Exhibit R-2, RDT&E Budget Item Justification: FY 2018 Navy	Date: May 2017
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 5: *System Development & Demonstration (SDD)*	**R-1 Program Element (Number/Name)** PE 0604756N *I Ship Self Def (Engage: Hard Kill)*

COST ($ in Millions)	Prior Years	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
Total Program Element	744.397	93.481	114.475	212.412	-	212.412	211.957	120.136	105.305	105.241	Continuing	Continuing
0167: *5in Rolling Airframe Missile*	218.423	23.769	18.100	41.178	-	41.178	26.714	22.383	6.465	4.321	Continuing	Continuing
0173: *NATO Sea Sparrow*	520.139	65.177	90.256	134.205	-	134.205	110.674	79.299	80.927	82.548	Continuing	Continuing
0243: *ALaMO*	0.000	0.000	5.759	26.175	-	26.175	25.128	0.000	0.000	0.000	0.000	57.062
2070: *OTH Missile*	0.000	0.000	0.000	0.000	-	0.000	31.400	0.000	0.000	0.000	0.000	31.400
9081: *Phalanx CIWS SEARAM*	5.835	0.963	0.360	10.854	-	10.854	18.041	18.454	17.913	18.372	Continuing	Continuing
9999: *Congressional Adds*	0.000	3.572	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	3.572

A. Mission Description and Budget Item Justification

This program element provides funding for the development of systems that fulfill a portion of the third phase of the Ship Self Defense: Engage Hard Kill. Development in this line will focus on hard kill capabilities in which missiles are used to intercept incoming Anti-Ship Cruise Missiles (ASCM). Missile and system improvements necessary to meet their requirements are being addressed via NATO SEASPARROW Missile System (NSSMS) (0173), Rolling Airframe Missile (RAM) (0167), Advanced Low Cost Munition Ordnance (ALaMO), Over-The-Horizon (OTH) missile (2070), and Phalanx Close-In Weapon System (CIWS) SeaRAM (9081). Missile improvements include improved kinematic performance plus advanced seeker and low elevation fusing/warhead capability improvements. CIWS System improvements include Technology Refresh for current fleet population and Next Generation CIWS for the future fleet. New system developments include integration of Griffin missile into Patrol Coastal (PC) and Littoral Combat Ship Missile Module, and development and/or qualification of shoulder launched missile system. ALaMO (0243) qualifies a guided 57mm projectile with an active seeker for United States Navy (USN) use. ALaMO provides enhanced lethality against Fast In-shore Attack Craft (FIAC) when compared to existing 57mm ammunition.

Exhibit R-2, RDT&E Budget Item Justification: FY 2018 Navy	Date: May 2017
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 5: *System Development & Demonstration (SDD)*	**R-1 Program Element (Number/Name)** PE 0604756N *I Ship Self Def (Engage: Hard Kill)*

B. Program Change Summary ($ in Millions)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Previous President's Budget	86.811	114.475	196.008	-	196.008
Current President's Budget	93.481	114.475	212.412	-	212.412
Total Adjustments	6.670	0.000	16.404	-	16.404
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	9.800	0.000			
• SBIR/STTR Transfer	-3.130	0.000			
• Program Adjustments	0.000	0.000	48.401	-	48.401
• Rate/Misc Adjustments	0.000	0.000	-31.997	-	-31.997

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2016	FY 2017
Project: 9999: *Congressional Adds*		
Congressional Add: *Shield Protection*	3.572	0.000
Congressional Add Subtotals for Project: 9999	3.572	0.000
Congressional Add Totals for all Projects	3.572	0.000

Change Summary Explanation

Project 0173 NATO Seasparrow - Increase is to support ESSM Block 2 Engineering and Manufacturing Development (E&MD). The plan for this effort was more heavily funded by international funds in prior years, with the US portion of funding being higher in the latter years. The image in the R4 exhibit details this graphically. Stalker supports Improved Stalker (I-Stalker), which will provide incremental improvements to the currently fielded Stalker Long Range Electro-Optic Sensor System (SLREOSS) in response to a 2016 United States Fleet Forces Command (USFFC) Operational Needs Statement (ONS).

Project 0167 RAM - Increase is to support RAM Block 2B Raid Engineering Change Proposal (ECP). The RAM Block 2B Raid ECP will provide an upgraded seeker and Missile-to-Missile Link (MML) capability to counter emerging complex raid threats. FY 2018 increase is also for implementation of RAM changes identified in the Integrated Combat System Failure Review Board (CSFRB) report known as the Fire Control Loop Improvement Project (FCLIP). These funds support RAM systems engineering, design analysis and testing of the combat system in support of the FCLIP Phase I process. Funding will deliver software baseline changes to the RAM Block 2 missiles, launcher software updates and updated interface to the combat system. Increase also funds implementation of FCLIP Phase II with Ship Self Defense System (SSDS) combat system improvement efforts that are key to air defense survivability. This issue completes the Fire Control Loop Improvement (FCLIP) developmental efforts and installs FCLIP fixes onto the ships. Addresses current capability gaps to improve overall

Exhibit R-2, RDT&E Budget Item Justification: FY 2018 Navy	Date: May 2017
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 5: *System Development & Demonstration (SDD)*	**R-1 Program Element (Number/Name)** PE 0604756N *I Ship Self Def (Engage: Hard Kill)*

Probability of Raid Annihilation (PRA) as identified during Failure Review Board (FRB) following A5-1 test event. Funding closes these gaps by implementing FRB-identified fixes which improve PRA.

Project 9081 CIWS SEARAM - Increase is to support CIWS Tech Refresh to eliminate legacy parts that are difficult and costly to maintain, reduce required maintenance actions, increase system reliability, and provide upgraded capability for the Fleet.

Project 0243 ALaMO - Increase is to support non-recurring engineering, design verification testing, environmental qualification, hazard classification, insensitive munitions and developmental testing starting in FY 2018.

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy			Date: May 2017
Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	Project (Number/Name) 0167 / *5in Rolling Airframe Missile*	

COST ($ in Millions)	Prior Years	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
0167: *5in Rolling Airframe Missile*	218.423	23.769	18.100	41.178	-	41.178	26.714	22.383	6.465	4.321	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The RAM program is an international cooperative program with the government of the Federal Republic of Germany. The purpose of this program is to develop, test, and field a surface-to-air self-defense system utilizing a dual mode, passive radio frequency/infrared RAM. The baseline system RAM Block 0/1/1A provide defense capability against active and passive anti-ship missiles, very low altitude missiles, and maneuvering missiles through the utilization of passive radio frequency and infrared seekers and a maritime optimized fuse. The RAM Block 2 upgrade programs are a cooperative requirement of the U.S. and Federal Republic of Germany, as agreed to in an international Memorandum of Understanding (MOU), and allows RAM to counter emerging, highly maneuverable ASCM threats utilizing advanced seekers while maintaining all the proven capabilities of RAM Block 0/1/1A's accurate terminal guidance, proven lethality, and no shipboard post launch dependence. Funding supports formal Developmental and Operational Testing (DT/OT) scheduled through FY 2018, data analysis, operational/test driven studies, support of combat system performance analysis, identification of operationally relevant improvements. The RAM BLK 2A Fire Control Loop Improvement Project (FCLIP) will provide software only modifications to the missile and launcher to improve raid performance. The RAM BLK 2B Raid ECP will provide an upgraded seeker and Missile-to-Missile Link (MML) capability to counter emerging complex raid threats. Development and test of RAM BLK 2B Raid ECP will occur through FY 2022.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Title: Rolling Airframe Missile Block 2 Development and Test	23.663	17.992	41.068	0.000	41.068
Articles:	-	-	-	-	-
FY 2016 Accomplishments: Funded completion of Integrated Operational Test & Evaluation (OT&E) (Development and Operational) IT-C2 (Multi-target raids) testing, analysis, incorporation of any changes and associated efforts to support a FRP decision. Funds also supported RAM systems engineering, design analysis and testing of the combat system changes in support of the FCLIP process. RAM supported the SSDS Combat System (CS) in the FCLIP Phase II System Requirements Review (SRR) and System Functional Review (SFR). Funding delivers software baseline changes to the RAM Block 2 Missiles, launcher software updates and updated interface to the combat system. Funds supported additional engineering efforts to transition from gap analysis/system requirements generation and simulation environment updates. FCLIP Phase I-Preliminary Design completes with the System Specification Review (SSR)/System Requirements Review (SRR) and Preliminary Design Review (PDR) in FY					

