Exhibit R-2, RDT&E Budget Item Justification: PB 2019 Navy											Date: February 2018	
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 5: *System Development & Demonstration (SDD)*					R-1 Program Element (Number/Name) PE 0604501N *I Advanced Above Water Sensors*							
COST ($ in Millions)	**Prior Years**	**FY 2017**	**FY 2018**	**FY 2019 Base**	**FY 2019 OCO**	**FY 2019 Total**	**FY 2020**	**FY 2021**	**FY 2022**	**FY 2023**	**Cost To Complete**	**Total Cost**
Total Program Element	292.885	70.658	87.233	35.635	-	35.635	17.393	15.793	14.817	15.127	Continuing	Continuing
3188: *Dual-Band Radar*	100.919	4.669	5.165	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	110.753
3232: *Multi-Mission Signal Processor*	156.332	2.215	2.442	2.464	-	2.464	2.054	3.048	3.103	3.176	Continuing	Continuing
3236: *Advanced Radar Technology*	20.686	53.331	68.665	25.257	-	25.257	2.141	0.000	0.000	0.000	0.000	170.080
3301: *Improved Capabilities SPY-1 Radar*	14.948	10.443	10.961	7.914	-	7.914	13.198	12.745	11.714	11.951	Continuing	Continuing

A. Mission Description and Budget Item Justification

The FY 2019 funding request was reduced by $5.25 million to account for the availability of prior year execution balances.

Dual Band Radar (DBR) Upgrades: Funding is for Dual Band Radar (DBR) System upgrades to implement cost savings initiatives for Volume Search Radar (VSR) modifications, supportability analysis and associated logistics product updates; future upgrades/technology insertion efforts for Multi-Function Radar (MFR)/VSR as a part of the DBR suite on CVN 78 and the MFR on DDG 1000 Class ships. Funding is also required to resolve the hardware and software issues discovered during the various test events to include: DTB2-411, Self Defense Test Ship (SDTS) testing, Land Based Testing and pertinent At-Sea test events. The upgrades will include all aspects of the radar system/subsystems, including hardware and software. Specific subsystem areas include the Array, Transmit/Receive (T/R) module, Receiver/ Exciter, Signal Data Processor, Radome, and power/cooling systems. Upgrades and technology insertions are required to maintain the level of force protection needed for ship defense against all threats envisioned in the littoral environment. The supportability analysis and logistic products associated with these upgrades will also be developed and updated. DBR CVN 78 Testing and Certification: FY17-FY18 requirement supports DBR At-Sea Test and Evaluation (T&E), Environmental Testing and DBR Systems Certification for CVN 78. FY2018 is the final year of RDT&E funding for this program.

Multi-Mission Signal Processor (MMSP): The development of MMSP provides simultaneous Anti-Air Warfare (AAW)/Ballistic Missile Defense (BMD) multi-mission capability for DDG 51 class ships as part of the Aegis Modernization Program. This capability is utilized for DDG 113 and follow new construction and Aegis Ashore. Modifies SPY-1D transmitters to enable dual beam for reduced frame times and better reaction time, provides stability for all D(V) waveforms, and avoids operational degradation. The SPY-1 radar system detects, tracks, and supports engagements of a broader range of threats. MMSP improves performance in littoral, ducted clutter, electronic attack (EA), and chaff environments and provides greater commonality in computer programs and equipment. This effort also provides for the development of MMSP on Destroyers Commercial Off The Shelf (COTS) refresh and MMSP technology refresh. MMSP development includes the commencement of technology refresh to support Aegis Modernization due to Diminishing Manufacturing Sources and Material Shortages (DMSMS) and obsolescence issues. MMSP technology refresh, including MMSP-Refresh (MMSP-R), began in FY16. MMSP-R includes software updates required on new computer platforms. Engineering efforts will be required to assess alternate technologies and determine optimal MMSP architectural solutions, which will include system security requirements. FY18 concludes MMSP on Destroyers COTS Refresh (ECPs), includes support for MMSP-R radar Integration & Test (I&T) and Advanced Capability Build 16 (ACB16) Phase 0 certification.

Exhibit R-2, RDT&E Budget Item Justification: PB 2019 Navy	Date: February 2018
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 5: *System Development & Demonstration (SDD)*	**R-1 Program Element (Number/Name)** PE 0604501N *I Advanced Above Water Sensors*

Advanced Radar Technology (ART): Enterprise Air Surveillance Radar (EASR) will modify an existing radar technology to meet the air surveillance requirements for multiple ship classes. EASR will be one sensor in a suite that is designed to meet the performance needs for ship self-defense, situational awareness and air traffic control. EASR will replace the Volume Search Radar (VSR) in the CVN 78 Class Dual Band Radar system and the AN/SPS-48/49 radar systems in numerous ship classes. The AN/SPS-48 Radars are long-range, three-dimensional (3-D) radars used to search, detect and provide space-stabilized, three-coordinate (range, bearing, height) data for air intercept control and designation to a weapon system. The AN/SPS-49A(V)1 radar system is a long range, two dimensional (2-D), L-Band air surveillance radar installed on USN major combatants. The AN/SPY-4 Volume Search Radar (VSR) is an S-Band active phased array radar deployed on CVN 78 providing volume surveillance and air traffic control. EASR funding will develop a modern 3-D air search radar that addresses the latest requirements for Aviation and Amphibious Warfare Ships and closely conforms to existing combat system interfaces, as well as aligns with existing shipboard space, weight, and power limits. The architecture and acquisition strategy for EASR is intended to drive a lower recurring cost by utilizing the same core technology for both fixed-face and rotating array variants. EASR will provide for engineering of component and system level technology improvements for equipment used by in-service air search radars.

Enterprise X-Band Illuminator (EXI): EXI funding will support the development of an X-band illuminator transmitter modification compatible with the EASR radar and Combat System suite for CVN and Amphibious ship classes.

Improved Capabilities for SPY-1 Radar: These Reliability, Maintainability, and Availability (RM&A) improvements and solid state technology insertions are intended to reduce cascading failures, mitigate obsolescence issues, and improve reliability in support of Anti-Air Warfare (AAW) and Ballistic Missile Defense (BMD) missions while still providing AN/SPY-1 Radar Total Ownership Cost Reductions. Improvements such as Solid State Insertion will yield reductions in annual fleet maintenance costs and is a top fleet requirement as part of the AEGIS Wholeness initiative. In addition to RM&A improvements, warfighting improvements funded in this line include: Transmitter Noise Cancellation (TNC) development will include hardware/software to counter low radar cross section, low altitude threats. Side Lobe Blanking (SLB) addresses shortfalls in mixed electronic attack environment while in an Integrated Air and Missile Defense (IAMD) mode. The Ship-Based Non-Cooperative Target Recognition (SBNCTR) program phases 2 and 3 will develop algorithms to provide classification for targets. Transition of Advanced Calibration Experiment (ACE) phases 1 and 2 from Baseline 7 into Baseline 9. Electronic Attack (EA) and Rapid Radar Capability Improvement Program (R2CIP) develop solutions for evolving EA threats. FY19 includes completion of ACE Phase 1, continuation of development of ACE Phase 1, SBNCTR Phase 2, TNC, EA improvements, 10KW Amp/CFA Solid State GaN and initiation of Elevated Radar Advanced Calibration Experiment (ERACE).

Exhibit R-2, RDT&E Budget Item Justification: PB 2019 Navy					Date: February 2018
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 5: *System Development & Demonstration (SDD)*			R-1 Program Element (Number/Name) PE 0604501N *I Advanced Above Water Sensors*		
B. Program Change Summary ($ in Millions)	**FY 2017**	**FY 2018**	**FY 2019 Base**	**FY 2019 OCO**	**FY 2019 Total**
Previous President's Budget	85.868	87.233	41.722	-	41.722
Current President's Budget	70.658	87.233	35.635	-	35.635
Total Adjustments	-15.210	0.000	-6.087	-	-6.087
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-2.197	0.000			
• Program Adjustments	0.000	0.000	-5.339	-	-5.339
• Rate/Misc Adjustments	-0.001	0.000	-0.748	-	-0.748
• Congressional General Reductions Adjustments	-0.012	-	-	-	-
• Congressional Directed Reductions Adjustments	-13.000	-	-	-	-

Change Summary Explanation

FY18 to FY19 decrease: The decrease from FY18 to FY19 is primarily due to two factors: 1) FY18 is the last year of funding for DBR; and 2) EASR development and testing, including procurement of test assets, ramps down from FY18 to FY19.

The FY19 funding request was reduced in Advanced Radar Technology by $2.250 million and Improved Capabilities SPY 1 Radar by $3.0 million to account for the availability of prior year execution balances.

Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy			Date: February 2018
Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604501N / *Advanced Above Water Sensors*	Project (Number/Name) 3188 / *Dual-Band Radar*	

COST ($ in Millions)	Prior Years	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
3188: *Dual-Band Radar*	100.919	4.669	5.165	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	110.753
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Dual-Band Radar (DBR) Upgrades: Funding is for Dual Band Radar (DBR) System upgrades to implement cost savings initiatives for Volume Search Radar (VSR) modifications, supportability analysis and associated logistics product updates; future upgrades/technology insertion efforts for Multi-Function Radar (MFR)/VSR as a part of the DBR suite on CVN 78 Class ships and the MFR on DDG 1000 Class ships. Funding is also required to resolve the hardware and software issues discovered during the various test events to include: DTB2-411, SDTS testing, Land Based Testing and pertinent At-Sea test events. The upgrades will include all aspects of the radar system/subsystems, including hardware and software. Specific subsystem areas include the Array, Transmit/Receive (T/R) module, Receiver/Exciter, Signal Data Processor, Radome, and power/cooling systems. Upgrades and technology insertions are required to maintain the level of force protection needed for ship defense against all threats envisioned in the littoral environment. The supportability analysis and logistic products associated with these upgrades will also be developed and updated. DBR CVN 78 Testing and Certification: FY17-FY18 requirement supports DBR At-Sea Test and Evaluation (T&E), Environmental Testing and DBR Systems Certification for CVN 78. FY2018 is the final year of RDT&E funding for this program.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
Title: RADAR UPGRADES TECHNOLOGY INSERTION	2.000	2.994	0.000	0.000	0.000
Articles:	-	-	-	-	-
FY 2018 Plans: - Complete technology insertion for the MFR/VSR/DBR hardware and software and development/updates to associated logistics products. - Complete technical support for DBR element certification in support of overall combat system certification. - Complete planning for DBR environmental testing. - Complete DBR at-sea shipboard testing. ***FY 2019 Base Plans:*** N/A ***FY 2019 OCO Plans:*** N/A ***FY 2018 to FY 2019 Increase/Decrease Statement:*** DBR RDT&E funding ends in FY18.					
Title: RADAR UPGRADES GOVERNMENT ENGINEERING SERVICES	2.454	2.000	0.000	0.000	0.000

Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604501N / *Advanced Above Water Sensors*	**Project (Number/Name)** 3188 / *Dual-Band Radar*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
Articles:	-	-	-	-	-
FY 2018 Plans: - Complete Government Engineering Services support radar upgrades and technology insertion of the MFR/ VSR/DBR radars. Complete oversight and assessment of efforts associated with this phase of the program. - Complete Government Engineering Services support for DBR element certification in support of overall combat system certification. - Complete Government Engineering Services support for DBR EMI testing and analysis efforts. - Complete Government Engineering Services support for DBR environmental testing. - Complete Government Engineering Services support for DBR at-sea shipboard testing. ***FY 2019 Base Plans:*** N/A ***FY 2019 OCO Plans:*** N/A ***FY 2018 to FY 2019 Increase/Decrease Statement:*** DBR RDT&E funding ends in FY18.					
Title: RADAR UPGRADES PROGRAM MANAGEMENT	0.215	0.171	0.000	0.000	0.000
Articles:	-	-	-	-	-
FY 2018 Plans: - Complete Program Management and logistics support for radars upgrades and technology insertion of the MFR/VSR/DBR radars. ***FY 2019 Base Plans:*** N/A ***FY 2019 OCO Plans:*** N/A ***FY 2018 to FY 2019 Increase/Decrease Statement:*** DBR RDT&E funding ends in FY18.					
Accomplishments/Planned Programs Subtotals	4.669	5.165	0.000	0.000	0.000

Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604501N / *Advanced Above Water Sensors*	**Project (Number/Name)** 3188 / *Dual-Band Radar*

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
• OPN/2980: *BLI 2980/ OPN Items Less Than $5M*	47.664	105.292	148.350	-	148.350	171.540	205.578	162.820	155.744	536.969	26,327.382
• O&M,N/1C2C/0702228N: *0702228N/1C2C/O&M,N*	2.397	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	11.765
• O&M,N/1C1C/0702228N: *0702228N/1C1C/O&M,N*	0.000	2.623	9.906	-	9.906	9.287	10.044	9.398	9.558	Continuing	Continuing

Remarks

D. Acquisition Strategy

Radar Upgrades and logistic products will be developed to address lessons learned and technology refresh for DBR systems on multiple ship classes.

E. Performance Metrics

- Complete upgrade studies and analyses each fiscal year to determine efficiencies for Hardware (H/W) and Software (S/W) upgrades and to determine appropriate logistics product updates
- Complete Electromagnetic Interference (EMI) Testing and Analysis
- Complete upgrade technology insertion
- Complete development of logistics products
- Implement supportability analysis to improve supportability and reduce overall lifecycle cost
- Complete DBR At-Sea Test and Evaluation (T&E)
- Complete planning for DBR Environmental Testing
- Complete DBR Systems Certification
- Complete DBR/SEWIP interface development
- Complete DBR Shipboard Testing

Exhibit R-3, RDT&E Project Cost Analysis: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604501N / *Advanced Above Water Sensors*	**Project (Number/Name)** 3188 / *Dual-Band Radar*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Government Engineering Support	WR	Other Government Activities : Various	1.143	0.000		0.000		0.000		-		0.000	0.000	1.143	-
Government Engineering Support	WR	NSWC/Dahlgren : Dahlgren, VA	14.959	1.153	Nov 2016	1.268	Oct 2017	0.000		-		0.000	0.000	17.380	-
Government Engineering Support	WR	NSWC/PHD : Port Hueneme, CA	6.473	0.323	May 2017	0.000		0.000		-		0.000	0.000	6.796	-
Government Engineering Support	WR	NSWC/Crane : Crane, IN	5.281	0.000		0.026	Nov 2017	0.000		-		0.000	0.000	5.307	-
Government Engineering Support	WR	NRL : Washington, DC	3.725	0.000		0.000		0.000		-		0.000	0.000	3.725	-
Government Engineering Support	SS/CPFF	JHU/APL : Columbia, MD	1.492	0.600	Dec 2016	0.605	Nov 2017	0.000		-		0.000	0.000	2.697	-
Government Engineering Support	MIPR	NSMA : Arlington, VA	0.903	0.000		0.000		0.000		-		0.000	0.000	0.903	-
Government Engineering Support	SS/CPFF	GTRI : Atlanta, GA	1.158	0.000		0.000		0.000		-		0.000	0.000	1.158	-
Government Engineering Support	WR	NSWC/Carderock : Philadelphia, PA	0.202	0.162	Nov 2016	0.101	Oct 2017	0.000		-		0.000	0.000	0.465	-
Government Engineering Support	WR	NSWC/Dam Neck : Dam Neck, VA	1.274	0.000		0.000		0.000		-		0.000	0.000	1.274	-
Government Engineering Support	SS/CPFF	AEGIS Tech Rep : Moorestown, NJ	0.014	0.000		0.000		0.000		-		0.000	0.000	0.014	-
Government Engineering Support	WR	TASC : Andover, MA	0.048	0.000		0.000		0.000		-		0.000	0.000	0.048	-
Government Engineering Support	WR	NSWC/Corona : Corona, CA	0.498	0.216	Jun 2017	0.000		0.000		-		0.000	0.000	0.714	-
Government Engineering Support	WR	NAWC/PT MUGU : PT MUGU, CA	0.586	0.000		0.000		0.000		-		0.000	0.000	0.586	-
Systems Engineering	SS/CPFF	Raytheon : Raytheon, Sudbury, MA	54.686	2.000	Mar 2017	2.994	Oct 2017	0.000		-		0.000	0.000	59.680	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604501N / *Advanced Above Water Sensors*	**Project (Number/Name)** 3188 / *Dual-Band Radar*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Systems Engineering	SS/CPAF	Raytheon IDS : San Diego, CA	1.500	0.000		0.000		0.000		-		0.000	0.000	1.500	-
Systems Engineering	SS/CPFF	General Dynamics AIS : Fairfax, VA	1.000	0.000		0.000		0.000		-		0.000	0.000	1.000	-
Systems Engineering	SS/CPFF	PMS 320 Syntek : Arlington, VA	0.400	0.000		0.000		0.000		-		0.000	0.000	0.400	-
		Subtotal	95.342	4.454		4.994		0.000		-		0.000	0.000	104.790	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management Support	C/CPIF	SPA (SEAPORT) : Washington, DC	4.719	0.000		0.000		0.000		-		0.000	0.000	4.719	-
DAWDF	Allot	N/A : N/A	0.027	0.000		0.000		0.000		-		0.000	0.000	0.027	-
Travel	Allot	PEOIWS2 : Washington, DC	0.180	0.020	Jul 2017	0.030	Mar 2018	0.000		-		0.000	0.000	0.230	-
Program Management Support	C/CPIF	ALION : Washington, DC	0.026	0.000		0.000		0.000		-		0.000	0.000	0.026	-
Program Management Support	C/CPFF	CACI : Washington, DC	0.316	0.000		0.000		0.000		-		0.000	0.000	0.316	-
Program Management Support	C/CPIF	TMB : Washington, DC	0.047	0.000		0.000		0.000		-		0.000	0.000	0.047	-
Program Management Support	C/CPIF	SPA : Washington, DC	0.000	0.195	Aug 2017	0.141	Nov 2017	0.000		-		0.000	0.000	0.336	-
Program Management Support	SS/CPIF	SPA (Bridge) : Washington, DC	0.262	0.000		0.000		0.000		-		0.000	0.000	0.262	-
		Subtotal	5.577	0.215		0.171		0.000		-		0.000	0.000	5.963	N/A

