysis of Alternatives, experimentation, key technology maturation, rapid prototyping, and concept refinement for the Marine Air Ground Task Force (MAGTF) Unmanned Aircraft System (UAS) Expeditionary (MUX) with Vertical/Short Take-Off and Vertical Landing (V/STOVL) capability. The MUX UAV supports Expeditionary Force 21 Operating Concepts and the 2017 Marine Aviation Plan (AvPlan) which require an advanced, multi-mission ship-based Group 5 UAS in support of Marine Expeditionary Force/Marine Expeditionary Brigade-sized MAGTF to address capability gaps. The future MUX UAV system will provide a weaponized, payload flexible, shipboard capable/expeditionary system that is runway independent for all weather, long range/persistence, operations from the sea in a contested environment. This next generation UAV capability will have far greater range, endurance, altitude, and payload capability than the current conventional Vertical Take Off and Landing (VTOL) technology can provide from air capable ships. The MUX system Initial Capabilities Document (ICD) was approved in Oct 2016. The Analysis of Alternatives (AOA) efforts commenced in FY18. Rapid prototyping strategies are also being pursued by the USMC to meet an early operational need date.

This effort will continue to refine program scope, phasing, and cost for development of the MUX capability. Funding in FY20 will also be used to reduce overall MUX program cost by leveraging other technology developmental programs, such as developmental communications/networking payloads capabilities, and USMC MQ-9 deployed services, allowing for continued technical maturation effort, rapid prototyping, and effective transition to a MUX POR.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: MUX Studies, Analysis, Experimentation and Concept Refinement	3.650	10.068	18.482	0.000	18.482
Articles:	-	-	-	-	-
FY 2019 Plans: Provides funding for Government and industry teams for acquisition activities including industry inquiries, aircraft trade studies, concept refinement, requirements/payload analysis, and rapid prototyping efforts related to the MUX POR. Supports continued development of the MUX Concept of Operations and draft CDD. Provides funding for experimentation with advanced concept demonstrator UAVs such as USMC CQ-24A Cargo UAS, DARPA/ONR developed Tern UAS, and US Army AMRDEC JMR-TD aircraft projects, along with other tactical UAV/payload/control station demonstrator efforts, to help inform tactical unmanned system performance requirements, initial KPP, CONOPS, concepts, tactics, doctrine, the future MUX program of record, and support					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0304240M / *(U)Advanced Tactical Unmanned Aircraft System*	**Project (Number/Name)** 3135 / *USMC MUX Medium Altitude - Long Endurance (MALE) Group 5 UAV*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
rapid prototyping efforts. Provides funding for engineering architecture assessments (aircraft and payloads) to establish specific areas where the government will function as the systems integrator. ***FY 2020 Base Plans:*** Planned efforts include continued development of capability architecture, model based system engineering from aircraft trade studies to analyze system architecture. Validate capability to CONOPS requirement documentation for future contracting actions, and rapid prototyping efforts related to the MUX POR. Supports continued development of the MUX Concept of Operations and draft CDD. Provide for experimentation with advanced concept payloads and control station demonstrator efforts to identify tactical unmanned system performance requirements in support of KPP refinement, tactics, and support rapid prototyping efforts. Continue issuance of second Broad Agency Announcement and conduct initial Materiel Development Decision (MDD) review. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increase due to amplified efforts for modeling and simulation. Continued vendor study contracts through the release of the second Broad Agency Announcement (BAA) and conceptual design beginning in FY20.					
Title: Technical and Engineering Services	1.328	2.640	2.675	0.000	2.675
Articles:	-	-	-	-	-
FY 2019 Plans: Provide Government Engineering support, Contractor support, Program support and travel for execution of MUX studies, experimentation, rapid prototyping, and concept refinement and for pre-MS A related acquisition activities to support the future MUX program of record. ***FY 2020 Base Plans:*** Provide Government Engineering support, Contractor support, Program support and travel for execution of MUX architecture development, component-level prototyping, modeling & simulation, development of AOA, analysis of data provided by DOD developmental programs. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:***					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0304240M / *(U)Advanced Tactical Unmanned Aircraft System*	**Project (Number/Name)** 3135 / *USMC MUX Medium Altitude - Long Endurance (MALE) Group 5 UAV*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Increase in FY20 due to requirements generation, analysis, and contract preparations which includes building Request For Proposal (RFP).					
Accomplishments/Planned Programs Subtotals	4.978	12.708	21.157	0.000	21.157

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

A Material Development Decision is anticipated in FY20. The MUX program will leverage other technology developmental programs, such as developmental communications/networking payloads capabilities, and USMC MQ-9 deployed services, Original Equipment Manufacturer internally funded UAV prototypes when available, existing tactical unmanned technologies, and promising new industry design concepts that result from industry trade studies. The government will develop and award study contracts as required to support program activities and analysis efforts. Assessment of available technology from existing S&T efforts and review of industry inquiries / study contracts will be used to determine the optimum MUX strategy. Delivery of MUX capability may be met through an accelerated acquisition approach and spiral development.