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	**Project (Number/Name)** 0167 / *5in Rolling Airframe Missile*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
2016. Commenced development of the Missile-to-Missile Link (MML) component of RAM BLK 2 Raid ECP to verify Over-The-Air (OTA) functionality. ***FY 2017 Plans:*** Funds ongoing Integrated OT&E (Development and Operational) OT-C5 (Probability of Raid Annihilation, PRA, Testbed) testing, analysis, testbed accreditation, incorporation of any changes and associated efforts to support a FRP decision (2018). Funds also support RAM Systems Engineering, design analysis and testing of the combat system changes in support of the Fire Control Loop Improvement Project (FCLIP) process. In support of the FCLIP upgrade process, funding will deliver an updated RAM Block 2 software baseline changes to the Missile, Launcher, and Interface protocols to the combat system to support FCLIP Phase II PDR. With the completion of RAM system FCLIP Phase I Preliminary Design Review (PDR) in FY 2016, the project will transition into the detailed design, preliminary integration, and prototyping phase leading to Critical Design Review (CDR) in 3rd QTR FY 2017. Funds will support system engineering project efforts culminating in a Formal Qualification Test (FQT) Technical Data Review in 1st quarter FY 2018. ***FY 2018 Base Plans:*** Funds completion of Integrated OT&E (Development and Operational) OT-C5 (Probability of Raid Annihilation, PRA, Testbed) testing, analysis, testbed accreditation, incorporation of any changes and associated efforts to support a FRP decision (2018). Funds continued design, integration, and test of the FCLIP combat system changes. Funds support conducting FCLIP development flight test and final verification and qualification testing as well as transition to production. Funding for RAM BLK 2 Raid ECP will support preliminary design work, development and delivery of prototype designs and verification testing with a PDR and MML prototype demonstration test both in 2nd QTR FY 2018. The Raid ECP CDR will occur in 3rd QTR FY 2019. Funds will also support hardware procurement in FY 2018 for proof of manufacturing flight testing in FY 2020 due to long lead materials. A FCLIP Phase II CDR will occur in FY 2018. ***FY 2018 OCO Plans:*** N/A					
Title: Rolling Airframe Missile Block 2 Travel	0.106	0.108	0.110	0.000	0.110
Articles:	-	-	-	-	-
FY 2016 Accomplishments:					

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	**Project (Number/Name)** 0167 / *5in Rolling Airframe Missile*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Funded program office travel to support program/testing as required by program schedule and in accordance with travel reduction mandate. ***FY 2017 Plans:*** Funds program office travel to support program/testing as required by program schedule and in accordance with travel reduction mandate. ***FY 2018 Base Plans:*** Funds program office travel to support program/testing as required by program schedule and in accordance with travel reduction mandate. ***FY 2018 OCO Plans:*** N/A					
Accomplishments/Planned Programs Subtotals	23.769	18.100	41.178	0.000	41.178

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
• WPN 2242: *RAM*	75.354	95.557	58.587	-	58.587	59.009	60.461	72.924	83.202	Continuing	Continuing
• OPN 5231: *Ship Missile Support Equipment*	9.779	8.175	7.800	-	7.800	10.425	7.552	9.529	3.052	Continuing	Continuing

Remarks

D. Acquisition Strategy

The RAM Program uses directed sole source contracts with Raytheon Missile Systems Company, Tucson, AZ.

E. Performance Metrics

Successfully complete DT/OT.
Achieved Initial Operational Capability (IOC) decision and support a FRP decision.

Exhibit R-3, RDT&E Project Cost Analysis: FY 2018 Navy			Date: May 2017
Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	Project (Number/Name) 0167 / *5in Rolling Airframe Missile*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2016 Cost	FY 2016 Award Date	FY 2017 Cost	FY 2017 Award Date	FY 2018 Base Cost	FY 2018 Base Award Date	FY 2018 OCO Cost	FY 2018 OCO Award Date	FY 2018 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Block 2 Upgrade	C/CPAF	Various : Various	154.650	0.000		0.000		0.000		-		0.000	0.000	154.650	-
Primary Hardware Dev/Blk 1	Various	Various : Various	10.081	0.000		0.000		0.000		-		0.000	0.000	10.081	-
FCLIP	WR	PHD : CA	0.125	0.068	Mar 2016	0.000		0.128	Nov 2017	-		0.128	0.000	0.321	-
FCLIP	SS/CPFF	AECOM : VA	0.000	0.232	Dec 2015	0.374	Feb 2017	0.244	Dec 2017	-		0.244	0.000	0.850	-
Raid ECP	SS/CPFF	Raytheon : Tucson/ Louisville	0.000	9.969	Sep 2016	4.659	Feb 2017	26.785	Dec 2017	-		26.785	0.000	41.413	-
FCLIP	SS/CPFF	Raytheon : Tucson/ Louisville	9.607	12.184	Jan 2016	11.250	Nov 2016	6.960	Dec 2017	-		6.960	0.000	40.001	-
Raid ECP	SS/CPFF	JHU/APL : MD	0.000	0.000		0.450	Dec 2016	0.458	Dec 2017	-		0.458	0.000	0.908	-
FCLIP	WR	China Lake : CA	1.225	0.485	Mar 2016	0.000		0.793	Nov 2017	-		0.793	0.000	2.503	-
Raid ECP	WR	China Lake : CA	0.000	0.000		0.245	Jan 2017	0.250	Nov 2017	-		0.250	0.000	0.495	-
FCLIP	SS/CPFF	JHU/APL : MD	0.118	0.118	Mar 2016	0.140	Feb 2017	0.143	Nov 2017	-		0.143	0.000	0.519	-
Raid ECP	WR	PHD : CA	0.000	0.000		0.100	Feb 2017	0.102	Nov 2017	-		0.102	0.000	0.202	-
Raid ECP	SS/CPFF	AECOM : VA	0.000	0.000		0.126	Feb 2017	0.306	Dec 2017	-		0.306	0.000	0.432	-
Raid ECP	SS/FFP	Raytheon : Tucson	0.000	0.000		0.000		4.000	Dec 2017	-		4.000	0.000	4.000	-
		Subtotal	175.806	23.056		17.344		40.169		-		40.169	0.000	256.375	-

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2016 Cost	FY 2016 Award Date	FY 2017 Cost	FY 2017 Award Date	FY 2018 Base Cost	FY 2018 Base Award Date	FY 2018 OCO Cost	FY 2018 OCO Award Date	FY 2018 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Studies and Analysis	Various	Various : Various	1.210	0.000		0.000		0.000		-		0.000	0.000	1.210	-
		Subtotal	1.210	0.000		0.000		0.000		-		0.000	0.000	1.210	-

Exhibit R-3, RDT&E Project Cost Analysis: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	**Project (Number/Name)** 0167 / *5in Rolling Airframe Missile*

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2016 Cost	FY 2016 Award Date	FY 2017 Cost	FY 2017 Award Date	FY 2018 Base Cost	FY 2018 Base Award Date	FY 2018 OCO Cost	FY 2018 OCO Award Date	FY 2018 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Test Support	C/CPFF	Raytheon : Tucson	16.739	0.397	Nov 2015	0.153	Nov 2016	0.549	Nov 2017	-		0.549	0.000	17.838	-
Test Support	WR	China Lake/PHD : CA/CA	12.300	0.100	Nov 2015	0.245	Nov 2016	0.200	Oct 2017	-		0.200	Continuing	Continuing	Continuing
FOT&E	WR	China Lake : PHD, CA	4.701	0.000		0.000		0.000		-		0.000	0.000	4.701	-
Miscellaneous	Various	Various : Various	5.765	0.000		0.000		0.000		-		0.000	0.000	5.765	-
Test Support	SS/CPFF	JHU/APL : MD	0.357	0.110	Mar 2016	0.250	Dec 2016	0.150	Nov 2017	-		0.150	0.000	0.867	-
		Subtotal	39.862	0.607		0.648		0.899		-		0.899	-	-	-

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2016 Cost	FY 2016 Award Date	FY 2017 Cost	FY 2017 Award Date	FY 2018 Base Cost	FY 2018 Base Award Date	FY 2018 OCO Cost	FY 2018 OCO Award Date	FY 2018 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Travel	Allot	Program Office : VA	1.398	0.106	Oct 2015	0.108	Oct 2016	0.110	Oct 2017	-		0.110	Continuing	Continuing	Continuing
Defense Acquisition Workforce Development Fund	Various	various : various	0.147	0.000		0.000		0.000		-		0.000	0.000	0.147	-
		Subtotal	1.545	0.106		0.108		0.110		-		0.110	-	-	-