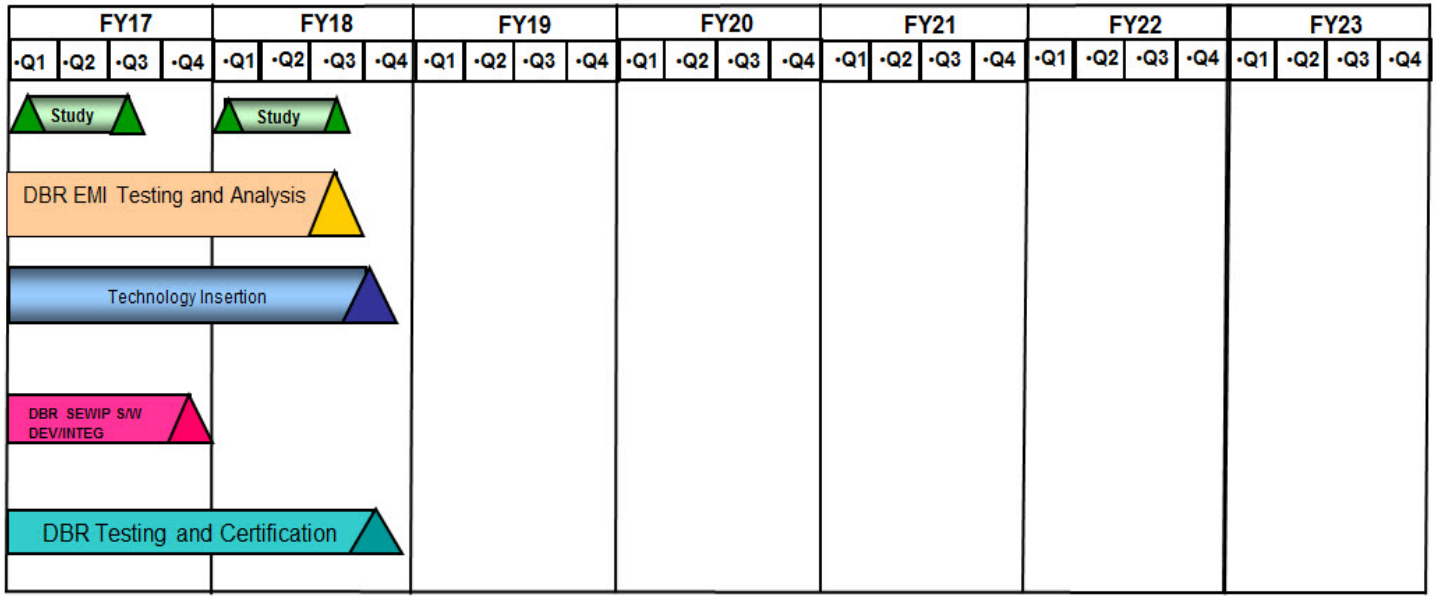
Exhibit R-3, RDT&E Project Cost Analysis: PB 2019 Navy			Date: February 2018
Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604501N / *Advanced Above Water Sensors*	Project (Number/Name) 3188 / *Dual-Band Radar*	

	Prior Years	FY 2017		FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	100.919	4.669		5.165		0.000		-		0.000	0.000	110.753	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604501N / *Advanced Above Water Sensors*	**Project (Number/Name)** 3188 / *Dual-Band Radar*

DBR System Upgrades



Note: Supportability Analysis is conducted in conjunction with the Study.
DBR At-Sea T&E, Planning for Environmental Testing and DBR System Certification are included in the DBR Testing and Certification support

Exhibit R-4A, RDT&E Schedule Details: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604501N / *Advanced Above Water Sensors*	**Project (Number/Name)** 3188 / *Dual-Band Radar*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 3188				
DBR System Upgrade Studies and Analysis	1	2017	3	2018
DBR EMI Testing and Analysis	1	2017	3	2018
DBR System Upgrade Technology Insertion	1	2017	4	2018
DBR SEWIP Software Development/Integration	1	2017	4	2017
DBR Testing and Certification	1	2017	4	2018

Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy			Date: February 2018
Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604501N / *Advanced Above Water Sensors*	Project (Number/Name) 3232 / *Multi-Mission Signal Processor*	

COST ($ in Millions)	Prior Years	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
3232: *Multi-Mission Signal Processor*	156.332	2.215	2.442	2.464	-	2.464	2.054	3.048	3.103	3.176	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Multi-Mission Signal Processor (MMSP): The development of MMSP provides simultaneous Anti-Air Warfare (AAW)/Ballistic Missile Defense (BMD) multi-mission capability for DDG 51 class ships as part of the Aegis Modernization Program. This capability is utilized for DDG 113 and follow new construction and Aegis Ashore. Modifies SPY-1D transmitters to enable dual beam for reduced frame times and better reaction time, provides stability for all D(V) waveforms, and avoids operational degradation. The SPY-1 radar system detects, tracks, and supports engagements of a broader range of threats. MMSP improves performance in littoral, ducted clutter, electronic attack (EA), and chaff environments and provides greater commonality in computer programs and equipment. This effort also provides for the development of MMSP on Destroyers Commercial Off The Shelf (COTS) refresh and MMSP technology refresh.

MMSP development includes the commencement of technology refresh to support Aegis Modernization due to Diminishing Manufacturing Sources and Material Shortages (DMSMS) and obsolescence issues. MMSP technology refresh, including MMSP-Refresh (MMSP-R), began in FY16. MMSP-R includes software updates required on new computer platforms. Engineering efforts will be required to assess alternate technologies and determine optimal MMSP architectural solutions, which will include system security requirements. FY18 concludes MMSP on Destroyers COTS Refresh (ECPs), includes support for MMSP-R radar Integration & Test (I&T) and Advanced Capability Build 16 (ACB16) Phase 0 certification.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
Title: SYSTEMS ENGINEERING	2.215	2.442	2.464	0.000	2.464
Articles:	-	-	-	-	-
FY 2018 Plans: - Continue MMSP-R development to support AEGIS Modernization due to DMSMS and obsolescence issues. - Complete MMSP-R integration and test. - Complete MMSP on Destroyers COTS Refresh Engineering Change Proposals (ECPs). - Support ACB16 Phase 0 certification. - Commence support of MMSP-R ACB16 integration and test. - Continue to maintain alignment with the BMD Program and the associated BSP adjunct to incorporate BMD capability within MMSP during AEGIS Modernization. - Continue to support ACB12 and ACB16 MMSP improvements.					
FY 2019 Base Plans:					

Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604501N / *Advanced Above Water Sensors*	**Project (Number/Name)** 3232 / *Multi-Mission Signal Processor*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
- Continue MMSP-R development to support AEGIS Modernization due to DMSMS and obsolescence issues. - Complete MMSP-R ACB16 integration and test. - Conduct MMSP-R ACB16 Multi-Mission Exercise (MMEX). - Complete ACB16 Phase 1 Certification. - Conduct MMSP-R Demo. - Continue to maintain alignment with the BMD Program and the associated BSP adjunct to incorporate BMD capability within MMSP during AEGIS Modernization. - Continue to support ACB12 and ACB16 MMSP improvements. ***FY 2019 OCO Plans:*** N/A ***FY 2018 to FY 2019 Increase/Decrease Statement:*** Increase in FY19 is due to minor program and rate adjustments.					
Accomplishments/Planned Programs Subtotals	2.215	2.442	2.464	0.000	2.464

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
• OPN/0900: *BLI 0900/ OPN DDG Modernization*	429.614	603.355	487.999	-	487.999	681.567	584.972	911.570	1,057.869	Continuing	Continuing

Remarks

D. Acquisition Strategy

Multi-Mission Signal Processor (MMSP) provides simultaneous AAW/BMD Multi-mission capability for AEGIS Modernization Program and leverages BMD 4.0.1 and SPY-1D(V) designs. This MMSP development efforts support integration of BMD 5.0 signal processing, and will lead to the OPN/SCN procurement for shore sites and shipsets. MMSP technology refresh will be incorporated into Baseline 9 and follow.