E. Performance Metrics

Performance metrics include successful completion of Trade Studies; successful development of a CONOPS AOA and draft CDD, identification of material solutions for concept refinement, and analysis of architectures.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0304240M / *(U)Advanced Tactical Unmanned Aircraft System*	Project (Number/Name) 3135 / *USMC MUX Medium Altitude - Long Endurance (MALE) Group 5 UAV*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
MUX Studies and Experimentation	Various	TBD : TBD	0.000	1.500	Jan 2018	8.045	Nov 2018	15.525	Nov 2019	-		15.525	Continuing	Continuing	Continuing
Requirements Analysis and Engineering Assessments	WR	Various : Various	0.000	2.150	Jan 2018	2.023	Nov 2018	2.957	Nov 2019	-		2.957	Continuing	Continuing	Continuing
		Subtotal	0.000	3.650		10.068		18.482		-		18.482	Continuing	Continuing	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Government Engineering Support	WR	NAWCAD : Patuxent River, MD	0.000	0.635	Jan 2018	1.252	Nov 2018	1.337	Nov 2019	-		1.337	0.000	3.224	-
Program Management Support	Various	Various : Various	0.000	0.600	Jan 2018	1.268	Nov 2018	1.248	Nov 2019	-		1.248	0.000	3.116	-
Travel	WR	NAWCAD : Patuxent River, MD	0.000	0.093	Jan 2018	0.120	Nov 2018	0.090	Nov 2019	-		0.090	0.000	0.303	-
		Subtotal	0.000	1.328		2.640		2.675		-		2.675	0.000	6.643	N/A

	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	4.978		12.708		21.157		-		21.157	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0304240M / *(U)Advanced Tactical Unmanned Aircraft System*	**Project (Number/Name)** 3135 / *USMC MUX Medium Altitude - Long Endurance (MALE) Group 5 UAV*