	Prior Years	FY 2016		FY 2017		FY 2018 Base		FY 2018 OCO		FY 2018 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	218.423	23.769		18.100		41.178		-		41.178	-	-	-

Remarks

Exhibit R-4, RDT&E Schedule Profile: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	**Project (Number/Name)** 0167 / *5in Rolling Airframe Missile*

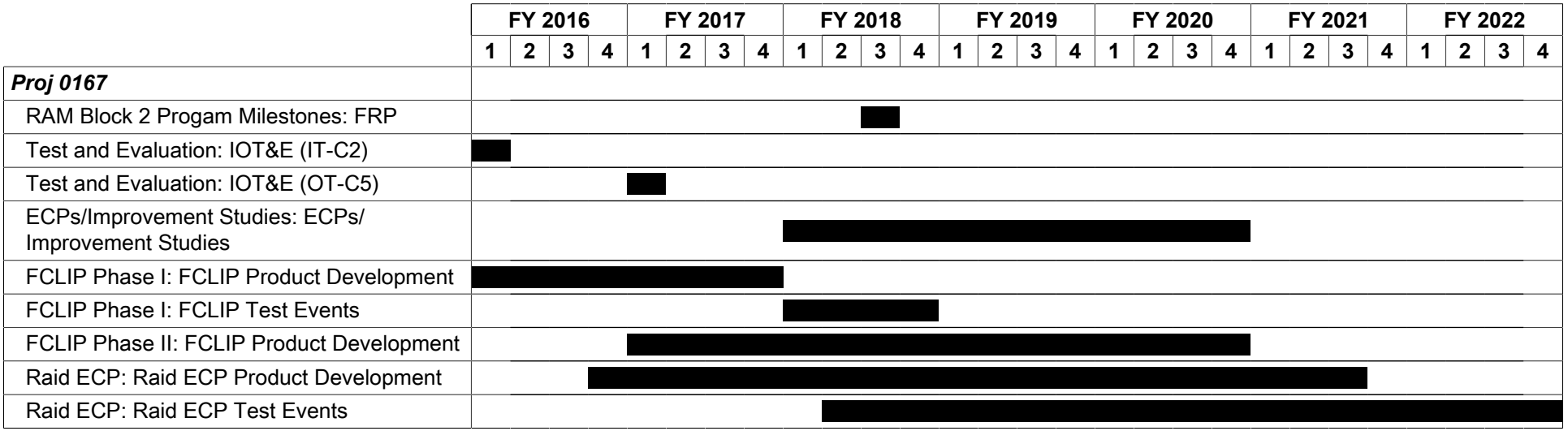


Exhibit R-4A, RDT&E Schedule Details: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	**Project (Number/Name)** 0167 / *5in Rolling Airframe Missile*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 0167				
RAM Block 2 Progam Milestones: FRP	3	2018	3	2018
Test and Evaluation: IOT&E (IT-C2)	1	2016	1	2016
Test and Evaluation: IOT&E (OT-C5)	1	2017	1	2017
ECPs/Improvement Studies: ECPs/Improvement Studies	1	2018	4	2020
FCLIP Phase I: FCLIP Product Development	1	2016	4	2017
FCLIP Phase I: FCLIP Test Events	1	2018	4	2018
FCLIP Phase II: FCLIP Product Development	1	2017	4	2020
Raid ECP: Raid ECP Product Development	4	2016	3	2021
Raid ECP: Raid ECP Test Events	2	2018	4	2022

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy			Date: May 2017
Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	Project (Number/Name) 0173 / *NATO Sea Sparrow*	

COST ($ in Millions)	Prior Years	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
0173: *NATO Sea Sparrow*	520.139	65.177	90.256	134.205	-	134.205	110.674	79.299	80.927	82.548	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This project encompasses four (4) primary efforts to enhance ship self defense:

1. Evolved SEASPARROW Missile (ESSM) Testing: A cooperative effort among 10 NATO SEASPARROW Nations and the U.S., to improve the capability of the SEASPARROW Missile to counter the low altitude, highly maneuverable ASCM threat. The program consists of evolving the SEASPARROW Missile through the development of a new rocket motor with tail control; thrust vector control and ordnance (warhead) upgrade; modifications to the MK 41 Vertical Launch System (VLS) to fire from a single cell with 4 ESSM (QuadPack); and modifications to the NATO SEASPARROW Surface Missile System (NSSMS) to provide ESSM capability.

2. NATO SEASPARROW Technical Direction Agent (TDA) - TDA support for the NSSMS Mk57 Mods 12-15 which is integrated with the Ship Self Defense System (SSDS) Mk 2 to provide ship missile defense utilizing an open architected design.

3. ESSM Block 2 Risk Reduction/ESSM Block 2 Engineering and Manufacturing Development (EMD): ESSM Block 2 upgrade is a cooperative effort between U.S Navy and NATO SEASPARROW Consortium Nations. ESSM Block 2 upgrade replaces the largely obsolete guidance section with a dual mode Active/Semi-Active X-Band seeker capable of defeating future threat capabilities within the existing envelope, including; smaller signatures, increased raid sizes, and adverse environments including countermeasures. Threat types include: advanced Anti-Ship Cruise Missiles (ASCMs), Anti-Ship Ballistic Missiles (ASBMs), surface and asymmetrical. The U.S. RDT&E funding accounts for 40% of the overall ESSM Block 2 Development Program. Year-to-year fluctuations in funding levels are due to the variations in contributions provided by the other Nations. Through FY 2016, the US has funded only 26% of the total effort, driving the US portion of the EMD annual cost to 60% in FY 2017 - FY 2020.

The overall consortium Block 2 budget is growing by 35% from FY 2017 to FY 2018. The US portion shows growth of 46% over this time frame due to the program phasing plan being more heavily funded by US in later years as well as other nations paying ahead of schedule, buying down their contribution in later years.

The increase from FY 2017 to FY 2018 is for the execution of DT flight tests, DT flight test analysis, OT flight test round build-up, TTP efforts, and the decrease in Non-US contributions.

4. Dual-Band Transceiver (DBT). The ESSM Block 2 missile will utilize a DBT for in-flight data communications. This two-way datalink enables control and management of the missile during flight. This DBT leverages the new DDG-1000/CVN-78 X-Band Transceiver (XBT) to incorporate the functions to support S-Band Aegis data link (i.e. a Dual Band Transceiver). This solves the S-band obsolescence issues and gives one common transceiver across the ESSM inventory.

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	**Project (Number/Name)** 0173 / *NATO Sea Sparrow*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Title: Evolved Sea Sparrow Missile (ESSM) testing	1.300	2.880	5.000	0.000	5.000
Articles:	-	-	-	-	-
FY 2016 Accomplishments: Conducted Aegis Baseline 9 firings in support of Aegis operational testing. Participated in LHA-6 operational test event DT-05R. Continued planning for Mk 29 Missile Launcher Upgrade (MLU) Testing and for ESSM Dual Band Transceiver testing.					
FY 2017 Plans: Begin integration testing on Zumwalt and CVN 78 Combat Systems installed on the Self Defense Test Ship. Begin live-fire testing on the Zumwalt Combat Systems on the Self Defense Test Ship. Participate in CVN 78 lead ship structural test firing planning and execution. Participate in LHD 2 and CVN 72 Combat System Ship Qualification Trial (CSSQT) planning and execution activities. Conduct ESSM Dual Band Transceiver live fire testing. Continue planning activities for Mk 29 Missile Launcher Upgrade testing. Test plan construction for ESSM Sea-Skimming guidance software improvement.					
FY 2018 Base Plans: Conduct Waterfront Integration Testing on DDG 1000 lead ship then conduct flight tests. Begin flight testing on the Self Defense Test Ship supporting CVN 78 and participate in the planning and execution of the ship's Combat System Ship Qualification Trial (CSSQT). Begin integration testing with Aegis ACB 16 and conduct flight tests. Conduct live fire event for LHD-2 and CVN-72 CSSQTs, testing the Objective Configuration Phase 2 upgrade. Conduct the risk reduction flight test supporting the Missile Launcher Upgrade (MLU). Conduct Near Miss Shock testing for MLU Launcher.					
FY 2018 OCO Plans: N/A					
Title: NATO Sea Sparrow Combat System Integraton Technical Direction Agent (TDA)	0.293	0.304	0.313	0.000	0.313
Articles:	-	-	-	-	-
FY 2016 Accomplishments: Continued as TDA for the NSSMS system. Provided engineering support and support risk mitigation with the development of the solid state Mk 9 Tracker Illuminator System (TIS) power upgrade and digital receiver.					
FY 2017 Plans:					