E. Performance Metrics

- Complete DDG Commercial Off The Shelf (COTS) Refresh - Engineering Change Proposal (ECP) for MMSP on Destroyers
- Complete ACB16 Phase 0 certification
- Complete ACB16 Phase 1 certification
- Complete ACB16 Phase 2 certification
- Complete ACB16 COTS Refresh

Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604501N / *Advanced Above Water Sensors*	**Project (Number/Name)** 3232 / *Multi-Mission Signal Processor*

- Complete MMSP-R Design and Development
- Complete MMSP-R Radar integration and test
- Complete MMSP-R ACB16 integration and test
- Complete MMSP-R ACB16 MMEX
- Complete MMSP-R Demo
- Complete MMSP-R ECPs

Exhibit R-3, RDT&E Project Cost Analysis: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604501N / *Advanced Above Water Sensors*	**Project (Number/Name)** 3232 / *Multi-Mission Signal Processor*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
SYSTEM ENGINEERING	SS/CPFF	Lockheed Martin : Moorestown, NJ	114.001	1.185	Nov 2017	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
SYSTEM ENGINEERING	C/CPFF	AEGIS Techrep : Moorestown, NJ	5.218	0.123	Jul 2017	0.150	Feb 2018	0.150	Dec 2018	-		0.150	Continuing	Continuing	Continuing
SYSTEM ENGINEERING	SS/FP	APL/JHU : Laurel, MD	4.841	0.070	Jan 2017	0.070	Feb 2018	0.075	Nov 2018	-		0.075	Continuing	Continuing	Continuing
SYSTEM ENGINEERING	WR	CSCS : Dahlgren, VA	1.580	0.000		0.062	Jun 2018	0.062	Jun 2019	-		0.062	0.000	1.704	-
SYSTEM ENGINEERING	WR	NRL : Washington, DC	2.970	0.088	Nov 2016	0.098	Oct 2017	0.102	Nov 2018	-		0.102	Continuing	Continuing	Continuing
SYSTEM ENGINEERING	MIPR	MIT/LL : Lexington, MA	1.453	0.000		0.000		0.000		-		0.000	0.000	1.453	-
SYSTEM ENGINEERING	WR	NSWC/DD : Dahlgren, VA	8.432	0.374	Nov 2016	0.406	Oct 2017	0.415	Oct 2018	-		0.415	Continuing	Continuing	Continuing
SYSTEM ENGINEERING	WR	SCSC : Wallops Island, VA	0.019	0.000		0.000		0.000		-		0.000	0.000	0.019	-
SYSTEM ENGINEERING	WR	NSWC/CR : Crane, IN	4.025	0.122	Nov 2016	1.397	Oct 2017	1.379	Oct 2018	-		1.379	Continuing	Continuing	Continuing
SYSTEM ENGINEERING	WR	NSWC/PHD : Port Hueneme, CA	4.028	0.121	Nov 2016	0.162	Oct 2017	0.182	Oct 2018	-		0.182	Continuing	Continuing	Continuing
SYSTEM ENGINEERING	WR	Office of Naval Research : Arlington, VA	5.779	0.000		0.000		0.000		-		0.000	0.000	5.779	-
		Subtotal	152.346	2.083		2.345		2.365		-		2.365	Continuing	Continuing	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Travel	Allot	PEOIWS2 : Washington, DC	0.228	0.010	Jan 2017	0.010	Nov 2017	0.010	Nov 2018	-		0.010	Continuing	Continuing	Continuing

Exhibit R-3, RDT&E Project Cost Analysis: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604501N / *Advanced Above Water Sensors*	**Project (Number/Name)** 3232 / *Multi-Mission Signal Processor*

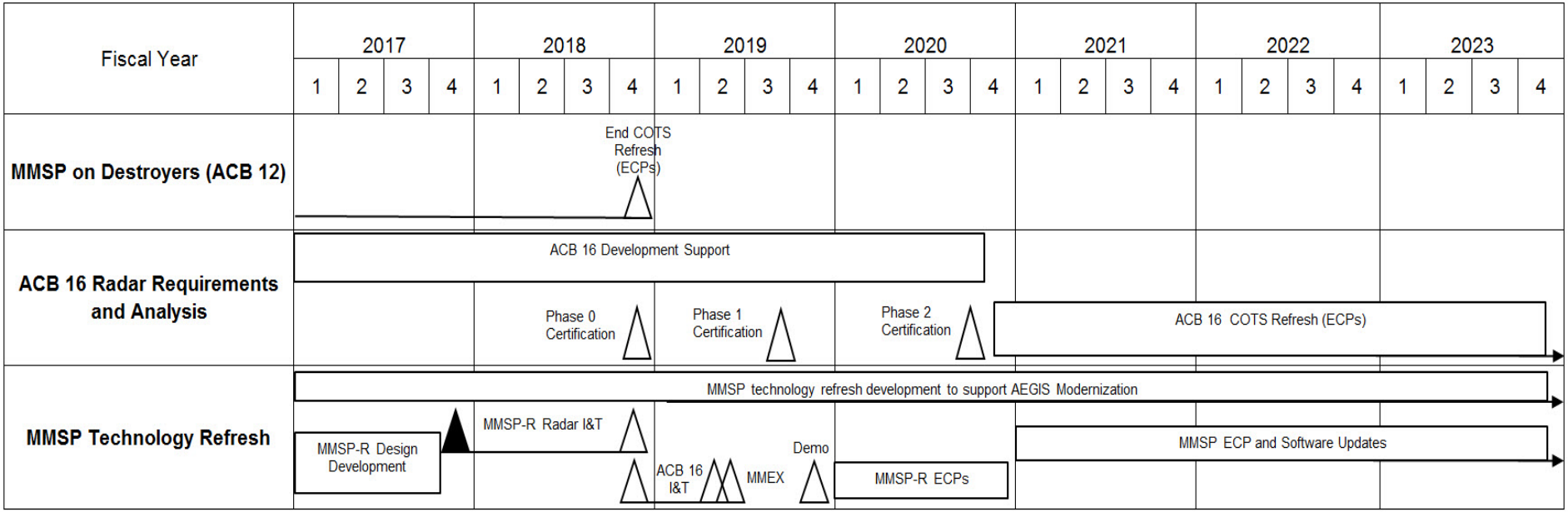
Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Support Management Services	C/CPIF	SPA : Washington, DC	0.000	0.078	Aug 2017	0.087	Aug 2018	0.089	Nov 2018	-		0.089	Continuing	Continuing	Continuing
Support Management Services	SS/CPIF	SPA (Bridge) : Washington, DC	1.359	0.044	Feb 2017	0.000		0.000		-		0.000	0.000	1.403	-
Support Management Services	C/CPIF	SPA (SEAPORT) : Washington, DC	2.247	0.000		0.000		0.000		-		0.000	0.000	2.247	-
Support Management Services	C/CPFF	CACI : Washington, DC	0.094	0.000		0.000		0.000		-		0.000	0.000	0.094	-
Support Management Services	C/CPFF	TMB : Washington, DC	0.031	0.000		0.000		0.000		-		0.000	0.000	0.031	-
Support Management Services	C/CPFF	Strategic Insight : Washington, DC	0.027	0.000		0.000		0.000		-		0.000	0.000	0.027	-
		Subtotal	3.986	0.132		0.097		0.099		-		0.099	Continuing	Continuing	N/A

	Prior Years	FY 2017		FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	156.332	2.215		2.442		2.464		-		2.464	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604501N / *Advanced Above Water Sensors*	**Project (Number/Name)** 3232 / *Multi-Mission Signal Processor*



ACB 16 COTS Refresh continues beyond the FYDP.
MMSP Technology Refresh continues beyond the FYDP.
FY17-23 funding is to support AEGIS capability upgrades for SPY-1 radar and signal processor.