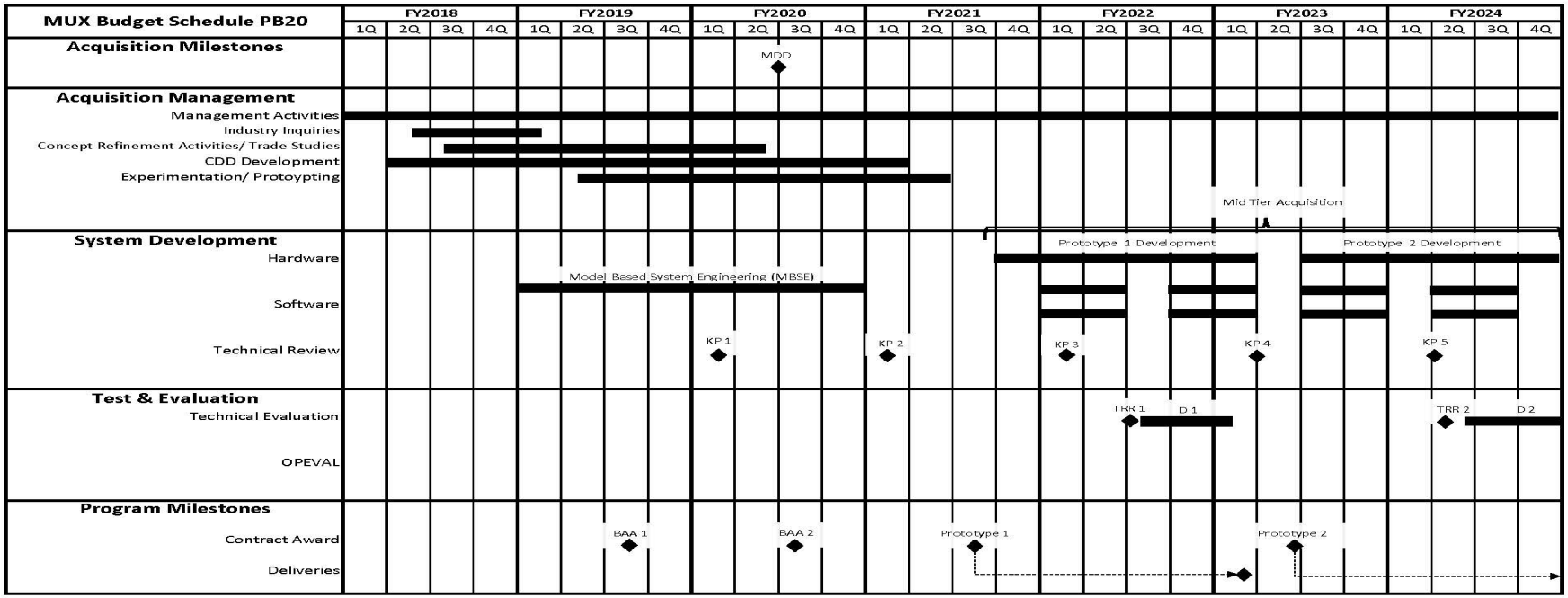


Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0304240M / *(U)Advanced Tactical Unmanned Aircraft System*	**Project (Number/Name)** 3135 / *USMC MUX Medium Altitude - Long Endurance (MALE) Group 5 UAV*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 3135				
Acquistion Milestones: MDD	2	2020	2	2020
Acquistion Milestones: Acquisition Management Activities: Program Management Activities	1	2018	4	2024
Acquistion Milestones: Acquisition Management Activities: Industry Inquiries	2	2018	1	2019
Acquistion Milestones: Acquisition Management Activities: Concept Refinement Activities/ Trade Studies	3	2018	2	2020
Acquistion Milestones: Acquisition Management Activities: CDD Development	2	2018	2	2021
Acquistion Milestones: Acquisition Management Activities: Experimentation/ Protoypting	2	2019	3	2021
System Development: Hardware	1	2018	1	2024
System Development: P1	3	2021	1	2023
System Development: P2	2	2023	4	2024
System Development: Software	1	2018	1	2024
System Development: Model Based System Engineering	1	2019	1	2021
System Development: Technical Review	1	2018	1	2024
Test & Evaluation: Technology Readiness Review (I)	2	2023	2	2024
Test & Evaluation: Technology Readiness Review (II)	4	2024	4	2024
Progam Milestones: Broad Agency Announcement (I)	3	2019	3	2019
Progam Milestones: Broad Agency Announcement (II)	3	2020	3	2020
Progam Milestones: Protype (I)	2	2021	2	2021
Progam Milestones: Protype (II)	2	2023	2	2023

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0304240M / *(U)Advanced Tactical Unmanned Aircraft System*	Project (Number/Name) 3427 / *KMAX Experimentation and Support*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
3427: *KMAX Experimentation and Support*	0.000	0.222	4.853	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	5.075
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Funding provides for experimentation for unmanned cargo operations and includes complementary Intelligence, Surveillance, and Reconnaissance (ISR), payloads, advanced sensors, autonomy; efforts to refine requirements and concept of operations (CONOPS); and support of future unmanned programs of record.

The program's two Marine Corps CQ-24A were successfully utilized in Afghanistan to support urgent operational needs in that theater of operations. The two CQ-24A aircraft and ground control system require contractor services to operate. Utilization of existing CQ-24A systems is an efficient risk reduction method.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: CQ-24A Cargo UAS Experimentation and Support Services	0.222	3.849	0.000	0.000	0.000
Articles:	-	-	-	-	-
FY 2019 Plans: Provides funding for government and industry teams to develop key sensor technologies needed for future VTOL aircraft. This includes continued development of autonomous obstacle avoidance and landing systems for dual military-commercial use, such as natural disaster response and combatting wild fires, allowing for cargo delivery in austere environments. Additionally, funding supports the continued development and integration of unique satellite communication systems designed for over-the-horizon use and operation in line-of-sight constrained environments. This combined capability will be demonstrated on the CQ-24A as part of a Cooperative Research and Development Agreement (CRADA) between the Navy and industry partners. Provides funding for engineering studies and architecture assessments (aircraft and payloads) to inform the future Cargo UAS requirements.					
FY 2020 Base Plans: N/A					
FY 2020 OCO Plans: N/A					
FY 2019 to FY 2020 Increase/Decrease Statement:					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0304240M / *(U)Advanced Tactical Unmanned Aircraft System*	**Project (Number/Name)** 3427 / *KMAX Experimentation and Support*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Decrease due to Expeditionary Force 21 Operating Concepts and the 2017 Marine Aviation Plan (AvPlan), do not support continued use of KMAX as a method for CONOPS developments.					
Title: Technical and Engineering Services	0.000	1.004	0.000	0.000	0.000
Articles:	-	-	-	-	-
FY 2019 Plans: Provide government engineering support, contractor support, program support and travel for execution of CQ-24A Cargo UAS experimentation and concept refinement for study products and acquisition activities to support future programs of record, to include MUX. ***FY 2020 Base Plans:*** N/A ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Decrease due to minimal government engineering support required for DMIL process.					
Accomplishments/Planned Programs Subtotals	0.222	4.853	0.000	0.000	0.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

The CQ-24A Cargo UAS experimentation and support activities will be contracted through a sole source contract with the aircraft prime vendor and through other contracts to sensor/communication vendors that are currently developing the AACUS and SATCOM capabilities for NAVAIR, including the use of small business.

Future Cargo UAS resupply requirements are being defined through USMC logistics efforts to identify accelerated acquisition opportunities to provide an early desired deployment date 2025 with transition to a future Program of Record at a later time.

E. Performance Metrics

Performance metrics include successful completion of technical demonstration with published reports and CONOPS updates, along with inputs to unmanned cargo re-supply requirements for capability documents and performance specifications.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0304240M / *(U)Advanced Tactical Unmanned Aircraft System*	Project (Number/Name) 3427 / *KMAX Experimentation and Support*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
CQ-24A Cargo UAS Experimentation	C/CPFF	Kaman : Bloomfield, CT	0.000	0.222	Feb 2019	3.239	Mar 2019	0.000		-		0.000	0.000	3.461	4.750
Requirements and Analysis, and Engineering Assessments	WR	NAWCAD : Patuxent River, MD	0.000	0.000	Jan 2018	0.610	Mar 2019	0.000		-		0.000	0.000	0.610	1.190
		Subtotal	0.000	0.222		3.849		0.000		-		0.000	0.000	4.071	N/A