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	**Project (Number/Name)** 0173 / *NATO Sea Sparrow*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Serve as TDA to provide combat system support for Mk 57 activities. Participate in NATO SEASPARROW Program Steering Committee (NSPSC), Program Reviews, and NATO SEASPARROW International In-Service Engineering Network (NIISEN) activities as directed. Provide TDA expertise to review and, where authorized by NATO SEASPARROW Program Office (NSPO), independently assess and analyze requirements, assess upgrade options, evaluate compliance, and derive delta qualification testing/analysis requirements. ***FY 2018 Base Plans:*** Serve as TDA to provide combat system support for Mk 57 NSSMS activities. Participate in NSPSC, Program Reviews, and NIISEN activities as directed. Provide TDA expertise to review and where authorized by NSPO independently assess and analyze requirements, assess upgrade options (including Combat Systems optimization candidates for ESSM Block 2), evaluate compliance, and derive delta qualification testing/analysis requirements. Provide engineering support and support risk mitigation with the development of the solid state Mk 9 TIS (a component of the Mk 57 NSSMS) power upgrade and digital receiver. ***FY 2018 OCO Plans:*** N/A					
Title: Evolved Sea Sparrow Blk 2 Risk Reduction/ESSM Blk 2 EMD	61.238	86.012	124.094	0.000	124.094
Articles:	-	-	-	-	-
FY 2016 Accomplishments: Continued maturing the ESSM Block 2 design during the EMD phase of the program focusing on Software (S/W) and Hardware (H/D) development. Completed 30 component design reviews and 4 incremental CDRs; initiated ground based testing, including Electromagnetic Environmental Effects (E3) planning, Computer in the Loop (CiL) and Hardware in the Loop (HiL) testing; initiated Captive Carry Flight test planning; continued maturation of the Models & Simulations supporting performance predictions; conducted initial warhead arena and Insensitive Munition (IM) tests; completed design modifications to the Mk 25 Canister; and initiated design of the new ESSM Block 2 shipping container. ***FY 2017 Plans:*** Continue maturing the ESSM Block 2 design during the EMD phase of the program focusing on S/W and H/D development. Conduct System Level Critical Design Review.					

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	**Project (Number/Name)** 0173 / *NATO Sea Sparrow*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Continue maturing tactical flight code and Models & Simulations supporting performance predictions; execute Captive Carry Flight testing; continue ground based testing to include execution of Electromagnetic Environmental Effects (E3); execute two Control Test Vehicle (CTV) Flight tests; prepare H/W and S/W for Developmental Flight Testing; and prepare for Milestone C. ***FY 2018 Base Plans:*** Continue maturing the ESSM Block 2 design during the EMD phase of the program focusing on S/W and H/D development. Complete GTVs 1-3 flight test; Execute Milestone C review; Complete Development Testing (DT) Tactical S/W Build; Prepare for DT flight tests; prepare for Operational Flight Testing to include build-up of flight-test rounds; Transition to Production (TTP) efforts, prepare for Functional Configuration Audit. ***FY 2018 OCO Plans:*** N/A					
Title: Stalker Long Range System ***Articles:*** ***Description:*** Improved Stalker (I-Stalker) will provide incremental improvements to the currently fielded Stalker Long Range Electro-Optic Sensor System (SLREOSS) in response to a 2016 United States Fleet Forces Command (USFFC) Operational Needs Statement (ONS). SLREOSS was developed as a modular, portable, form/fit replacement for the NATO Sea Sparrow Missile System (NSSMS) MK 6 Low Light Level Television (LLLTV) in response to the 2010 Naval Forces Central Command (NAVCENT) Counter Swarm Urgent Operational Need (UON) to combat Fast Attack Craft/Fast Inshore Attack Craft (FAC/FIAC). It is currently being fielded in either the NSSMS MK6 MOD 3 LLLTV Director Mount configuration or NSSMS MK6 MOD 4 LLLTV Independent Mount configuration depending on platform specifications. I-Stalker will provide required upgrades to the SLREOSS Independent Mount configuration with the enhanced capabilities provided by the Navy owned Situational Awareness System (SAwS) to deliver an integrated radar and electro-optic/Infrared control and display suite. ***FY 2016 Accomplishments:*** N/A ***FY 2017 Plans:*** N/A ***FY 2018 Base Plans:***	0.000 -	0.000 -	2.999 -	0.000 -	2.999 -

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	**Project (Number/Name)** 0173 / *NATO Sea Sparrow*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Perform design and development of SAwS integration with Stalker (I-Stalker). Complete final design based on previous experimental efforts. Fabricate Engineering Developmental Model (EDM). Update software and perform design verification testing. ***FY 2018 OCO Plans:*** N/A					
Title: Dual Band Transceiver (DBT)	2.346	1.060	1.799	0.000	1.799
Articles:	-	-	-	-	-
FY 2016 Accomplishments: Completed Proof of Design (POD) development for both ESSM Block 1 and ESSM Block 2 integration activities. Tasks included: successfully held the DBT incremental Critical Design Review (iCDR) on the hardware and software; continued with DBT Transition-To-Production (TTP) activities; conducted independent 3rd Party testing to validate S-Band and X-Band operation; began ESSM Block 1 and ESSM Block 2 integration activities (Hardware in the Loop (HiL) and ESSM Block 1 All Up Rounds (AUR) validation; began development of a Proof of Manufacturing (POM) Technical Data Package (TDP); and continued to support ESSM Block 2 and preparations for CDR. ***FY 2017 Plans:*** Develop POM hardware to support both ESSM Block 1 and ESSM Block 2 integration activities. Produce Production Representative Missile (PRM) hardware to support flight testing; plan for and execute POM integration and qualification testing; verify and validate Transition Section Computer (TSC) software; and begin Class 1 Engineering Change Proposal (ECP) development. Complete DBT TTP activities. Conduct DBT Production Readiness Review (PRR). Plan activities for Waterfront Integration Tests (WIT) and support Safety related reviews Weapon Systems Explosive Safety Review (WSESRB) and Software System Safety Technical Review Panel (SSSTRP) prior to flight testing. ***FY 2018 Base Plans:*** Complete DBT TTP activities; execute Waterfront Integration Tests (WIT) and support Safety related reviews Weapon Systems Explosive Safety Review (WSESRB) and Software System Safety Technical Review Panel (SSSTRP) prior to flight testing; analyze S-Band and X-Band flight test results; develop flight test reports; complete qualification events leading to ESSM Block 1 Class 1 ECP. ***FY 2018 OCO Plans:***					

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	**Project (Number/Name)** 0173 / *NATO Sea Sparrow*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
N/A					
Accomplishments/Planned Programs Subtotals	65.177	90.256	134.205	0.000	134.205

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
• WPN 2307: *ESSM*	37.671	107.397	74.524	1.768	76.292	99.433	125.513	218.927	295.154	Continuing	Continuing
• OPN 5231: *Ship Missile Defense*	41.850	38.597	50.606	-	50.606	50.239	30.338	30.851	31.569	Continuing	Continuing
• WPN 2307C: *ESSM AP*	54.462	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	54.462
• OMN 1D4D: *NATO Seasparrow*	24.659	18.090	32.507	-	32.507	47.287	20.408	20.926	21.352	0.000	515.887

Remarks

Stalker program also funded by OPN and OMN.
OPN funding for Stalker is captured above in LI 5231 - Ship Missile Defense line as follows: FY18: $5.668M, FY19: $10.598M.
OMN funding for Stalker is captured above in LI 1D4D - NATO Seasparrow line as follows: FY18: $1.8M, FY19: $2.7M.

D. Acquisition Strategy

ESSM is a directed sole source contract to Raytheon Missile Systems Company. The MK 29 ESSM Missile Launcher Upgrade (MLU) and Open architecture/Ship Self Defense System (SSDS) Integration effort is a directed sole source contract to Raytheon Company Integrated Defense System.

E. Performance Metrics

Successfully complete Developmental Test/Operational testing.

