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 0604501N *I Advanced Above Water Sensors*							
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	250.389	42.796	85.868	87.233	-	87.233	41.722	13.780	14.912	15.164	Continuing	Continuing
3188: *Dual-Band Radar*	90.878	10.041	4.808	5.165	-	5.165	0.000	0.000	0.000	0.000	0.000	110.892
3232: *Multi-Mission Signal Processor*	144.748	11.584	2.279	2.442	-	2.442	2.530	2.070	3.070	3.134	Continuing	Continuing
3236: *Advanced Radar Technology*	0.589	20.397	68.037	68.665	-	68.665	28.041	0.000	0.000	0.000	0.000	185.729
3301: *Improved Capabilities SPY-1 Radar*	14.174	0.774	10.744	10.961	-	10.961	11.151	11.710	11.842	12.030	Continuing	Continuing

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 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.

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 a Solid State Switch Assembly (SSSA) through an ONR/MANTECH project, MMSP on Destroyers Commercial Off The Shelf (COTS) refresh, MMSP technology refresh, radar capability upgrades, reliability improvements, and Ship-Based Non-Cooperative Target Recognition (SBNCTR). Initiate transition of Advanced Calibration Experiment (ACE) into Baseline (BL) 7.2. 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 includes the MMSP-Refresh (MMSP-R) beginning 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 Commercial Off the Shelf (COTS) Refresh Engineering Change Proposals (ECPs), includes support for MMSP-R radar Integration & Test (I&T) and Aegis Capability Build (ACB) 16 Phase 0 certification.

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 0604501N *I Advanced Above Water Sensors*

Advanced Radar Technology (ART): Funds the development and integration of existing and new radar technologies into the Navy's sensors to enhance performance and/or ensure sensor operations and sustainment throughout the lifecycle of the sensor and platforms on which installed.

Enterprise Air Surveillance Radar (EASR): 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 develop 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 will develop algorithms to provide classification for targets. Transition of Advanced Calibration Experiment (ACE) from Baseline 7 into Baseline 9. Electronic Attack (EA) and Rapid Radar Capability Improvement Program (R2CIP) develop solutions for evolving EA threats. FY18 includes the continuation of development for ACE Phase 1, SBNCTR Phase 2, TNC, EA improvements, and 10KW Amp/Cross Field Amplifier (CFA) Solid State Gallium Nitride (GaN).

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 0604501N *I Advanced Above Water Sensors*		
B. Program Change Summary ($ in Millions)	**FY 2016**	**FY 2017**	**FY 2018 Base**	**FY 2018 OCO**	**FY 2018 Total**
Previous President's Budget	43.914	85.868	88.249	-	88.249
Current President's Budget	42.796	85.868	87.233	-	87.233
Total Adjustments	-1.118	0.000	-1.016	-	-1.016
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-1.118	0.000			
• Program Adjustments	0.000	0.000	-1.676	-	-1.676
• Rate/Misc Adjustments	0.000	0.000	0.660	-	0.660

Change Summary Explanation

FY16: FY16 decrease is primarily due to Small Business Innovative Research (SBIR) reductions.

FY18: FY18 decrease is due to reductions for SPY-1 Improvements.

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 0604501N / *Advanced Above Water Sensors*	Project (Number/Name) 3188 / *Dual-Band Radar*	

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
3188: *Dual-Band Radar*	90.878	10.041	4.808	5.165	-	5.165	0.000	0.000	0.000	0.000	0.000	110.892
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.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Title: RADAR UPGRADES TECHNOLOGY INSERTION	9.576	2.927	2.994	0.000	2.994
Articles:	-	-	-	-	-
FY 2016 Accomplishments: - Continued Technology Insertion for the MFR/VSR/DBR hardware and software and development/updates to associated logistics products. - Continued to provide technical support for DBR element certification in support of overall combat system certification. - Completed validation testing and integration of the DBR/Battle Force Tactical Trainer (BFTT) and DBR/ Cooperative Engagement Capability (CEC) software interface. - Continued validation testing and integration of DBR/Surface Electronic Warfare Improvement Program (SEWIP) software interfaces. - Continued planning for DBR Environmental Testing. - Continue DBR Pierside Shipboard Testing.					