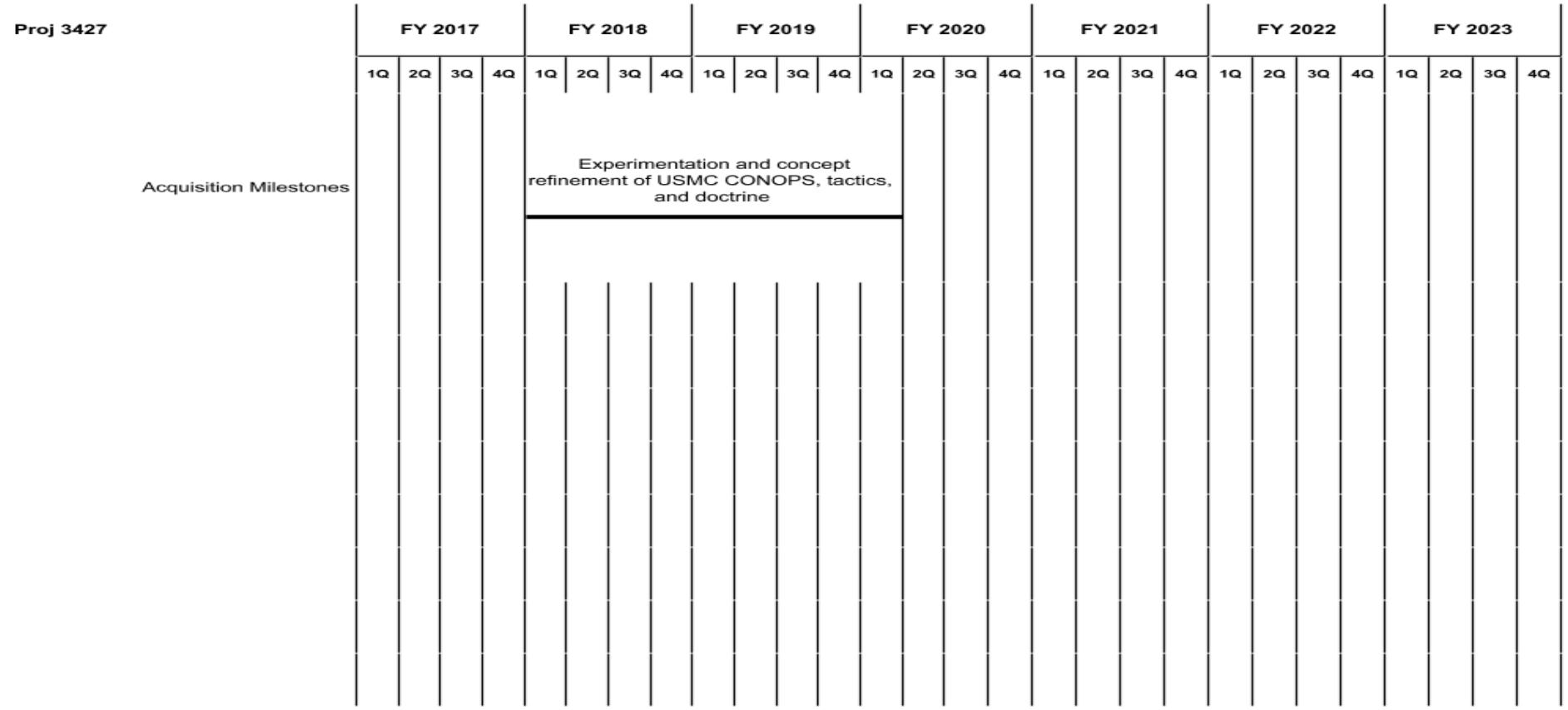
Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Govt Engineering Support	WR	NAWCAD : Patuxent River, MD	0.000	0.000		0.474	Nov 2018	0.000		-		0.000	0.000	0.474	-
Program Management Support	Various	Various : Various	0.000	0.000	Jan 2018	0.450	Nov 2018	0.000		-		0.000	0.000	0.450	-
Travel	WR	NAWCAD : Patuxent River, MD	0.000	0.000	Jan 2018	0.080	Nov 2018	0.000		-		0.000	0.000	0.080	-
		Subtotal	0.000	0.000		1.004		0.000		-		0.000	0.000	1.004	N/A

	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	0.222		4.853		0.000		-		0.000	0.000	5.075	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0304240M / *(U)Advanced Tactical Unmanned Aircraft System*	**Project (Number/Name)** 3427 / *KMAX Experimentation and Support*



2019PB - 0304240M - 3427

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0304240M / *(U)Advanced Tactical Unmanned Aircraft System*	**Project (Number/Name)** 3427 / *KMAX Experimentation and Support*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 3427				
Acquisition Milestones: Experimentation and concept refinement of USMC CONOPS, tactics, and doctrine	1	2018	1	2020

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0304240N *I (U)Advanced Tactical Unmanned Aircraft System*

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	0.000	0.000	9.300	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	9.300
3429: *TERN UAS*	0.000	0.000	9.300	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	9.300

A. Mission Description and Budget Item Justification

The Navy has identified capability gaps in the Navy's Distributed Maritime Operations (DMO) concept that could be filled with a next generation, sea-based Medium Altitude Long Endurance (MALE) Unmanned Aerial Vehicle (UAV) operating from Surface Combatant Ships. This program element provides for the maturation, prototyping, and demonstration of advanced platform, payload, networking, and enabling technologies in advance of a future program of record. Technologies that require further maturation include advanced Vertical Take-off and Landing air vehicles, advanced data networks that support distributed unmanned operations, and other technologies that enable maritime over the horizon targeting and early warning at safe stand-off distances. These prototypes will be assessed for military utility through fleet experimentation events and large force exercises. Results will be combined with analytical studies to refine requirements for the next generation of maritime aviation Family of Systems (FOS) and will directly support capability gaps associated with the Future Surface Combatant (FSC). This project is a Military Intelligence Program.