Acronyms:

ACB: AEGIS Capability Build
COTS: Commercial Off The Shelf
I&T: Integration & Test
ECP: Engineering Change Proposal
MMEX: Multi-Mission Exercise
MMSP-R: Multi-Mission Signal Processor Refresh

Exhibit R-4A, RDT&E Schedule Details: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604501N / *Advanced Above Water Sensors*	**Project (Number/Name)** 3232 / *Multi-Mission Signal Processor*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 3232				
DDG Commercial Off The Shelf (COTS) Refresh - Engineering Change Proposals (ECP)	1	2017	4	2018
ACB16 Development Support	1	2017	3	2020
MMSP-Refresh (MMSP-R) Design Development	1	2017	4	2017
MMSP Technology Refresh to Support AEGIS Modernization	1	2017	4	2023
MMSP-R Radar Integration and Test	4	2017	4	2018
ACB16 Phase 0 Certification	4	2018	4	2018
MMSP-R ACB16 Integration and Test	4	2018	2	2019
MMSP-R ACB16 Multi-Mission Exercise (MMEX)	2	2019	2	2019
ACB16 Phase 1 Certification	3	2019	3	2019
MMSP-R Demo	4	2019	4	2019
MMSP-R ECPs	1	2020	4	2020
ACB16 Phase 2 Certification	3	2020	3	2020
ACB16 COTS Refresh (ECPs)	4	2020	4	2023
MMSP ECP and Software Updates	1	2021	4	2023

Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy			Date: February 2018
Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604501N / *Advanced Above Water Sensors*	Project (Number/Name) 3236 / *Advanced Radar Technology*	

COST ($ in Millions)	Prior Years	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
3236: *Advanced Radar Technology*	20.686	53.331	68.665	25.257	-	25.257	2.141	0.000	0.000	0.000	0.000	170.080
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Advanced Radar Technology (ART): Enterprise Air Surveillance Radar (EASR) will modify an existing radar technology to meet the air surveillance requirements for multiple ship classes. EASR will be one sensor in a suite that is designed to meet the performance needs for ship self-defense, situational awareness and air traffic control. EASR will replace the Volume Search Radar (VSR) in the CVN 78 Class Dual Band Radar system and the AN/SPS-48/49 radar systems in numerous ship classes. The AN/SPS-48 Radars are long-range, three-dimensional (3-D) radars used to search, detect and provide space-stabilized, three-coordinate (range, bearing, height) data for air intercept control and designation to a weapon system. The AN/SPS-49A(V)1 radar system is a long range, two dimensional (2-D), L-Band air surveillance radar installed on USN major combatants. The AN/SPY-4 Volume Search Radar (VSR) is an S-Band active phased array radar deployed on CVN 78 providing volume surveillance and air traffic control. EASR funding will develop a modern 3-D air search radar that addresses the latest requirements for Aviation and Amphibious Warfare Ships and closely conforms to existing combat system interfaces, as well as aligns with existing shipboard space, weight, and power limits. The architecture and acquisition strategy for EASR is intended to drive a lower recurring cost by utilizing the same core technology for both fixed-face and rotating array variants. EASR will provide for engineering of component and system level technology improvements for equipment used by in-service air search radars.

Enterprise X-Band Illuminator (EXI): EXI funding will support the development of an X-band illuminator transmitter modification compatible with the EASR radar and Combat System suite for CVN and Amphibious ship classes.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
Title: SYSTEMS ENGINEERING - EASR	38.846	45.016	11.611	0.000	11.611
Articles:	-	-	-	-	-
FY 2018 Plans: - Build up array and complete array integration - Conduct EASR TIMs - Commence EASR Simulator System Testing - Conduct Subsystem Level Testing - Continue EASR test planning in support of test site requirements - Continue supporting EASR IPTs and WGs to facilitate successful integration of the radar with the ship and combat system					

Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604501N / *Advanced Above Water Sensors*	**Project (Number/Name)** 3236 / *Advanced Radar Technology*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
Decrease in FY18 from PB18 primarily due to contractor's refinement of estimates. Funding reallocated to government engineering services to procure test assets in support of test and evaluation efforts. OCO: - N/A ***FY 2019 Base Plans:*** - Conduct EASR TIMs - Continue EASR Simulator System Testing - Complete Test Readiness Review for DT-3 - Complete Transition Critical Design Review (CDR) - Complete Subsystem Level Testing - Commence combat system integration with the emulator - Continue EASR IPTs and WGs to facilitate successful integration of the radar with the ships and combat system - Commence land-based testing - Receive Long Lead Material Authorization for Low-Rate Initial Production (LRIP) units ***FY 2019 OCO Plans:*** N/A ***FY 2018 to FY 2019 Increase/Decrease Statement:*** Decrease in FY19 is primarily due to the procurement of all the EDM hardware in FY18.					
Title: SYSTEMS ENGINEERING - X BAND ILLUMINATOR (EXI)	1.000	0.000	0.000	0.000	0.000
Articles:	-	-	-	-	-
FY 2018 Plans: N/A - There is no funding required for the EXI Development contract in FY18 since NATO SEASPARROW will be completing the EXI upgrade effort. ***FY 2019 Base Plans:*** N/A ***FY 2019 OCO Plans:***					

Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604501N / *Advanced Above Water Sensors*	**Project (Number/Name)** 3236 / *Advanced Radar Technology*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
N/A					
Title: GOVERNMENT ENGINEERING SERVICES - EASR	12.053	22.491	12.478	0.000	12.478
Articles:	-	-	-	-	-

FY 2018 Plans:
- Continue to analyze and assess EASR E&MD contract deliverables
- Continue to provide support to EASR IPTs and WGs
- Continue to support regular EASR Program Management Reviews
- Continue to support test site preparations
- Support EASR simulator system testing
- Continue to support EASR interface integration with the combat system suite
- Support EASR interface with ships design agent
- Support EASR cost, schedule, and performance management, contract administration, contract oversight, risk identification and risk mitigation
- Continue to provide support to EASR TIMs

Increase in FY18 from PB18 primarily due to contractor's refinement of estimates. Funding reallocated to government engineering services to support test and evaluation efforts, including the contract award for Land Based Test Site (LBTS) construction.

FY 2019 Base Plans:
- Continue analysis and assessment of EASR E&MD contract deliverables
- Continue support of EASR IPTs and WGs
- Continue EASR Program Management Reviews
- Continue support of land-based developmental testing
- Complete support of EASR interface integration with the combat system suite
- Support EASR cost, schedule, and performance management contract administration, contract oversight, risk identification and risk mitigation
- Support EASR TIMs

FY 2019 OCO Plans:
N/A

FY 2018 to FY 2019 Increase/Decrease Statement:

Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604501N / *Advanced Above Water Sensors*	**Project (Number/Name)** 3236 / *Advanced Radar Technology*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
Decrease in FY19 is primarily due to the completion of system engineering activities in FY18.					
Title: PROGRAM MANAGEMENT SUPPORT - EASR	1.432	1.158	1.168	0.000	1.168
Articles:	-	-	-	-	-
FY 2018 Plans: - Continue to provide support to EASR IPTs and WGs - Continue to analyze and assess EASR E&MD contract deliverables - Continue to conduct regular EASR Program Management Reviews - Continue to support execution of EASR cost, schedule, and performance management, contract administration, contract oversight, risk identification and risk mitigation - Continue to provide support to EASR TIMs OCO: - N/A					
FY 2019 Base Plans: - Support EASR IPTs and WGs - Continue the analysis and assessment of EASR E&MD contract deliverables - Continue EASR Program Management Reviews - Continue support of EASR schedule and performance management contract administration, contract oversight, risk identification and risk mitigation - Support EASR TIMs					
FY 2019 OCO Plans: N/A					
FY 2018 to FY 2019 Increase/Decrease Statement: Increase in FY19 is primarily due to minor program and rate adjustments.					
Accomplishments/Planned Programs Subtotals	53.331	68.665	25.257	0.000	25.257

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604501N / *Advanced Above Water Sensors*	**Project (Number/Name)** 3236 / *Advanced Radar Technology*

D. Acquisition Strategy

Advanced Radar Technology (ART)/EASR: The EASR Acquisition is a planned competitive procurement based on a radar specification that incorporates the latest requirements for aviation and amphibious warfare ships, closely conforms to existing combat system interfaces, and includes physical Space Weight and Power (SWAP) Not-to-Exceed (NTE) interface requirements from:
- CVN 79+, LHA, LPD 29+, FFG(X) and LX(R) for Forward-Fit
- CVN, LHA and LHD for back-fit

E. Performance Metrics

EASR E&MD
EXI In-Process Reviews (IPRs)
EASR E&MD System PDR
EASR E&MD System CDR
EASR E&MD Land Based System Integration Testing
EASR Production Authorization