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 0604501N / *Advanced Above Water Sensors*	**Project (Number/Name)** 3188 / *Dual-Band Radar*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
- Commenced systems engineering analysis and software modifications for DBR track management improvement (e.g., reduce environmental and false clutter tracks). Increase from PB17 planned value due primarily to: - DBR FY16 increase by $3.7M provided additional funding to the DBR prime contractor (Raytheon IDS) for DBR integration and test efforts at the Wallops Island Integration Test Center (WIETC), Wallops Island, VA. This testing included DBR element and combat system integration testing in support of CVN 78 and DDG 1000 shipbuilding programs. This funding was also used to resolve DBR Web-Based System Trouble Reports (WSTRs) that were identified during testing at WIETC. ***FY 2017 Plans:*** - Continue Technology Insertion for the MFR/VSR/DBR hardware and software and development/updates to associated logistics products. - Continue to provide technical support for DBR element certification in support of overall combat system certification. - Complete validation testing and integration of DBR/SEWIP software interfaces. - Continue planning for DBR Environmental Testing. - Complete DBR Pierside Shipboard Testing. - Commence DBR At-Sea Shipboard Testing. - Complete systems engineering analysis and software modifications for DBR track management improvement (e.g., reduce environmental and false clutter tracks). ***FY 2018 Base 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 2018 OCO Plans:*** N/A					
Title: RADAR UPGRADES GOVERNMENT ENGINEERING SERVICES	0.173	1.800	2.081	0.000	2.081
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 0604501N / *Advanced Above Water Sensors*	**Project (Number/Name)** 3188 / *Dual-Band Radar*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
- Continued to provide Government Engineering Services support for radar upgrades and technology insertion of the MFR/ VSR/DBR radars. Continue to perform oversight and assessment of efforts associated with this phase of the program. - Completed Government Engineering Services support of DBR/BFTT and DBR/CEC software interface development integration. - Continued Government Engineering Services support of DBR/SEWIP software interface development integration. - Continued to provide Government Engineering Services required to complete DBR element certification to support overall combat system certification. - Completed Government Engineering Services to support validation testing and integration of the DBR/BFTT and DBR/CEC software interface. - Continued to provide Government Engineering Services to support validation testing and integration of the DBR/SEWIP software interfaces. - Continued Government Engineering Services support for DBR Electromagnetic Interference (EMI) Testing and Analysis efforts. - Continued planning for DBR Environmental Testing. - Continued DBR Pierside Shipboard Testing. Decrease from PB17 planned values due to reallocation to DBR prime contractor for DBR integration and test efforts at WIETC.					
FY 2017 Plans: - Continue to provide Government Engineering Services support for radar upgrades and technology insertion of the MFR/ VSR/DBR radars. Continue to perform oversight and assessment of efforts associated with this phase of the program. - Continue to provide Government Engineering Services required to complete DBR element certification to support overall combat system certification. - Complete Government Engineering Services to support validation testing and integration of the DBR/SEWIP software interface. - Continue Government Engineering Services support for DBR EMI Testing and Analysis efforts. - Continued planning for DBR Environmental Testing. - Continue DBR Pierside Shipboard Testing. - Commence DBR At-Sea Shipboard Testing.					

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 0604501N / *Advanced Above Water Sensors*	**Project (Number/Name)** 3188 / *Dual-Band Radar*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Increase from PB17 planned values primarily due to refined estimates for government engineering efforts relative to complexity of DBR pierside and at-sea testing planned in FY17. Plans support both CVN 78 and DDG 1000 shipbuilding program schedules. CVN78 ship activation schedule was extended from FY16 into FY17; planned scope updated with continued pierside activation and commencement of at-sea testing in FY17. ***FY 2018 Base Plans:*** - Complete Government Engineering Services support radars 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 2018 OCO Plans:*** N/A					
Title: RADAR UPGRADES PROGRAM MANAGEMENT	0.292	0.081	0.090	0.000	0.090
Articles:	-	-	-	-	-
FY 2016 Accomplishments: - Continued to provide Program Management and logistics support for radar upgrades and technology insertion for the MFR/ VSR/DBR radars. - Completed Program Management for validation testing and integration of the DBR/BFTT and DBR/CEC software interfaces. - Continued to provide Program Management for validation testing and integration of the DBR/SEWIP software interfaces. ***FY 2017 Plans:*** - Continue to provide Program Management and logistics support for radar upgrades and technology insertion for the MFR/ VSR/DBR radars. - Complete Program Management for validation testing and integration of the DBR/SEWIP software interface. ***FY 2018 Base 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 0604501N / *Advanced Above Water Sensors*	**Project (Number/Name)** 3188 / *Dual-Band Radar*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
- Complete Program Management and logistics support for radars upgrades and technology insertion of the MFR/VSR/DBR radars. ***FY 2018 OCO Plans:*** N/A					
Accomplishments/Planned Programs Subtotals	10.041	4.808	5.165	0.000	5.165