This project provides for trade studies, analysis, and continued prototype development, testing, fleet experimentation, and concept refinement for next generation manned-unmanned aviation technologies to meet Navy Fleet and Combatant Commander (COCOM) classified warfighter gaps in a DMO construct. This project will also conduct requirements analysis and studies for allocation of requirements for manned/unmanned platforms needed for DMO and for operations on Future Surface Combatants (FSC). Candidate technologies are focused on developing new DMO platforms and the required sensors and communications relay payloads that are enabling technologies for DMO. Technologies currently being developed and assessed for military utility include Advanced Vertical Take-off airframes to include the Tern MALE UAV Advanced Technology Concept Demonstrator (ATCD), developed primarily by Defense Advanced Research Projects Agency (DARPA) and the Office of Naval Research (ONR).

B. Program Change Summary ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	0.000	9.300	14.400	-	14.400
Current President's Budget	0.000	9.300	0.000	-	0.000
Total Adjustments	0.000	0.000	-14.400	-	-14.400
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Program Adjustments	0.000	0.000	-14.397	-	-14.397

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy					Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*		R-1 Program Element (Number/Name) PE 0304240N *I (U)Advanced Tactical Unmanned Aircraft System*			
• Rate/Misc Adjustments	0.000	0.000	-0.003	-	-0.003

Change Summary Explanation

The Department of the Navy terminated TERN UAS in FY 2020.

Schedule: Not Applicable
Technical: Not applicable

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0304240N / *(U)Advanced Tactical Unmanned Aircraft System*	Project (Number/Name) 3429 / *TERN UAS*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
3429: *TERN UAS*	0.000	0.000	9.300	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	9.300
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The goal of this program is to develop technologies to allow for their evaluation in the Distributed Maritime Operations (DMO) construct to support requirements refinement for aviation support to current and future surface combatants to include the Future Surface Combatant (FSC) program. This program will conduct studies and analysis of requirements to determine the most effective allocation of mission requirements to aviation platforms and between manned and unmanned platforms to enable future DMO and FSC operations. Areas of analysis will include, but are not limited to, over-the horizon communications, targeting, distributed maneuvering, manned-unmanned platform mix, and optimized sensor payload configurations to satisfy DMO mission gaps. The program will demonstrate organic shipboard platforms capable of providing persistent 24/7 Intelligence, Surveillance, and Reconnaissance (ISR), targeting, early warning, and anti-surface strike capabilities at long radius orbits. To achieve these goals, the program will investigate new concepts for aircraft launch and recovery, logistics, and maintenance in maritime operating conditions. This effort will assist in funding mission utility technical assessment of a Medium-Altitude, Long-Endurance Unmanned Aerial Vehicle (MALE UAV) technology demonstrators intended for surface combatants.

This program will demonstrate an over the horizon communications ISR network to address joint service wireless high data rate communications, interoperability, and targeting gaps for Navy's DMO roadmap. The ISR communications network will provide cross-domain connectivity, including prototyping of systems such as the joint service Manned-Unmanned Distributed Lethality Airborne Network (MUDLAN), for Navy specific platforms. This payload provides information exchange between multi-domain platforms at very high data rates in a spectrum challenged environment without reliance on space-based capabilities and provides an alternate Precision Navigation and Timing (PNT) capability for operating in a GPS-denied environment. This effort includes fleet experimentation of the technology with manned-unmanned assets in a cross-domain, joint service DMO environment.

This program funds continuing advancement and experimentation of the enabling sensor technologies required to operate in the DMO environment, such as demonstrating sense and avoid sensors and autonomy software in real world environments and advanced ice detection systems to avoid potential loss of aircraft when operating at extreme ranges. Additionally, the project will support prototype development and fleet experimentation of other mission payloads required for DMO gaps. Prototypes will be demonstrated in Fleet exercises to inform requirements for an aviation family of systems to support the FSC Program of Record and Fleet operations in a DMO construct.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: MALE (TERN) UAV Technical Maturation and Experimentation	0.000	7.150	0.000	0.000	0.000
Articles:	-	-	-	-	-
FY 2019 Plans:					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0304240N / *(U)Advanced Tactical Unmanned Aircraft System*	**Project (Number/Name)** 3429 / *TERN UAS*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Commence aircraft trade studies, concept refinement, technology maturation, aircraft experimentation and testing, envelope expansion, and potential payload integration for meeting Navy mission requirements to inform the Navy's future Family of Systems (FOS). Test and evaluate Tern UAV in ground and flight test events. Refine objective performance requirements, initial Key Performance Parameters (KPP), CONOPS, concepts, tactics, doctrine, and reduce risk for the future ship-based UAV FOS. Provides architecture assessments for integrating the MALE UAV ground and air segments to support interoperability with Navy Common Control System (CCS). ***FY 2020 Base Plans:*** N/A ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** The Department of the Navy terminated TERN UAS in FY 2020.					
Title: Technical and Engineering Services ***Articles:*** ***FY 2019 Plans:*** Initiate and provide Government engineering support, contractor support, program support and travel for continued experimentation and analysis. ***FY 2020 Base Plans:*** N/A ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** The Department of the Navy terminated TERN UAS in FY 2020.	0.000 -	2.150 -	0.000 -	0.000 -	0.000 -
Accomplishments/Planned Programs Subtotals	0.000	9.300	0.000	0.000	0.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0304240N / *(U)Advanced Tactical Unmanned Aircraft System*	**Project (Number/Name)** 3429 / *TERN UAS*

D. Acquisition Strategy

The program will continue experimentation efforts leveraging DARPA/ONR contracts for Tern. SBIR contracts will be used for safety and mission systems payloads that were originally awarded under small business contract actions. Maturation of other payloads will be acquired in accordance with program office acquisition plans

E. Performance Metrics

Performance metrics include successful completion of trade studies, successful demonstration of the minimum design criteria identified in the contracts, and Fleet/ COCOM assessment of compliance with Measures of Effectiveness (MOEs).