Exhibit R-3, RDT&E Project Cost Analysis: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	**Project (Number/Name)** 0173 / *NATO Sea Sparrow*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2016 Cost	FY 2016 Award Date	FY 2017 Cost	FY 2017 Award Date	FY 2018 Base Cost	FY 2018 Base Award Date	FY 2018 OCO Cost	FY 2018 OCO Award Date	FY 2018 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
ESSM Systems Engineering/Firing Spt	WR	Corona : CA	9.692	0.000		0.705	Oct 2016	0.705	Oct 2017	-		0.705	0.000	11.102	-
NATO OC System Engineering	C/ FFPLOE	Raytheon : RI	1.955	0.000		0.000		0.000		-		0.000	0.000	1.955	-
NATO OC - Software	C/ FFPLOE	Raytheon : RI	8.054	0.000		0.000		0.000		-		0.000	0.000	8.054	-
Stalker System Engineering	WR	NSWC Crane : IN	4.782	0.000		0.000		0.499	Jan 2018	-		0.499	0.000	5.281	-
Stalker Hardware Engineering	WR	NSWC Crane : IN	14.350	0.000		0.000		0.888	Jan 2018	-		0.888	0.000	15.238	-
Stalker Software Engineering	WR	NSWC Crane : IN	2.725	0.000		0.000		0.887	Jan 2018	-		0.887	0.000	3.612	-
ESSM Primary Hardware Development	C/CPAF	Raytheon : Tuscon	193.941	0.000		0.000		0.000		-		0.000	0.000	193.941	-
ESSM Ancillary Hardware	Various	Various : Various	71.324	0.000		0.000		0.000		-		0.000	0.000	71.324	-
ESSM Blk 2 EMD	C/CPIF	Raytheon : Tuscon	38.878	51.721	Oct 2015	73.641	Mar 2017	111.343	Oct 2017	-		111.343	0.000	275.583	-
ESSM Blk 2 Risk reduction	SS/ FFPLOE	Raytheon : Tuscon	44.150	0.000		0.000		0.000		-		0.000	0.000	44.150	-
NATO OC Systems Engineering SPT	WR	NSWC PHD : CA	0.700	0.000		0.000		0.000		-		0.000	0.000	0.700	-
Dual Band Tranceiver	SS/FFP	Raytheon : Tuscon	2.750	1.746	Feb 2016	0.460	Mar 2017	1.199	Oct 2017	-		1.199	0.000	6.155	-
		Subtotal	393.301	53.467		74.806		115.521		-		115.521	0.000	637.095	-

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2016 Cost	FY 2016 Award Date	FY 2017 Cost	FY 2017 Award Date	FY 2018 Base Cost	FY 2018 Base Award Date	FY 2018 OCO Cost	FY 2018 OCO Award Date	FY 2018 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
NATO System TDA	SS/FP	APL : MD	2.192	0.293	Dec 2015	0.304	Dec 2016	0.313	Nov 2017	-		0.313	Continuing	Continuing	Continuing
NATO OC	SS/FFP	APL : MD	0.000	0.000		0.000		0.000		-		0.000	0.000	0.000	-
Stalker -ISEA/TDA/RM&A	SS/FFP	various : various	0.750	0.000		0.000		0.000		-		0.000	0.000	0.750	-
ILS/Engineering Support	Various	Various : Various	15.543	0.000		0.000		0.000		-		0.000	0.000	15.543	-

Exhibit R-3, RDT&E Project Cost Analysis: FY 2018 Navy			Date: May 2017
Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	Project (Number/Name) 0173 / *NATO Sea Sparrow*	

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2016 Cost	FY 2016 Award Date	FY 2017 Cost	FY 2017 Award Date	FY 2018 Base Cost	FY 2018 Base Award Date	FY 2018 OCO Cost	FY 2018 OCO Award Date	FY 2018 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
ESSM Blk 2 EMD	WR	APL : MD	3.880	3.976	Nov 2015	4.095	Nov 2016	4.218	Oct 2017	-		4.218	0.000	16.169	-
ESSM Blk 2 EMD	WR	NAWC CL : CA	5.379	4.083	Nov 2015	5.742	Nov 2016	5.926	Nov 2017	-		5.926	0.000	21.130	-
ESSM Blk 2 EMD	Various	Various : Various	2.269	1.458	Jan 2016	2.532	Jan 2017	2.607	Nov 2017	-		2.607	0.000	8.866	-
NATO OC Support	WR	Dahlgren : VA	2.174	0.000		0.000		0.000		-		0.000	0.000	2.174	-
Dual Band Transceiver	WR	APL : MD	0.200	0.200	Feb 2016	0.200	Dec 2016	0.200	Dec 2017	-		0.200	0.000	0.800	-
Dual Band Tranceiver	WR	NAWC CL : CA	0.400	0.400	Feb 2016	0.400	Dec 2016	0.400	Dec 2017	-		0.400	0.000	1.600	-
		Subtotal	32.787	10.410		13.273		13.664		-		13.664	-	-	-

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2016 Cost	FY 2016 Award Date	FY 2017 Cost	FY 2017 Award Date	FY 2018 Base Cost	FY 2018 Base Award Date	FY 2018 OCO Cost	FY 2018 OCO Award Date	FY 2018 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
ESSM Developmental Test & Evaluation	WR	NAWC CL : CA	21.845	0.000		0.204	Nov 2016	0.204	Oct 2017	-		0.204	Continuing	Continuing	Continuing
ESSM OPEVAL/ TECHEVAL/Test Firings	WR	Corona, IHD, Dahlgren, SNSWC, PHD) : various	18.118	0.000		0.285	Nov 2016	0.285	Nov 2017	-		0.285	0.000	18.688	-
ESSM Developmental Test & Evaluation	SS/FFP	APL : MD	5.782	0.000		0.100	Oct 2016	0.100	Oct 2017	-		0.100	Continuing	Continuing	Continuing
ESSM Test & Evaluation	C/CPAF	Raytheon : Tuscon	17.833	1.084	Feb 2016	1.000	Nov 2016	3.118	Nov 2017	-		3.118	Continuing	Continuing	Continuing
ESSM Test & Evaluation	WR	Dahlgren/PHD : VA/ CA	2.342	0.000		0.372	Nov 2016	0.372	Nov 2017	-		0.372	0.000	3.086	-
Developmental Test & Evaluation	WR	Dahlgren : VA	0.418	0.000		0.000		0.000		-		0.000	0.000	0.418	-
I-Stalker Development Test and Evaluation	WR	NSWC Crane : IN	0.000	0.000		0.000		0.500	Jan 2018	-		0.500	0.000	0.500	-
		Subtotal	66.338	1.084		1.961		4.579		-		4.579	-	-	-

Exhibit R-3, RDT&E Project Cost Analysis: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	**Project (Number/Name)** 0173 / *NATO Sea Sparrow*

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2016 Cost	FY 2016 Award Date	FY 2017 Cost	FY 2017 Award Date	FY 2018 Base Cost	FY 2018 Base Award Date	FY 2018 OCO Cost	FY 2018 OCO Award Date	FY 2018 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
ESSM-Support and Performing Activity	Allot	PHD/NAWC CL/ APL : CA/MD	14.763	0.116	Oct 2015	0.116	Oct 2016	0.116	Oct 2017	-		0.116	Continuing	Continuing	Continuing
ESSM-Travel	Allot	Program Office : VA	3.227	0.100	Oct 2015	0.100	Oct 2016	0.100	Oct 2017	-		0.100	Continuing	Continuing	Continuing
ESSM-Misc	Various	various : various	2.149	0.000		0.000		0.000		-		0.000	0.000	2.149	2.065
NATO Travel/Misc	Various	Program Office : various	2.111	0.000		0.000		0.000		-		0.000	0.000	2.111	-
Engineering Support	Various	Various : Various	5.458	0.000		0.000		0.000		-		0.000	0.000	5.458	-
I-Stalker Prgram Management Support	C/CPIF	TMB : Washington, DC	0.000	0.000		0.000		0.200	Jan 2018	-		0.200	0.000	0.200	-
Stalker Travel	WR	NAVSEA Program Office Travel : Washington, DC	0.005	0.000		0.000		0.025	Jan 2018	-		0.025	0.000	0.030	-
		Subtotal	27.713	0.216		0.216		0.441		-		0.441	-	-	-

	Prior Years	FY 2016		FY 2017		FY 2018 Base		FY 2018 OCO		FY 2018 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	520.139	65.177		90.256		134.205		-		134.205	-	-	-

Remarks

Various used for multiple vendors and location under threshold.