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
• OPN/2980: *BLI 2980/ OPN Items Less Than $5M*	8.922	17.634	16.422	-	16.422	16.332	16.553	16.872	17.251	Continuing	Continuing
• O&M,N/1C2C/0702228N: *0702228N/1C2C/O&M,N*	2.641	2.397	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	0.000	2.623	-	2.623	2.683	2.736	2.793	2.852	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 co-site and off-ship EMI analysis testing
- Complete VSR Radome development and determine opportunities to improve configuration and performance
- 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/CEC interface development
- Complete DBR Systems Certification

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 0604501N / *Advanced Above Water Sensors*	**Project (Number/Name)** 3188 / *Dual-Band Radar*

- Complete Common Array Power System (CAPS) redesign
- Complete DBR/SEWIP interface development
- Complete DBR/BFTT interface development
- Complete DBR Shipboard Testing

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 0604501N / *Advanced Above Water Sensors*	Project (Number/Name) 3232 / *Multi-Mission Signal Processor*	

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
3232: *Multi-Mission Signal Processor*	144.748	11.584	2.279	2.442	-	2.442	2.530	2.070	3.070	3.134	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 a Solid State Switch Assembly (SSSA) through an ONR/MANTECH project, MMSP on Destroyers Commercial Off The Shelf (COTS) refresh, MMSP technology refresh, radar capability upgrades, reliability improvements, and Ship-Based Non-Cooperative Target Recognition (SBNCTR). Initiate transition of Advanced Calibration Experiment (ACE) into Baseline (BL) 7.2.

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 includes the MMSP-Refresh (MMSP-R) beginning 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 I&T and ACB16 Phase 0 certification.

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	11.584	2.279	2.442	0.000	2.442
Articles:	-	-	-	-	-
FY 2016 Accomplishments: - Continued to support MMSP/ACB12 Radar Integration at-sea validation testing and computer program corrections. - Supported Final Certification of MMSP on Destroyers. - Completed ACE integration into BL 7.2. - Continued MMSP on Destroyers COTS Refresh and Radar Capability improvements. - Continued DDG BL 9 Radar Capabilities Upgrades, SBNCTR, and BL 9 Radar Synchronization. - Continued ACB16 Radar upgrades for MMSP.					

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 0604501N / *Advanced Above Water Sensors*	**Project (Number/Name)** 3232 / *Multi-Mission Signal Processor*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
- Continued to maintain alignment with the Ballistic Missile Defense Program and the associated Ballistic Missile. Defense Signal Processor (BSP) adjunct to incorporate BMD capability within MMSP during AEGIS Modernization. - Supported Production Readiness Review (PRR) of Solid State Switch Assembly (SSSA) and complete transition to production. - Initiated development of MMSP-R. Changes from PB17 due primarily to: - Realignment of funds to Dual Band Radar (3188) and FY16 Small Business Innovative Research (SBIR) reduction ($1.8M). Overall, minor impacts resulted in schedule/phasing adjustments for SBNCTR (canceled IPR #2) and ACE research and development activities. - FY 16 MMSP-R was initiated due to concept maturity and the opportunity to leverage FMS-funded development.					
FY 2017 Plans: - Continue MMSP-R development to support AEGIS Modernization due to Diminishing Manufacturing Sources and Material Shortages (DMSMS) and obsolescence issues. Engineering efforts will be required to assess alternate technologies and determine optimal MMSP architectural solutions, which will include System Security requirements. - Continue to maintain alignment with the Ballistic Missile Defense Program and the associated Ballistic Missile Defense Signal Processor (BSP) adjunct to incorporate BMD capability within MMSP during AEGIS Modernization. - Continue to support ACB12 and ACB16 MMSP improvements. - Initiate MMSP-R integration and test.					
FY 2018 Base Plans: - Continue to support MMSP-R to support AEGIS Modernization due to DMSMS and obsolescence issues. - Complete MMSP-R integration and test. - Complete MMSP on Destroyers COTS Refresh ECPs. - Complete support of ACB16 Phase 0 certification. - Commence support of MMSP-R ACB16 integration and test. - Continue to maintain alignment with the Ballistic Missile Defense Program and the associated Ballistic Missile Defense Signal Processor (BSP) adjunct to incorporate BMD capability within MMSP during AEGIS Modernization.					