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0304240N / *(U)Advanced Tactical Unmanned Aircraft System*	**Project (Number/Name)** 3429 / *TERN UAS*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
MALE (TERN) UAV Technical Maturation & Experimentation	C/CPIF	Northrop Grumman : San Diego, CA	0.000	0.000		7.150	Dec 2018	0.000		-		0.000	0.000	7.150	7.150
UAS Sensors and Autonomy	C/CPIF	Varioius : Various	0.000	0.000		0.000		0.000		-		0.000	0.000	0.000	-
Advanced Data Networks	C/CPIF	Various : Various	0.000	0.000		0.000		0.000		-		0.000	0.000	0.000	-
Technical and Engineering Services	WR	NAWCAD : Patuxent River, MD	0.000	0.000		1.200	Oct 2018	0.000		-		0.000	0.000	1.200	-
		Subtotal	0.000	0.000		8.350		0.000		-		0.000	0.000	8.350	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Range Cost	WR	NAWCWD : Point Mugu, CA	0.000	0.000		0.300	Nov 2018	0.000		-		0.000	0.000	0.300	-
		Subtotal	0.000	0.000		0.300		0.000		-		0.000	0.000	0.300	N/A

Management Services ($ in Millions)

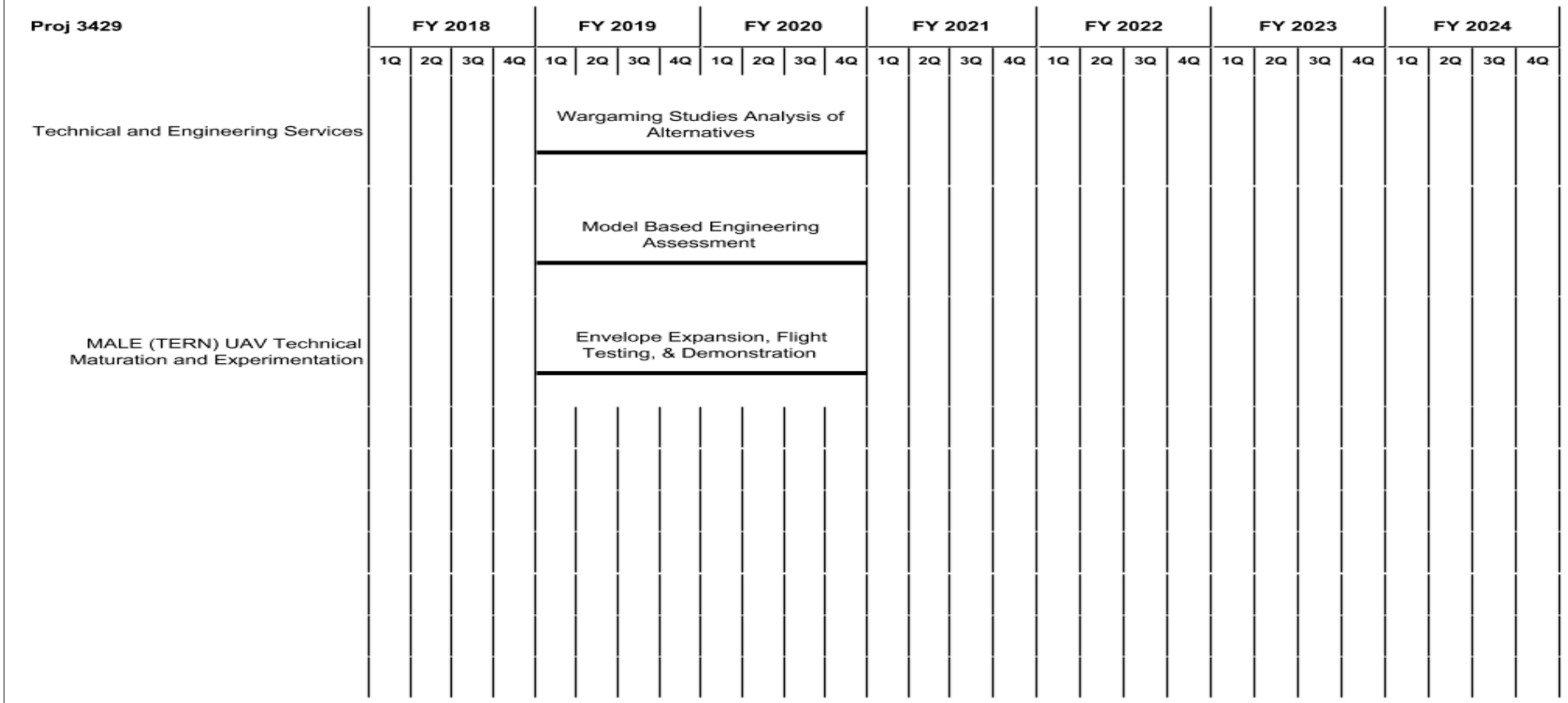
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Government Engineering Support	WR	NAWCAD : Patuxent River, MD	0.000	0.000		0.310	Oct 2018	0.000		-		0.000	0.000	0.310	-
Program Management Support	Various	Various : Various	0.000	0.000		0.250	Oct 2018	0.000		-		0.000	0.000	0.250	-
Travel	WR	NAWCAD : Patuxent River, MD	0.000	0.000		0.090	Nov 2018	0.000		-		0.000	0.000	0.090	-
		Subtotal	0.000	0.000		0.650		0.000		-		0.000	0.000	0.650	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0304240N / *(U)Advanced Tactical Unmanned Aircraft System*	Project (Number/Name) 3429 / *TERN UAS*	