Exhibit R-4, RDT&E Schedule Profile: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	**Project (Number/Name)** 0173 / *NATO Sea Sparrow*

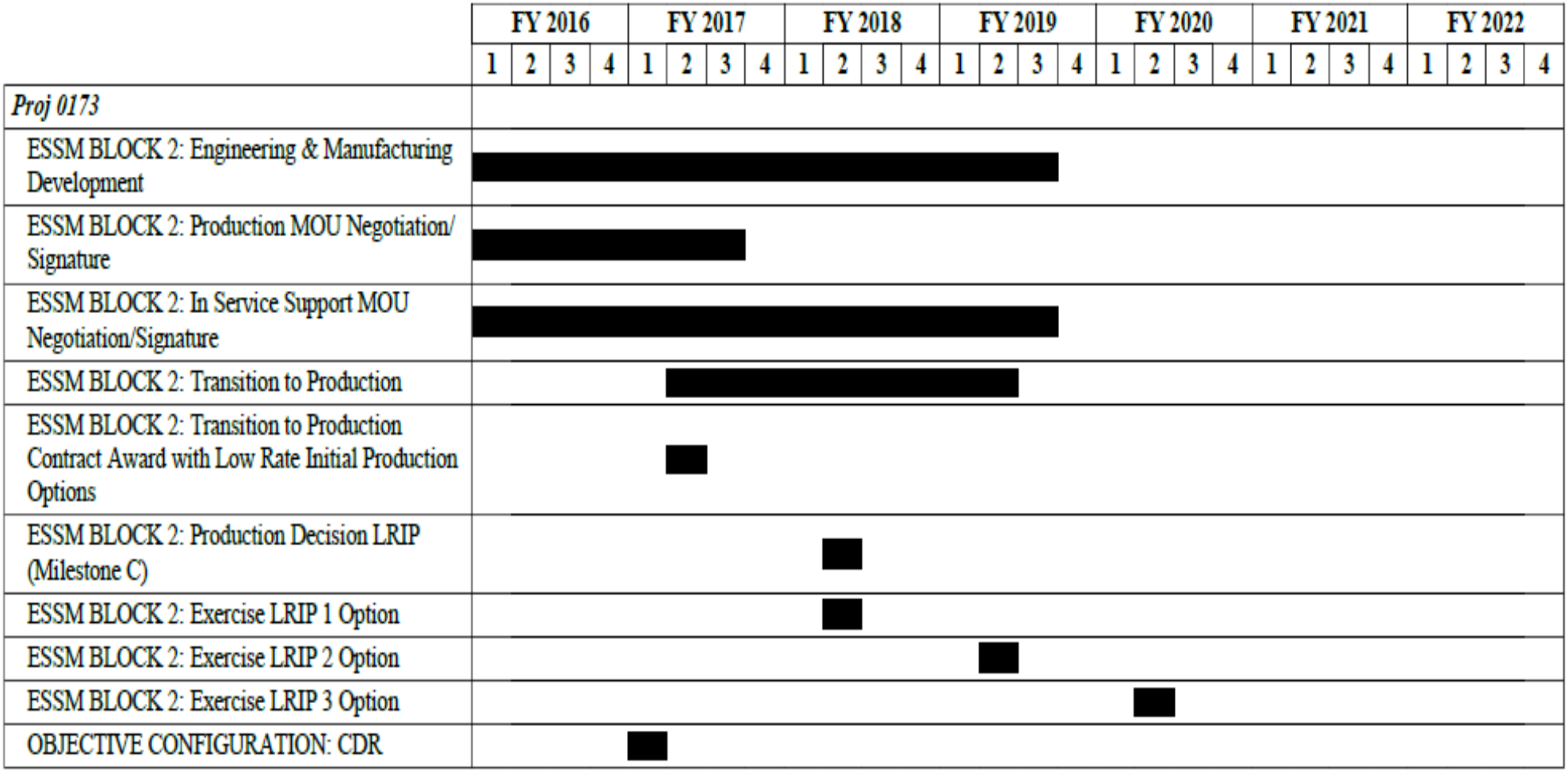
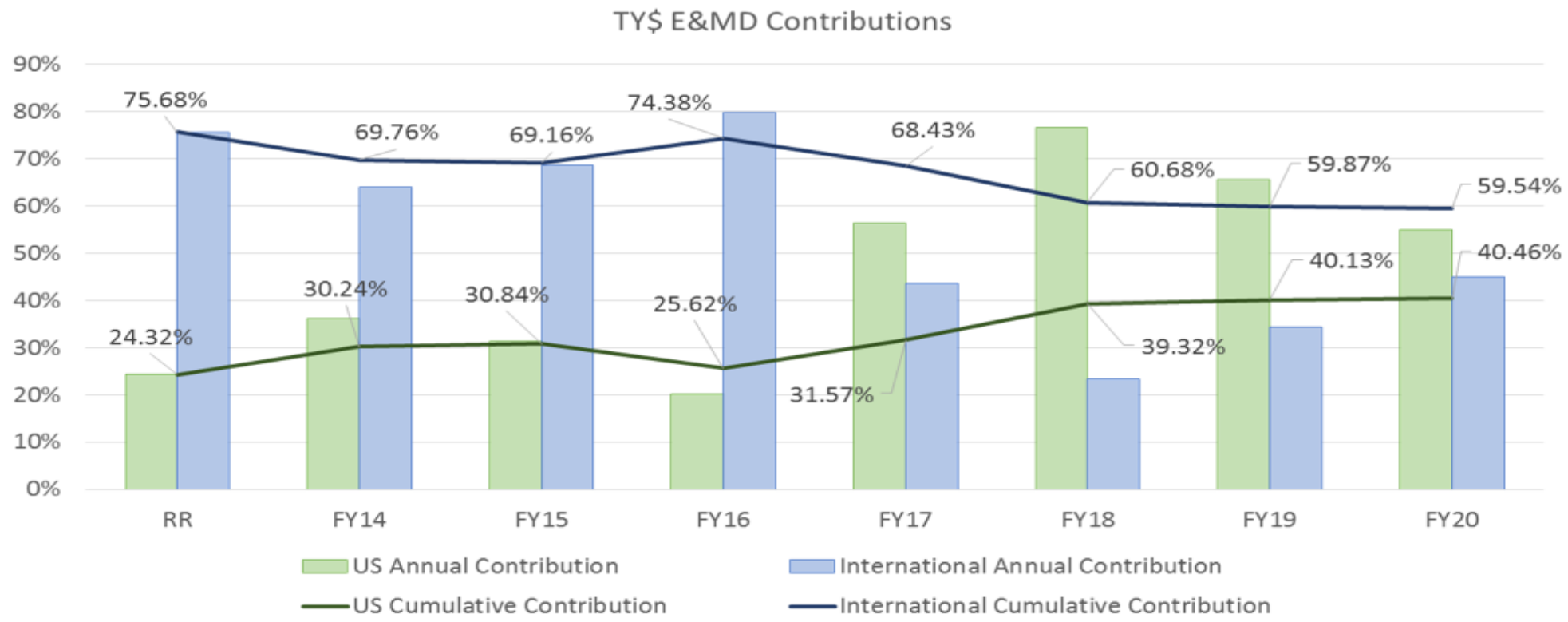


Exhibit R-4, RDT&E Schedule Profile: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	**Project (Number/Name)** 0173 / *NATO Sea Sparrow*



Under the ESSM Block 2 Development Memorandum of Understanding (MOU), the US accounts for 40% of the total funding with the other Nations accounting for the remaining 60%. The program phasing plan was designed for heavy international/light US funding in the early years and light international/heavy US funding in the later years.