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 0604501N / *Advanced Above Water Sensors*	**Project (Number/Name)** 3232 / *Multi-Mission Signal Processor*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
- Continue to support ACB12 and ACB16 MMSP improvements. ***FY 2018 OCO Plans:*** N/A					
Accomplishments/Planned Programs Subtotals	11.584	2.279	2.442	0.000	2.442

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
• SCN/2122: *BLI 2122/SCN DDG 51*	4,207.664	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	77,260.074
• OPN/0900: *BLI 0900/ OPN DDG Modernization*	421.195	432.766	603.355	-	603.355	456.218	605.847	582.863	714.483	3,365.248	9,021.982

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. This effort also provides for the development of a Solid State Switch Assembly (SSSA) through an ONR/MANTECH project, and will lead to OPN/SCN procurement for shore sites and shipsets. MMSP technology refresh, radar capability upgrades, reliability improvements, and ship-based Non-Cooperative Target Recognition will be incorporated into Baseline 9 and follow.

E. Performance Metrics

- Complete DDG SPY-1D(V) Engineering Exercise (EE) #2
- Complete DDG Qualification Testing
- Complete DDG ACB12 Multi-Mission Exercise (MMEX)
- Complete DDG Delivery
- Complete DDG Aegis Light Off (ALO)
- Complete DDG Combat System Ship Qualification Trials (CSSQT)
- Complete MMSP on DDG on Final Certification
- Complete DDG Commercial Off The Shelf (COTS) Refresh - Engineering Change Proposal (ECP) for MMSP on Destroyers
- Complete Solid State Switch Assembly (SSSA) contract award
- Complete SSSA Critical Design Review (CDR)
- Complete Ship-Based Non-Cooperative Target Recognition (SBNCTR) Engineering Exercise (EE)

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 0604501N / *Advanced Above Water Sensors*	**Project (Number/Name)** 3232 / *Multi-Mission Signal Processor*

- Complete ACB16 Preliminary Design Review (PDR)
- Complete ACB16 Phase 0 certification
- Complete ACB16 Phase 1 certification
- Complete ACB16 Phase 2 certification
- Complete ACB16 COTS Refresh
- Complete SSSA qualification testing
- Complete SSSA Production Readiness Review (PRR)
- Complete SSSA transition to production
- Complete SBNCTR integration review
- Complete ACE BL 7.2 Demo
- Complete ACE BL 7.2 Certification
- Complete MMSP-R Radar integration and test
- Complete MMSP-R ACB16 integration and test
- Complete MMSP-R MMEX
- Complete MMSP-R Demo

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 0604501N / *Advanced Above Water Sensors*	Project (Number/Name) 3236 / *Advanced Radar Technology*	

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
3236: *Advanced Radar Technology*	0.589	20.397	68.037	68.665	-	68.665	28.041	0.000	0.000	0.000	0.000	185.729
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Advanced Radar Technology (ART): Funds the development and integration of existing and new radar technologies into the Navy's sensors to enhance performance and/or ensure sensor operations and sustainment throughout the lifecycle of the sensor and platforms on which installed.