Exhibit R-3, RDT&E Project Cost Analysis: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604501N / *Advanced Above Water Sensors*	**Project (Number/Name)** 3236 / *Advanced Radar Technology*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Systems Engineering - S2F	C/CPFF	Northrop Grumman - ES : Baltimore, MD	0.608	0.000		0.000		0.000		-		0.000	0.000	0.608	-
Systems Engineering - EASR	C/CPIF	EASR E&MD Contractor - Raytheon : Marborough, MA	12.265	38.846	Dec 2016	45.016	Nov 2017	11.611	Nov 2018	-		11.611	0.000	107.738	-
Systems Engineering - EXI	SS/CPFF	Raytheon : Portsmouth, RI	1.000	1.000	Mar 2017	0.000		0.000		-		0.000	0.000	2.000	-
		Subtotal	13.873	39.846		45.016		11.611		-		11.611	0.000	110.346	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Government Engineering - EASR	WR	NSWC/DD : Dahlgren, VA	3.137	4.118	Dec 2016	7.669	Oct 2017	5.935	Nov 2018	-		5.935	0.000	20.859	-
Government Engineering - EASR	WR	NSWC/CR : Crane, IN	0.594	1.026	Dec 2016	1.050	Feb 2018	0.708	Nov 2018	-		0.708	0.000	3.378	-
Government Engineering - EASR	WR	NSWC/PHD : Port Huneme, CA	0.381	0.648	Dec 2016	1.270	Feb 2018	0.685	Nov 2018	-		0.685	0.000	2.984	-
Government Engineering - EASR	WR	NSWC/ PHI : Philadelphia, PA	0.057	0.078	Dec 2016	0.132	Nov 2017	0.083	Nov 2018	-		0.083	0.000	0.350	-
Government Engineering - EASR	WR	NRL : Washington, DC	0.293	0.631	Dec 2016	0.524	Nov 2017	0.463	Nov 2018	-		0.463	0.000	1.911	-
Government Engineering - EASR	SS/CPFF	JHU/APL : Baltimore, MD	0.635	3.873	Dec 2016	4.215	Mar 2018	2.704	Dec 2018	-		2.704	0.000	11.427	-
Government Engineering - EASR	WR	SCSC : Wallops Island, VA	0.000	0.235	Dec 2016	0.000		0.347	Nov 2018	-		0.347	0.000	0.582	-
Government Engineering - EASR	WR	NSWC/CD : Bethesda, Maryland	0.160	0.325	Dec 2016	0.114	Nov 2017	0.000		-		0.000	0.000	0.599	-
Engineering Support - EASR	SS/CPIF	SPA (Bridge) : Washington, DC	0.000	0.459	Feb 2017	0.000		0.000		-		0.000	0.000	0.459	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2019 Navy			Date: February 2018
Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604501N / *Advanced Above Water Sensors*	Project (Number/Name) 3236 / *Advanced Radar Technology*	

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Engineering Support - EASR	WR	NAVFAC : Washington, DC	0.000	0.157	Jul 2017	5.842	Feb 2018	0.578	Nov 2018	-		0.578	0.000	6.577	-
Engineering Support - EASR	WR	SPAWAR : San Diego, CA	0.000	0.000		0.449	Feb 2018	0.000		-		0.000	0.000	0.449	-
Engineering Support - EASR	C/CPIF	SPA : Washington, DC	0.000	0.503	Aug 2017	1.226	Nov 2017	0.975	Nov 2018	-		0.975	0.000	2.704	-
		Subtotal	5.257	12.053		22.491		12.478		-		12.478	0.000	52.279	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Systems Engineering - S2F	WR	NRL : Washington, DC	0.581	0.000		0.000		0.000		-		0.000	0.000	0.581	-
		Subtotal	0.581	0.000		0.000		0.000		-		0.000	0.000	0.581	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Support Management Services	C/CPIF	SPA : Washington, DC	0.000	0.465	Aug 2017	0.849	Nov 2017	0.882	Nov 2018	-		0.882	0.000	2.196	-
Travel	Allot	TRAVEL : Washington, DC	0.043	0.080	Nov 2016	0.100	Feb 2018	0.078	Nov 2018	-		0.078	0.000	0.301	-
Support Management Services	C/CPIF	CACI : Washington, DC	0.142	0.170	May 2017	0.100	Dec 2017	0.100	Nov 2018	-		0.100	0.000	0.512	-
Support Management Services	SS/CPIF	SPA (Bridge) : Washington, DC	0.625	0.412	Feb 2017	0.000		0.000		-		0.000	0.000	1.037	-
Support Management Services	C/CPIF	TMB : Washington, DC	0.165	0.223	Jan 2017	0.074	Oct 2017	0.074	Nov 2018	-		0.074	0.000	0.536	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2019 Navy			Date: February 2018
Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604501N / *Advanced Above Water Sensors*	Project (Number/Name) 3236 / *Advanced Radar Technology*	

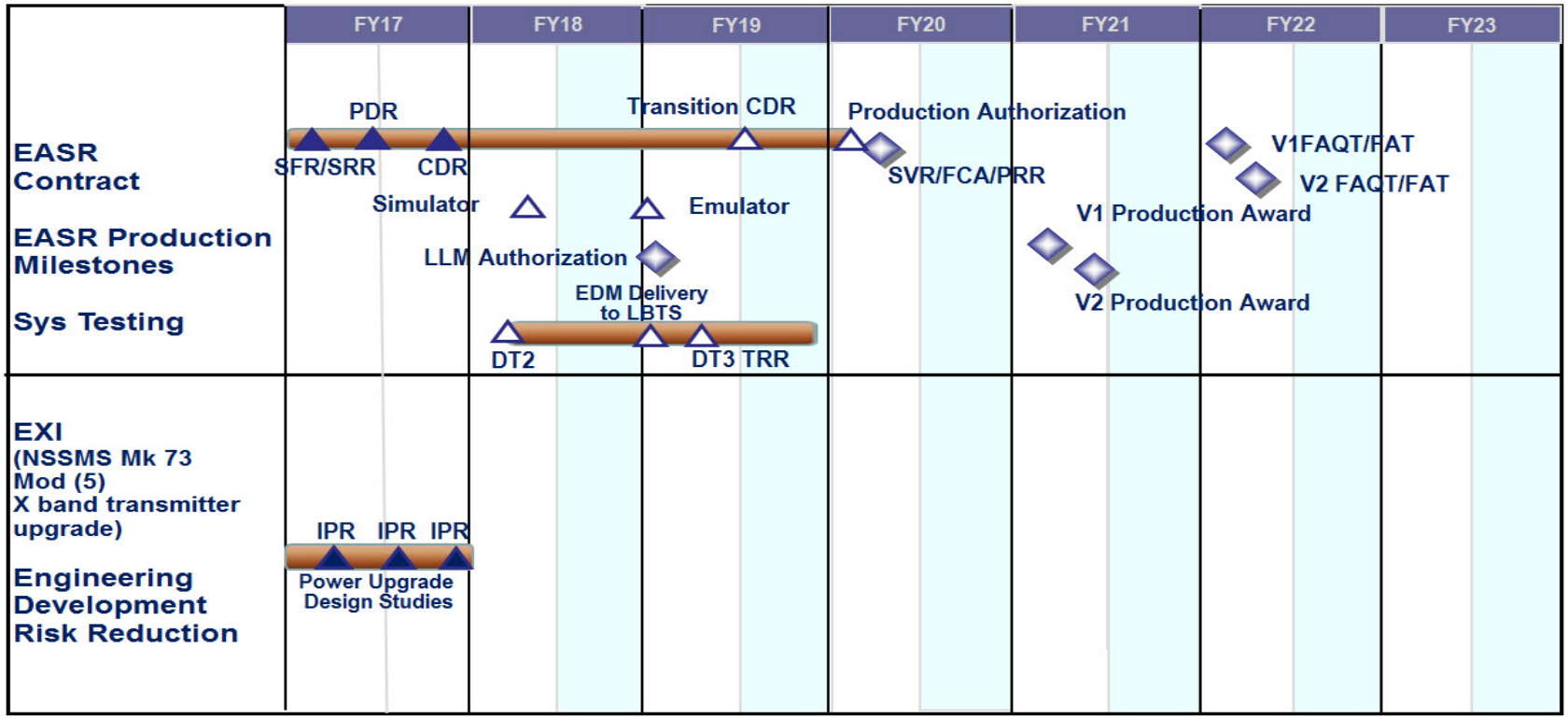
Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Support Management Services	C/CPIF	STRATEGIC INSIGHT : Washington, DC	0.000	0.082	Dec 2016	0.035	Feb 2018	0.034	Dec 2018	-		0.034	0.000	0.151	-
		Subtotal	0.975	1.432		1.158		1.168		-		1.168	0.000	4.733	N/A

	Prior Years	FY 2017		FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	20.686	53.331		68.665		25.257		-		25.257	0.000	167.939	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604501N / *Advanced Above Water Sensors*	**Project (Number/Name)** 3236 / *Advanced Radar Technology*



CDR – Critical Design Review
DT- Developmental Testing
FAQT/FAT - First Article Qualification Test / Factory Acceptance Testing
IPR -In-Process Review
LBTS – Land Based Test Site
LLM -Long Lead Material
PDR - Preliminary Design Review
SFR/SRR - System Functional Review / Systems Readiness Review
SVR/FCA/PRR - System Verification Review, 308 Functional Configuration Audit, and Production Readiness Review