Exhibit R-4A, RDT&E Schedule Details: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	**Project (Number/Name)** 0173 / *NATO Sea Sparrow*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 0173				
ESSM BLOCK 2: Engineering & Manufacturing Development	1	2016	3	2019
ESSM BLOCK 2: Production MOU Negotiation/Signature	1	2016	3	2017
ESSM BLOCK 2: In Service Support MOU Negotiation/Signature	1	2016	3	2019
ESSM BLOCK 2: Transition to Production	2	2017	2	2019
ESSM BLOCK 2: Transition to Production Contract Award with Low Rate Initial Production Options	2	2017	2	2017
ESSM BLOCK 2: Production Decision LRIP (Milestone C)	2	2018	2	2018
ESSM BLOCK 2: Exercise LRIP 1 Option	2	2018	2	2018
ESSM BLOCK 2: Exercise LRIP 2 Option	2	2019	2	2019
ESSM BLOCK 2: Exercise LRIP 3 Option	2	2020	2	2020
OBJECTIVE CONFIGURATION: CDR	1	2017	1	2017
I-STALKER: I Stalker Development	1	2018	2	2019
I-STALKER: Development Testing	1	2019	2	2019
I-STALKER: EDM Delivery	2	2019	2	2019

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy			Date: May 2017
Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	Project (Number/Name) 0243 / *ALaMO*	

COST ($ in Millions)	Prior Years	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
0243: *ALaMO*	0.000	0.000	5.759	26.175	-	26.175	25.128	0.000	0.000	0.000	0.000	57.062
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The 57mm MK 332 HE-4G Projectile significantly increases MK 110 Gun Mount lethality and effectiveness against Fast Attack Craft and Fast In-Shore Attack Craft (FAC/FIAC). The 57mm ALaMO concluded development as part of a classified program and transitioned to qualification for Navy use in FY 2017. ALaMO will transition to production at the conclusion of the program.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Title: Systems Engineering and Testing	0.000	5.759	26.175	0.000	26.175
Articles:	-	-	-	-	-
FY 2016 Accomplishments: N/A					
FY 2017 Plans: - Procure long lead hardware for MK 332 design verification prototypes and begin initial planning for test events in FY 2018.					
FY 2018 Base Plans: - Procure balance of hardware for design verification and performance verification test assets. - Conduct MK 332 component and projectile design verification tests. - Conduct radar and divert mechanism performance verification tests from land based test sites. - Measure warhead fragmentation and conduct lethality modeling. - Perform safety and suitability environmental qualification tests. - Conduct the test planning for hazard classification and insensitive munitions qualification. - Coordinate the planning for FY 2019 land based and shipboard DT events. Begin planning IOT&E with Commander Operational Test & Evaluation Force (COMOPTEVFOR).					
FY 2018 OCO Plans: N/A					
Accomplishments/Planned Programs Subtotals	0.000	5.759	26.175	0.000	26.175

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	**Project (Number/Name)** 0243 / *ALaMO*

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

MK 332 HE-4G will be qualified for Navy use in FY 2019, supporting Low Rate Initial Production in FY 2020.

E. Performance Metrics

Quarterly Program Reviews and semi-annual Product Certification Panel Reviews.

Exhibit R-3, RDT&E Project Cost Analysis: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	**Project (Number/Name)** 0243 / *ALaMO*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2016 Cost	FY 2016 Award Date	FY 2017 Cost	FY 2017 Award Date	FY 2018 Base Cost	FY 2018 Base Award Date	FY 2018 OCO Cost	FY 2018 OCO Award Date	FY 2018 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Produce Design Verification hardware, DT Hardware	SS/CPIF	L3/ Mustang : Plano, Tx	0.000	0.000		5.000	Mar 2017	19.964	Jan 2018	-		19.964	19.044	44.008	-
		Subtotal	0.000	0.000		5.000		19.964		-		19.964	19.044	44.008	-

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2016 Cost	FY 2016 Award Date	FY 2017 Cost	FY 2017 Award Date	FY 2018 Base Cost	FY 2018 Base Award Date	FY 2018 OCO Cost	FY 2018 OCO Award Date	FY 2018 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Government Engineering Services	WR	NSWC, DD : Dahlgren, VA	0.000	0.000		0.419	Oct 2016	3.364	Oct 2017	-		3.364	3.100	6.883	-
Government Engineering Services	WR	NSWC, IHEODTD : Indian Head, MD	0.000	0.000		0.340	Oct 2016	2.847	Oct 2017	-		2.847	2.670	5.857	-
		Subtotal	0.000	0.000		0.759		6.211		-		6.211	5.770	12.740	-

	Prior Years	FY 2016		FY 2017		FY 2018 Base		FY 2018 OCO		FY 2018 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	0.000		5.759		26.175		-		26.175	24.814	56.748	-

Remarks

Exhibit R-4, RDT&E Schedule Profile: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	**Project (Number/Name)** 0243 / *ALaMO*

ALaMO Program Schedule

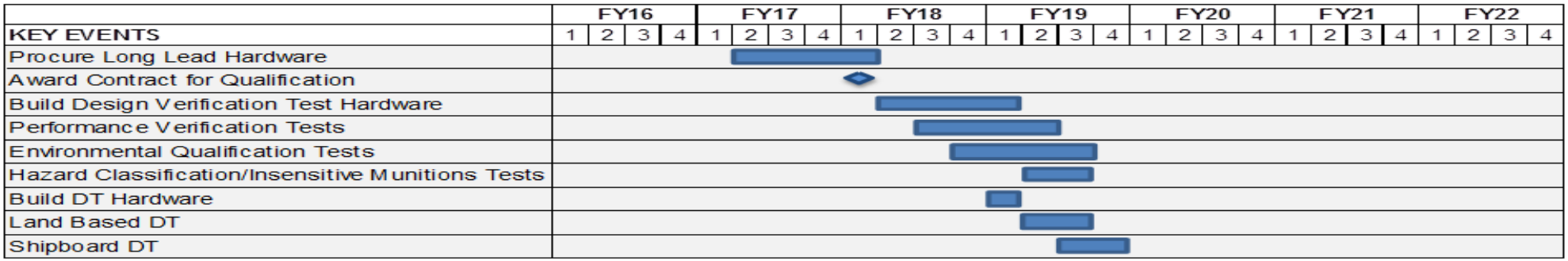


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Exhibit R-4A, RDT&E Schedule Details: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	**Project (Number/Name)** 0243 / *ALaMO*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 0243				
Procure Long Lead Hardware	2	2017	1	2018
Award Contract For Qualification	1	2018	1	2018
Build Design Verification Test Hardware	2	2018	1	2019
Performance Verification Tests	3	2018	2	2019
Environmental Qualification Tests	4	2018	3	2019
Hazard Classification/Insensitive Munitions	2	2019	3	2019
Build DT Hardware	1	2019	1	2019
Land Based DT	2	2019	3	2019
Shipboard DT	3	2019	4	2019

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy			Date: May 2017
Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	Project (Number/Name) 2070 / *OTH Missile*	

COST ($ in Millions)	Prior Years	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
2070: *OTH Missile*	0.000	0.000	0.000	0.000	-	0.000	31.400	0.000	0.000	0.000	0.000	31.400
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

OTH Missile funds competitive acquisition, testing, and fielding of a modern, technologically mature Over-the-Horizon Weapon System (OTH-WS) surface to surface missile capability to be installed onto commissioned and in-production Littoral Combat Ship (LCS) beginning in FY 2021. This continues efforts begun in FY 2016 and FY 2017 Frigate PE 0603599N Project 3086. This is not a new start.

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy			Date: May 2017
Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	Project (Number/Name) 9081 / *Phalanx CIWS SEARAM*	

COST ($ in Millions)	Prior Years	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
9081: *Phalanx CIWS SEARAM*	5.835	0.963	0.360	10.854	-	10.854	18.041	18.454	17.913	18.372	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The MK 15 Close-In Weapons System (CIWS) is a fast reaction, rapid fire, computer controlled radar system utilizing either a 20mm gun (Phalanx) or a SeaRAM weapon system (SeaRAM) to meet its primary mission of providing Anti-Ship Missile (ASM) defense. CIWS fleet population exceeds 220 systems onboard nearly every USN surface combatant. In addition, CIWS continues to be installed on new construction surface ships with life expectancies of 25+ years. Basic system architecture is 20+ years old, hasn't had a significant R&D development effort since the 1990's, and is in need of Technology Refresh in order to avoid hardware obsolescence, maintain/improve reliability, increase capability, and provide affordable spare parts to achieve acceptable Operational Availability for the next 20+ years. Technology Refresh development starts in FY 2018 and will be fielded during CIWS overhauls and will consist of three efforts: Electric Gun Drive System (EGDS), Electronics Enclosure Modernization (ELX), and Local Control Station and Remote Control Station (LCS/RCS) Redesign. EGDS will replace the current pneumatic gun drive system that is difficult and costly to maintain with an all-electric drive system. EGDS will reduce maintenance/troubleshooting requirements, reduce support costs, and provide capability increases such as variable firing rates and reduced ammunition expenditures. ELX replaces costly and obsolete 1970's technology circuit card assemblies, servo controllers and electronic drawer backplanes with COTS digital devices, integrated controllers, and efficient power converters. ELX also will provide a reduction in weight of approx 960 lbs and simplified maintainability. LCS/RCS Redesign eliminates expensive obsolete components, decreases maintenance requirements and complexity, increases commonality between the LCS and RCS via open architecture, and simplifies the user operation by reducing Human Machine Interface requirements.