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	0.000		9.300		0.000		-		0.000	0.000	9.300	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0304240N / *(U)Advanced Tactical Unmanned Aircraft System*	**Project (Number/Name)** 3429 / *TERN UAS*



2020PB - 0304240N - 3429

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0304240N / *(U)Advanced Tactical Unmanned Aircraft System*	**Project (Number/Name)** 3429 / *TERN UAS*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 3429				
Technical and Engineering Services: Wargaming, Studies, Analysis of Alternatives	1	2019	4	2020
Technical and Engineering Services: Model Base Engineering Assessments	1	2019	4	2020
MALE (TERN) UAV Technical Maturation and Experimentation: Envelope Expansion, Flight Testing, & Demonstration	1	2019	4	2020

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy											Date: March 2019	
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0304270N *I Electronic Warfare Development - MIP*							
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
Total Program Element	4.968	0.527	0.466	0.609	-	0.609	0.561	0.579	0.584	0.596	Continuing	Continuing
2260: *Specific Emitter ID*	4.968	0.527	0.466	0.609	-	0.609	0.561	0.579	0.584	0.596	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project supports systems development and collection of Specific Emitter Identification (SEI) information from National Technical Means (NTM) to track commercial ships over 200 gross registered tons world-wide. Research and development will cover improvements and enhancements to Electronic Intelligence technology. This will include improved/next generation SEI technology for miniaturization and automation of hardware, national collection systems, signal processing and analysis, and de-interleaving of signals. Propagation in a multi-path signal environment will also be assessed. All work on this project will be undertaken in pursuit of goals stated by the Office of Naval Intelligence and the National Security Agency in support of the Worldwide Ship Tracking Program.

This PE is a Military Intelligence Program (MIP).

B. Program Change Summary ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	0.527	0.466	0.552	-	0.552
Current President's Budget	0.527	0.466	0.609	-	0.609
Total Adjustments	0.000	0.000	0.057	-	0.057
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Rate/Misc Adjustments	0.000	0.000	0.057	-	0.057

Change Summary Explanation

Technical: Not applicable.

Schedule: Not applicable.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0304270N / *Electronic Warfare Development - MIP*	Project (Number/Name) 2260 / *Specific Emitter ID*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
2260: *Specific Emitter ID*	4.968	0.527	0.466	0.609	-	0.609	0.561	0.579	0.584	0.596	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This project supports systems development and collection of Specific Emitter Identification (SEI) information from National Technical Means (NTM) to track commercial ships over 200 gross registered tons world-wide. Research and development will cover improvements and enhancements to Electronic Intelligence technology. This will include improved/next generation SEI technology for miniaturization and automation of hardware, national collection systems, signal processing and analysis, and de-interleaving of signals. Propagation in a multi-path signal environment will also be assessed. All work on this project will be undertaken in pursuit of goals stated by the Office of Naval Intelligence and the National Security Agency in support of the Worldwide Ship Tracking Program.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: SENSOR FUSION	0.145	0.130	0.167	0.000	0.167
Articles:	-	-	-	-	-
Description: This effort supports systems development and information fusion of improved SEI technology for automation of hardware, national collection systems, signal processing and analysis, and de-interleaving of signals. ***FY 2019 Plans:*** This subarea develops SEI technology for automation of hardware, national collection systems, signal processing and analysis, and de-interleaving of signals. ***FY 2020 Base Plans:*** This subarea develops advanced technologies that support the tracking of commercial ships over 200 gross registered tons through improvements in signal processing, de-interleaving of signals, information fusion, and hardware of national collection systems which employ SEI technology. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** There is no significant change from FY 2019 to FY 2020.					
Title: SYSTEM AUTOMATION	0.166	0.149	0.196	0.000	0.196
Articles:	-	-	-	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0304270N / *Electronic Warfare Development - MIP*	**Project (Number/Name)** 2260 / *Specific Emitter ID*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Description: This effort supports development of an autonomous surveillance system capable of providing emitter signal information to a central location. ***FY 2019 Plans:*** This subarea develops an autonomous surveillance system that provides emitter signal information to a central location. ***FY 2020 Base Plans:*** This subarea develops technologies that support improvements and enhancements to Electronic Intelligence capabilities using associated technology that provides emitter signal information to a central location from an autonomous surveillance system. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** There is no significant change from FY 2019 to FY 2020.					
Title: TECHNOLOGY REFRESH & COMMUNICATION ENHANCEMENT	0.216	0.187	0.246	0.000	0.246
Articles:	-	-	-	-	-
Description: This effort improves Specific Emitter Identification (SEI) system performance, real-time communication and tactical use of SEI which will be expanded with next generation SEI technology. ***FY 2019 Plans:*** This subarea improves Specific Emitter Identification (SEI) system performance, real-time communication and tactical use of SEI. ***FY 2020 Base Plans:*** This subarea improves next generation SEI system performance, situational awareness and the tactical employment of SEI technology through developmental improvements in software and real-time communications. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:***					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0304270N / *Electronic Warfare Development - MIP*	**Project (Number/Name)** 2260 / *Specific Emitter ID*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
There is no significant change from FY 2019 to FY 2020.					
Accomplishments/Planned Programs Subtotals	0.527	0.466	0.609	0.000	0.609

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Not applicable.