Exhibit R-4A, RDT&E Schedule Details: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604501N / *Advanced Above Water Sensors*	**Project (Number/Name)** 3236 / *Advanced Radar Technology*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 3236				
EASR E&MD	1	2017	2	2020
EASR System Functional Review (SFR)/System Requirements Review (SRR)	1	2017	1	2017
EXI Power Upgrade Design Trade Studies In-Process Reviews (IPRs)	1	2017	4	2017
EASR System Preliminary Design Review (PDR)	2	2017	2	2017
EASR System Critical Design Review (CDR)	4	2017	4	2017
Delivery of EASR Simulator	2	2018	2	2018
EASR Developmental Test (DT) 2	2	2018	4	2018
Delivery of EASR Emulator	1	2019	1	2019
EASR Long Lead Material Authorization	1	2019	1	2019
EASR EDM Delivery to LBTS	1	2019	1	2019
EASR Test Rediness Review (TRR) and DT3	2	2019	4	2019
EASR Transition CDR	3	2019	3	2019
EASR System Verification Review (SVR)/Functional Configuration Audit (FCA)/ Production Readiness Review (PRR)	1	2020	1	2020
EASR Production Authorization	2	2020	2	2020
EASR V1 Production Award	1	2021	1	2021
EASR V2 Production Award	2	2021	2	2021
EASR V1 FAQT/FAT	1	2022	1	2022
EASR V2 FAQT/FAT	2	2022	2	2022

Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy			Date: February 2018
Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604501N / *Advanced Above Water Sensors*	Project (Number/Name) 3301 / *Improved Capabilities SPY-1 Radar*	

COST ($ in Millions)	Prior Years	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
3301: *Improved Capabilities SPY-1 Radar*	14.948	10.443	10.961	7.914	-	7.914	13.198	12.745	11.714	11.951	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Improved Capabilities for SPY-1 Radar: These Reliability, Maintainability, and Availability (RM&A) improvements and solid state technology insertions are intended to reduce cascading failures, mitigate obsolescence issues, and improve reliability in support of Anti-Air Warfare (AAW) and Ballistic Missile Defense (BMD) missions while still providing AN/SPY-1 Radar Total Ownership Cost Reductions. Improvements such as Solid State Insertion will yield reductions in annual fleet maintenance costs and is a top fleet requirement as part of the AEGIS Wholeness initiative. In addition to RM&A improvements, warfighting improvements funded in this line include: Transmitter Noise Cancellation (TNC) development will include hardware/software to counter low radar cross section, low altitude threats. Side Lobe Blanking (SLB) addresses shortfalls in mixed electronic attack environment while in an Integrated Air and Missile Defense (IAMD) mode. The Ship-Based Non-Cooperative Target Recognition (SBNCTR) program phases 2 and 3 will develop algorithms to provide classification for targets. Transition of Advanced Calibration Experiment (ACE) phases 1 and 2 from Baseline 7 into Baseline 9. Electronic Attack (EA) and Rapid Radar Capability Improvement Program (R2CIP) develop solutions for evolving EA threats. FY19 includes completion of ACE Phase 1, continuation of development of ACE Phase 2, SBNCTR Phase 2, TNC, EA improvements, 10KW Amp/CFA Solid State GaN and initiation of Elevated Radar Advanced Calibration Experiment (ERACE).

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
Title: Improved Capabilities SPY-1 Radar	10.443	10.961	7.914	0.000	7.914
Articles:	-	-	-	-	-
FY 2018 Plans:					
- Continue development of additional cost reduction initiatives					
- Continue TNC development and conduct SDR					
- Perform requirements analysis and specification updates for Electronic Attack Improvements					
- Continue requirements development and design reviews for SBNCTR Phase 2					
- Continue Radar IPT support for all baselines					
- Conduct ACE Phase 1 Demo					
- Conduct ACE Phase 1 testing					
- Initiate Elevated Radar Advanced Calibration Experiment (ERACE) development					
FY 2019 Base Plans:					
- Continue development of additional cost reduction initiatives					
- Continue TNC development and conduct PDR and CDR					

Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604501N / *Advanced Above Water Sensors*	**Project (Number/Name)** 3301 / *Improved Capabilities SPY-1 Radar*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
- Initiate Electronic Attack Improvements Technology Development - Continue requirements development and design reviews for SBNCTR Phase 2 - Continue Radar IPT support for all baselines - Conduct ACE Phase 1 Certification and complete development - Continue ERACE development and conduct demo/testing ***FY 2019 OCO Plans:*** N/A ***FY 2018 to FY 2019 Increase/Decrease Statement:*** The FY19 funding request was reduced by $3.050M to account for the availability of prior year execution balances and rate adjustments.					
Accomplishments/Planned Programs Subtotals	10.443	10.961	7.914	0.000	7.914

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
• OPN/2980: *Items Less Than $5M*	47.664	105.292	148.350	-	148.350	171.540	205.578	162.820	155.744	536.969	26,327.382
• O&MN/1C2C/0702228N: *O&M,N AEGIS Wholeness SPY Transmitter Reliability*	4.040	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	17.948
• O&MN/1C1C/0702228N: *O&M,N AEGIS Wholeness SPY Transmitter Reliability*	0.000	4.262	4.324	-	4.324	4.435	4.532	4.625	4.717	Continuing	Continuing

Remarks

D. Acquisition Strategy

Improved Capabilities SPY-1 Reliability, Maintainability, and Availability (RM&A) will design and develop an Ordnance Alterations (ORDALT) Package for fixes and modifications to known transmitter, microwave tube (MWT), and logistic shortcomings (also includes the MK-99 Continuous Wave Illuminator (CWI) MWT. Investment in development of SPY-1 RM&A improvements to address failure mechanisms and improve reliability is planned to continue beyond the FYDP. Radar capability upgrades (SBNCTR, ACE and ERACE) and reliability improvements will be incorporated into Baseline 7, Baseline 9 and follow.

E. Performance Metrics

- Complete 10KW GaN-based Driver/Pre-Driver studies/investigations

Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604501N / *Advanced Above Water Sensors*	**Project (Number/Name)** 3301 / *Improved Capabilities SPY-1 Radar*

- Complete GaN-based Driver/Pre-Driver studies/investigations
- Complete Advanced Calibration Experiment (ACE) Baseline (BL) 9 Phase 1 Demo
- Complete Transmitter Noise Cancellation (TNC) SDR
- Complete Electronic Attack (EA) Studies and Rapid Radar Capability Program (R2CIP) concept development
- Complete ACE BL 9 Phase 1 testing
- Complete TNC Preliminary Design Review (PDR)
- Complete EA studies and R2CIP requirements analysis and spec updates
- Complete SBNCTR integration and test
- Complete TNC Critical Design Review (CDR)
- Complete Sidelobe Blanking (SLB) requirements analysis
- Complete SBNCTR EA
- Complete ACE Phase 1 certification and development
- Complete EA and R2CIP Technology Development
- Complete TNC integration and test
- Complete 10KW Amplifier/CFA Solid State GaN Technology Development
- Complete TNC merge to Common Source Library (CSL)
- Complete ACE Phase 2 requirements definition
- Complete ACE Phase 2 Demo
- Complete ACE Phase 2 certification testing
- Complete EA improvements and R2CIP implementation and testing
- Complete SBNCTR Phase 3 requirements definition
- Complete ERACE requirements definition
- Complete ERACE Demo
- Complete ERACE Testing
- Complete ERACE Certification

Exhibit R-3, RDT&E Project Cost Analysis: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604501N / *Advanced Above Water Sensors*	**Project (Number/Name)** 3301 / *Improved Capabilities SPY-1 Radar*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
SYSTEM ENGINEERING	MIPR	Office of Naval Research : Arlington, VA	1.000	0.000		0.000		0.000		-		0.000	0.000	1.000	-
SYSTEM ENGINEERING	C/CPFF	Raytheon : Sudbury, MA	1.941	0.000		0.000		0.000		-		0.000	0.000	1.941	-
SYSTEM ENGINEERING	WR	NSWC/Crane, IN : Crane, IN	12.007	0.908	Nov 2016	3.387	Nov 2017	1.580	Nov 2018	-		1.580	Continuing	Continuing	Continuing
SYSTEM ENGINEERING	SS/CPFF	Lockheed Martin : Moorestown, NJ	0.000	5.046	Feb 2017	3.750	Jan 2018	3.008	Dec 2018	-		3.008	Continuing	Continuing	Continuing
SYSTEM ENGINEERING	SS/CPFF	AEGIS Techrep : Moorestown, NJ	0.000	0.439	Mar 2017	0.341	Nov 2017	0.261	Dec 2018	-		0.261	Continuing	Continuing	Continuing
SYSTEM ENGINEERING	SS/FP	APL/JHU : Laurel, MD	0.000	0.465	Jan 2017	0.370	Feb 2018	0.260	Nov 2018	-		0.260	Continuing	Continuing	Continuing
SYSTEM ENGINEERING	WR	CSCS : Dahlgren, VA	0.000	0.194	Jun 2017	0.148	Jun 2018	0.125	Jun 2019	-		0.125	Continuing	Continuing	Continuing
SYSTEM ENGINEERING	WR	NRL : Washington, DC	0.000	0.375	Nov 2016	0.361	Nov 2017	0.301	Nov 2018	-		0.301	Continuing	Continuing	Continuing
SYSTEM ENGINEERING	MIPR	MIT/LL : Lexington, MA	0.000	0.450	Mar 2017	0.450	Mar 2018	0.400	Mar 2019	-		0.400	Continuing	Continuing	Continuing
SYSTEM ENGINEERING	WR	NSWC DD : Dahlgren, VA	0.000	1.674	Nov 2016	1.542	Nov 2017	1.392	Nov 2018	-		1.392	Continuing	Continuing	Continuing
SYSTEM ENGINEERING	WR	NSWC/PHD : Port Hueneme, CA	0.000	0.195	Nov 2016	0.149	Nov 2017	0.124	Nov 2018	-		0.124	Continuing	Continuing	Continuing
		Subtotal	14.948	9.746		10.498		7.451		-		7.451	Continuing	Continuing	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Travel	Allot	PEOIWS2 : Washington, DC	0.000	0.010	Feb 2017	0.020	Jan 2018	0.020	Jan 2019	-		0.020	Continuing	Continuing	Continuing