SeaRAM CIWS is deployed onboard DDG 64, 71, 75, and 78 in order to provide additional capability to meet emerging threats. Efforts include development, qualification, and testing of software and hardware modifications in order to support fielding on these AEGIS class ships. The SeaRAM installation schedule on DDG is as follows: DDG 78 completed March 2016; DDG 64 completed July 2016; DDG 75 completed November 2016; DDG 71 completed March FY 2017.

CIWS Next Generation has been deferred to future years.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Title: CIWS Tech Refresh / SeaRAM on DDG Class	0.963	0.360	10.854	0.000	10.854
Articles:	-	-	-	-	-
FY 2016 Accomplishments: Non-recurring engineering efforts for integration/fielding of SeaRAM CIWS onboard DDG 64, 71, 75, and 78.					
FY 2017 Plans:					

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	**Project (Number/Name)** 9081 / *Phalanx CIWS SEARAM*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Non-recurring engineering efforts for integration/fielding of SeaRAM CIWS onboard DDG 64, 71, 75, and 78. ***FY 2018 Base Plans:*** Non-recurring engineering efforts for CIWS Technology Refresh Modernization activities are focused on redesign of key subsystems, some of which date to the 1970s with obsolete and largely unsupportable electronics systems. Replacing these subsystems with modular "refreshed" components will reduce total ownership costs for the overall sustainment of the Phalanx system and provide a significant capability increase. - Electric Gun Drive System - $2M - Electronic Modernization - $7M - Local Control Station/Remote Control Station Redesign - $1.8M ***FY 2018 OCO Plans:*** N/A					
Accomplishments/Planned Programs Subtotals	0.963	0.360	10.854	0.000	10.854

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

The MK 15 Close-In Weapons System (CIWS) is a fast reaction, rapid fire, computer controlled radar system utilizing either a 20mm gun (Phalanx) or a SeaRAM weapon system (SeaRAM) to meet its primary mission of providing Anti-Ship Missile (ASM) defense. Funding provides support for efforts related to Technology Refresh (for current fleet population) as well as efforts related to the integration/installation of SeaRAM CIWS in DDG 64, 71, 75, and 78. This work will be completed via sole source contracts to the CIWS Design Agent (Raytheon Missile Systems). Tech Refresh improvements will be fielded as Engineering Change Proposals (ECPs) and will be installed during CIWS overhauls or pierside.

E. Performance Metrics

Successfully complete trade studies and initial requirements definition for Technology Refresh and efforts related to successful integration/installation of SeaRAM CIWS in DDG class ships.

Exhibit R-3, RDT&E Project Cost Analysis: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	**Project (Number/Name)** 9081 / *Phalanx CIWS SEARAM*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2016 Cost	FY 2016 Award Date	FY 2017 Cost	FY 2017 Award Date	FY 2018 Base Cost	FY 2018 Base Award Date	FY 2018 OCO Cost	FY 2018 OCO Award Date	FY 2018 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
CIWS Tech Refresh	SS/CPFF	Raytheon Missile Systems : Tucson, AZ	4.435	0.000		0.000		0.000		-		0.000	0.000	4.435	4.435
SeaRAM CIWS on DDG Class	SS/CPFF	Raytheon Missile Systems: : Various	1.000	0.963	Nov 2015	0.360	Nov 2016	0.000		-		0.000	0.000	2.323	-
CIWS Tech Refresh	Various	Various : Various	0.400	0.000		0.000		10.854	Apr 2018	-		10.854	Continuing	Continuing	Continuing
		Subtotal	5.835	0.963		0.360		10.854		-		10.854	-	-	-

Remarks

CIWS Tech Refresh modernization activities are focused on redesign of key subsystems, some of which date to the 1970s with obsolete and largely unsupportable electronics systems. Replacing these subsystems with modular "refreshed" components will reduce total ownership costs and maintenance requirements for the overall sustainment of the Phalanx system.

	Prior Years	FY 2016 Cost	FY 2016 Award Date	FY 2017 Cost	FY 2017 Award Date	FY 2018 Base Cost	FY 2018 Base Award Date	FY 2018 OCO Cost	FY 2018 OCO Award Date	FY 2018 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	5.835	0.963		0.360		10.854		-		10.854	-	-	-

Remarks

Exhibit R-4, RDT&E Schedule Profile: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	**Project (Number/Name)** 9081 / *Phalanx CIWS SEARAM*

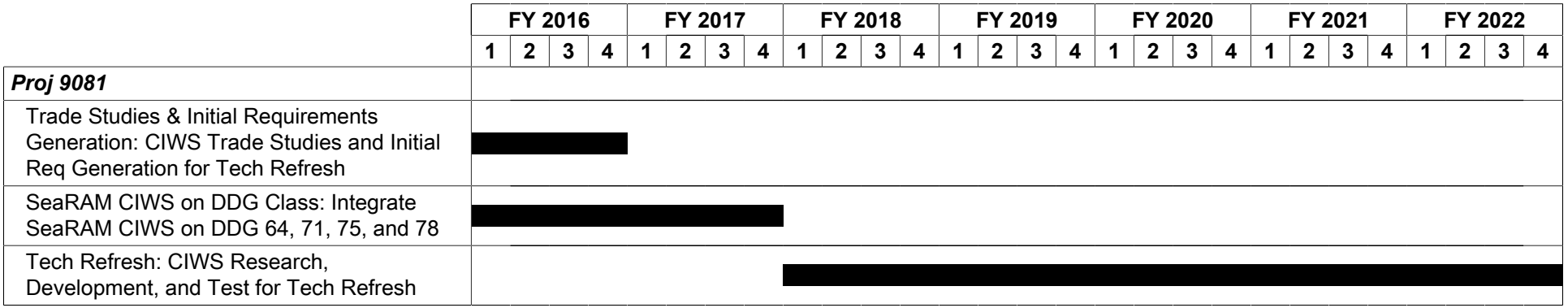

Exhibit R-4A, RDT&E Schedule Details: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	**Project (Number/Name)** 9081 / *Phalanx CIWS SEARAM*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 9081				
Trade Studies & Initial Requirements Generation: CIWS Trade Studies and Initial Req Generation for Tech Refresh	1	2016	4	2016
SeaRAM CIWS on DDG Class: Integrate SeaRAM CIWS on DDG 64, 71, 75, and 78	1	2016	4	2017
Tech Refresh: CIWS Research, Development, and Test for Tech Refresh	1	2018	4	2022

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy			Date: May 2017
Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604756N / *Ship Self Def (Engage: Hard Kill)*	Project (Number/Name) 9999 / *Congressional Adds*	

COST ($ in Millions)	Prior Years	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
9999: *Congressional Adds*	0.000	3.572	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	3.572
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The existing Crew Served Weapons Stations (CSWS) aboard CVN 68 class ships do not have ballistic shields installed. Commercially available ballistic shields do not meet the shipboard integration requirements or military levels of ballistic defeat. The Advanced Ballistic Protection for Crew Served Weapons Stations will provide protection for our sailors as they protect our ships. The system a comprised of a unique composite materials system that meets or exceeds the required ballistic protection while being able to withstand the uniquely harsh environment present on seaborne vessels.

A Small Business Innovation Research contract was competed and a Phase I contract awarded to three contractors to develop candidate designs. SBIR Phase II down-selected to one vendor: Kinetic Resolve (a service-disabled veteran-owned small business located in Stillwater, MN) and The Protective Group (TPG), a small business located in Miami Lakes, FL, collectively operating as Kinetic Protection, LLC. Phase II was awarded to generate proof of concepts for two mount locations on a selected carrier. A production decision will be made with a SBIR Phase III to roll the design out to CVNs and potentially to additional ship classes (ex. LCS, destroyers, etc.)

B. Accomplishments/Planned Programs ($ in Millions)	FY 2016	FY 2017
Congressional Add: Shield Protection	3.572	0.000
FY 2016 Accomplishments: Provided engineering support for increased proof of concept fielding for the Advanced Ballistic Protection for Crew Served Weapons Stations		
FY 2017 Plans: N/A		
Congressional Adds Subtotals	3.572	0.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

This work will be completed via SBIR contracts Phase III, sole source contracts to Kinetic Protection LLC, based on completion of tasking with SBIR II and bringing forth their proprietary data.

E. Performance Metrics

Successfully complete development of enhanced capability for the Advanced Ballistic Protection for two (2) Crew Served Weapons Stations (CSWS).