E. Performance Metrics

MIP Program.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0304270N / *Electronic Warfare Development - MIP*	Project (Number/Name) 2260 / *Specific Emitter ID*	

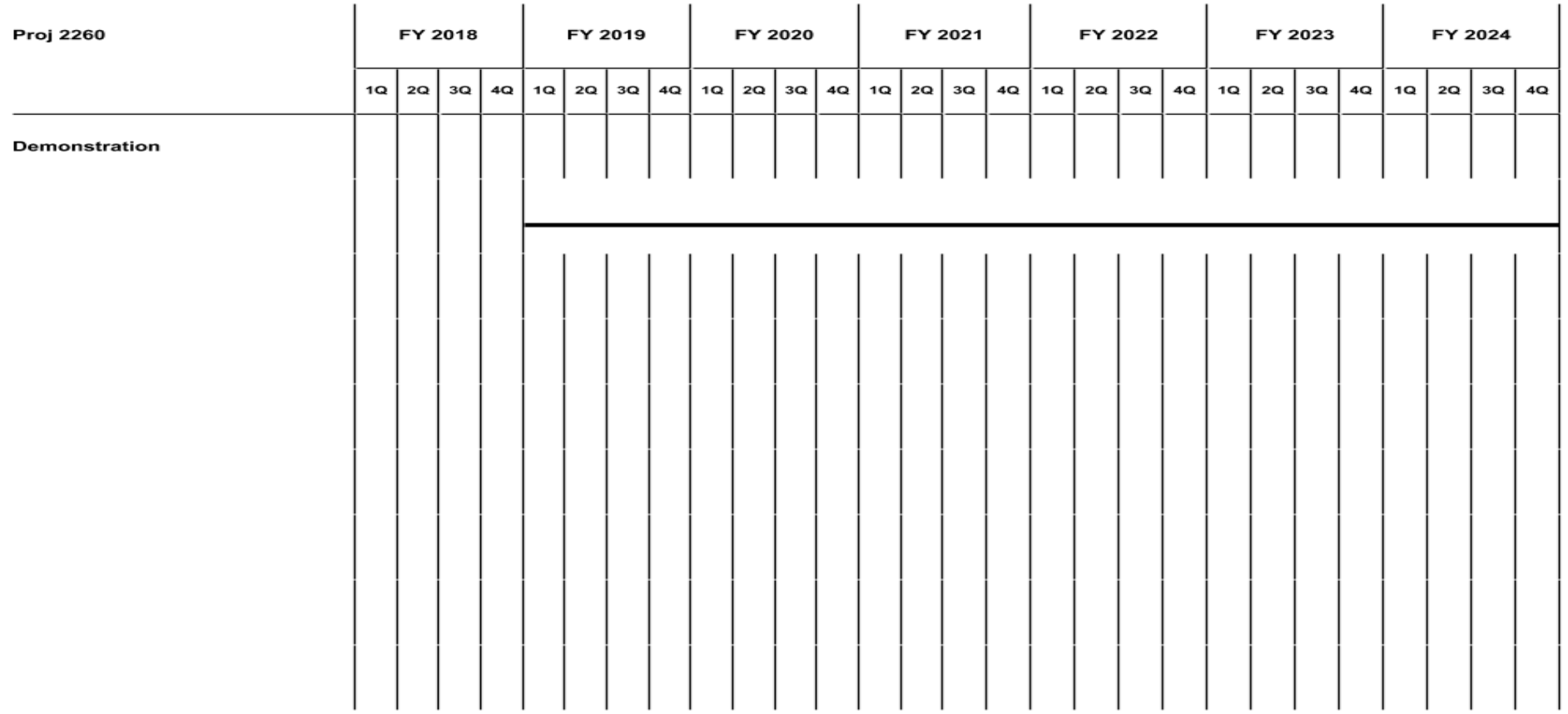
Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
NRL	TBD	Not Specified : Not Specified	4.968	0.527	Jan 2018	0.466	Jan 2019	0.609	Jan 2020	-		0.609	Continuing	Continuing	Continuing
		Subtotal	4.968	0.527		0.466		0.609		-		0.609	Continuing	Continuing	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	4.968	0.527		0.466		0.609		-		0.609	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0304270N / *Electronic Warfare Development - MIP*	**Project (Number/Name)** 2260 / *Specific Emitter ID*



2020DON - 0304270N - 2260

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0304270N / *Electronic Warfare Development - MIP*	**Project (Number/Name)** 2260 / *Specific Emitter ID*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 2260				
Demonstration: Installation and Testing	1	2019	4	2024

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