Exhibit R-3, RDT&E Project Cost Analysis: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604501N / *Advanced Above Water Sensors*	**Project (Number/Name)** 3301 / *Improved Capabilities SPY-1 Radar*

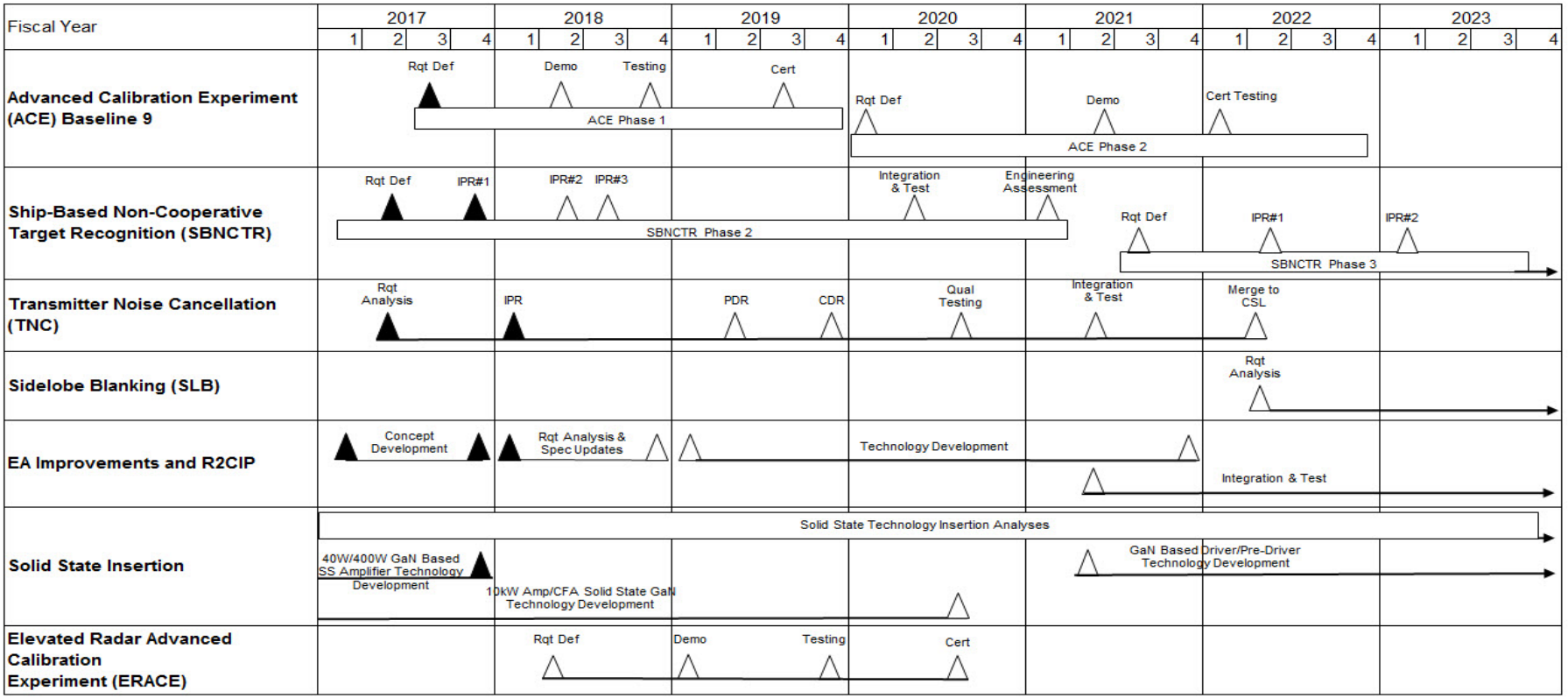
Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Support Management Services	C/CPIF	SPA : Washington, DC	0.000	0.506	Aug 2017	0.443	Nov 2017	0.443	Nov 2018	-		0.443	0.000	1.392	-
Support Management Services	SS/CPIF	SPA (Bridge) : Washington, DC	0.000	0.181	Feb 2017	0.000		0.000		-		0.000	0.000	0.181	-
		Subtotal	0.000	0.697		0.463		0.463		-		0.463	Continuing	Continuing	N/A

	Prior Years	FY 2017		FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	14.948	10.443		10.961		7.914		-		7.914	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604501N / *Advanced Above Water Sensors*	**Project (Number/Name)** 3301 / *Improved Capabilities SPY-1 Radar*



SBNCTR PHASE 3, SLB, EA Improvements and R2CIP, and Solid State Insertion continue beyond the FYDP.

Acronyms:

CFA: Crossed Field Amplifier
CDR: Critical Design Review
CSL: Common Source Library
EA: Electronic Attack
ERACE: Elevated Radar ACE
GaN: Gallium Nitride
IPR: In-Progress Review
PDR: Preliminary Design Review
R2CIP: Rapid Radar Capability Improvement Program
SS: Solid State

Exhibit R-4A, RDT&E Schedule Details: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604501N / *Advanced Above Water Sensors*	**Project (Number/Name)** 3301 / *Improved Capabilities SPY-1 Radar*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 3301				
40W/400W GaN Based Solid State Amplifier Technology Development	1	2017	4	2017
Solid State Technology Insertion Analyses	1	2017	4	2023
10KW GaN Amplifier/CFA Solid State Technology Development	1	2017	3	2020
EA Improvements and R2CIP Concept Development	1	2017	4	2017
SBNCTR - Rqts Definition	2	2017	2	2017
TNC Requirements Analysis	2	2017	2	2017
ACE Phase 1 Requirements Definition	3	2017	3	2017
SBNCTR Phase 2 IPR #1	4	2017	4	2017
TNC IPR	1	2018	1	2018
EA Improvements and R2CIP Rqt Analysis & Spec Updates	1	2018	4	2018
ACE Phase 1 Demo	2	2018	2	2018
SBNCTR Phase 2 IPR #2	2	2018	2	2018
ERACE Requirements Definition	2	2018	2	2018
SBNCTR Phase 2 IPR #3	3	2018	3	2018
ACE Phase 1 Testing	4	2018	4	2018
EA Improvements and R2CIP Technology Development	1	2019	4	2021
ERACE Demo	1	2019	1	2019
TNC PDR	2	2019	2	2019
ACE Phase 1 Certification	3	2019	3	2019
TNC CDR	4	2019	4	2019
ERACE Testing	4	2019	4	2019

Exhibit R-4A, RDT&E Schedule Details: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604501N / *Advanced Above Water Sensors*	**Project (Number/Name)** 3301 / *Improved Capabilities SPY-1 Radar*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
ACE Phase 2 Requirements Definition	1	2020	1	2020
SBNCTR Phase 2 Integration & Test	2	2020	2	2020
ERACE Certification	3	2020	3	2020
TNC Qualification Testing	3	2020	3	2020
SBNCTR Phase 2 Engineering Assessment	1	2021	1	2021
TNC Integration & Test	2	2021	2	2021
ACE Phase 2 Demo	2	2021	2	2021
EA Improvements and R2CIP Integration and Test	2	2021	4	2023
GaN based Driver/Pre-Driver Technology Development	2	2021	4	2023
SBNCTR Phase 3 Requirements Definition	3	2021	3	2021
ACE Phase 2 Certification Testing	1	2022	1	2022
TNC Merge to Common Source Library	2	2022	2	2022
SLB Requirements Analysis	2	2022	4	2023
SBNCTR Phase 3 IPR #1	2	2022	2	2022
SBNCTR Phase 3 IPR #2	1	2023	1	2023