Enterprise Air Surveillance Radar (EASR): 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 develop 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 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Title: SYSTEMS ENGINEERING - SPEED TO FLEET (S2F)	0.600	0.000	0.000	0.000	0.000
Articles:	-	-	-	-	-
FY 2016 Accomplishments:					
- Completed development, integration, and testing of an advanced signal processing capability for X-Band radars (S2F)					
- Completed S2F land based and Self Defense Test Ship (SDTS) testing					
- Continued S2F Final Demonstration on SDTS					

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
- Continued transition of an advanced signal processing capability for X-Band radars (Speed To Fleet) ***FY 2017 Plans:*** - Complete S2F Final Demonstration on SDTS - Complete transition of an advanced signal processing capability for X-Band radars (Speed To Fleet) - Obtain S2F approval to begin Fleet software transition process ***FY 2018 Base Plans:*** - N/A ***FY 2018 OCO Plans:*** - N/A					
Title: SYSTEMS ENGINEERING - EASR	12.265	42.790	50.721	0.000	50.721
Articles:	-	-	-	-	-
FY 2016 Accomplishments: - Awarded EASR Engineering and Manufacturing Development (E&MD) contract - Initiated EASR Preliminary Design - Conducted EASR Technical Interchange Meetings (TIMs) - Commenced support to EASR Integrated Product Teams (IPTs) and Working Groups (WGs) to facilitate successful integration of the radar with the ship and combat system Increase from PB17 planned values primarily due to updated contract costs that modified phasing of funding requirements for Systems Engineering between FY16 and FY17. Based on contract funding requirements, initial funding increment at award was higher than previously planned, re-phasing a portion of the spending plan into FY16. ***FY 2017 Plans:*** - Conduct EASR TIMs - Continue supporting EASR IPTs and WGs to facilitate successful integration of the radar with the ship and combat system - Conduct EASR Preliminary Design Review (PDR) - Complete EASR Preliminary Design - Initiate EASR Detailed Design - Conduct EASR Critical Design Review (CDR)					

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 0604501N / *Advanced Above Water Sensors*	**Project (Number/Name)** 3236 / *Advanced Radar Technology*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
- Finalize EASR Detailed Design Review - Procure EDM Hardware and Pedestal Hardware - Initiate EASR test planning in support of test site requirements - Build up Array and commence integration of array Decrease in FY17 from PB17 planned values primarily due to revised contract costs that modified phasing of funding requirements for Systems Engineering between FY16 and FY17. Based on contract funding requirements, initial funding increment at award was higher than previously planned, re-phasing a portion of the spending plan from FY17 to FY16. ***FY 2018 Base Plans:*** - 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 - Initiate EASR test planning in support of test requirements ***FY 2018 OCO Plans:*** - N/A					
Title: SYSTEMS ENGINEERING - X BAND ILLUMINATOR (EXI)	1.000	8.000	0.000	0.000	0.000
Articles:	-	-	-	-	-
FY 2016 Accomplishments: - Awarded EXI Development contract - Initiated EXI Preliminary Design - Commenced support to EXI Integrated Product Teams (IPTs) and Working Groups (WGs) to facilitate successful integration of the radar with the ship and combat system - Conducted EXI TIMs					

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 0604501N / *Advanced Above Water Sensors*	**Project (Number/Name)** 3236 / *Advanced Radar Technology*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Decrease in FY16 from PB17 planned values primarily due to contract awarded in the latter part of FY16, with incurred costs lower than originally planned; realized FY16 costs were reassessed and updated for phasing of allocations for EXI Systems Engineering between FY16 and FY17. ***FY 2017 Plans:*** - Complete EXI Preliminary Design - Conduct EXI Preliminary Design Review (PDR) - Initiate EXI Detailed Design - Continue support to EXI IPTs and WGs to facilitate successful integration with the ship and combat system - Conduct EXI TIMs Increase from PB17 planned values primarily due to contract awarded in the latter part of FY16 and updated phasing of funding between FY16 and FY17, resulting in less activity realized in FY16 and more of the effort needed in FY17. Phasing of allocation for EXI Systems Engineering was reduced in FY16 and increased FY17 accordingly. ***FY 2018 Base 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 2018 OCO Plans:*** N/A					
Title: GOVERNMENT ENGINEERING SERVICES - EASR	5.250	15.313	16.147	0.000	16.147
Articles:	-	-	-	-	-
FY 2016 Accomplishments: - Supported EASR Source Selection - Analyzed and assessed EASR E&MD contract deliverables - Provided support to EASR IPTs and WGs - Supported EASR cost, schedule, and performance management, contract administration, contract oversight, risk identification and risk mitigation - Provided support to EASR TIMs					

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 0604501N / *Advanced Above Water Sensors*	**Project (Number/Name)** 3236 / *Advanced Radar Technology*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Decrease in FY16 from PB17 planned values primarily due to lower incurred costs than originally planned and reallocation among Systems Engineering, Government Engineering Services, and Program Management Support to support FY16 efforts. ***FY 2017 Plans:*** - Provide support to EASR PDR - Continue to analyze and assess EASR E&MD contract deliverables - Continue to provide support to EASR IPTs and WGs - Support regular EASR Program Management Reviews - Continue to support EASR cost, schedule, and performance management, contract administration, contract oversight, risk identification and risk mitigation - Continue to provide support to EASR TIMs - Provide support to EASR Critical Design Review (CDR) - Commence support for EASR Test Site Preparation - Support EASR interface integration with the Combat System Suite Increase from PB17 planned values was primarily due to updated and more detailed FY17 task planning updates that determined an increased effort for Government Engineering Services was required to review, analyze, and validate radar development technical progress and contract deliverables. ***FY 2018 Base 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 - Continue to support EASR cost, schedule, and performance management, contract administration, contract oversight, risk identification and risk mitigation - Continue to provide support to EASR TIMs ***FY 2018 OCO Plans:*** - N/A					
Title: GOVERNMENT ENGINEERING SERVICES - EXI	0.300	0.300	0.300	0.000	0.300

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Articles:	-	-	-	-	-
FY 2016 Accomplishments: - Provided support to EXI IPTs and WGs Decrease in FY16 from PB17 planned values primarily due to late FY16 contract award and change in strategy where majority of development is being conducted by NATO SEASPARROW Missile System (NSSMS) upgrades for the tracker-illuminator that meets EXI requirements, and realignment of funding from EXI to DBR (project 3188). ***FY 2017 Plans:*** - Provide support to EXI PDR - Continue to provide support to EXI IPTs and WGs Decrease in FY17 from PB17 planned values primarily due to change in development strategy where majority of development is being conducted by NATO SEASPARROW Missile System (NSSMS) upgrades for the tracker-illuminator that meets EXI requirements. Government Engineering Services continues to support EXI technical requirements with NSSMS Program. ***FY 2018 Base Plans:*** - Provide support to EXI CDR - Continue to provide support to EXI IPTs and WGs ***FY 2018 OCO Plans:*** N/A					
Title: PROGRAM MANAGEMENT SUPPORT - EASR/EXI	0.982	1.634	1.497	0.000	1.497
Articles:	-	-	-	-	-
FY 2016 Accomplishments: - Supported EASR Source Selection - Provided support to EASR/EXI IPTs and WGs - Analyzed and assessed EASR E&MD and EXI contract deliverables - Supported execution of EASR/EXI cost, schedule, and performance management, contract administration, contract oversight, risk identification and risk mitigation - Provided support to EASR/EXI TIMs					

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Decrease in FY16 from PB17 planned values primarily due to FY16 costs that were lower than previously estimated due to efficiencies realized during the source selection. ***FY 2017 Plans:*** - Continue to provide support to EASR/EXI IPTs and WGs - Continue to analyze and assess EASR E&MD and EXI contract deliverables - Continue to conduct regular EASR/EXI Program Management Reviews - Continue to support execution of EASR/EXI cost, schedule, and performance management, contract administration, contract oversight, risk identification and risk mitigation - Continue to provide support to EASR/EXI TIMs Increase in FY17 from PB17 planned values primarily due to updated and more detailed FY17 task planning updates that determined an increased allocation for EASR and EXI program management support efforts was required in FY17. ***FY 2018 Base Plans:*** - Continue to provide support to EASR/EXI IPTs and WGs - Continue to analyze and assess EASR E&MD and EXI contract deliverables - Continue to conduct regular EASR/EXI Program Management Reviews - Continue to support execution of EASR/EXI cost, schedule, and performance management, contract administration, contract oversight, risk identification and risk mitigation - Continue to provide support to EASR/EXI TIMs ***FY 2018 OCO Plans:*** - N/A					
Accomplishments/Planned Programs Subtotals	20.397	68.037	68.665	0.000	68.665

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
• OPN/2026: *0204228N Radar Support*	19.841	14.363	30.086	-	30.086	23.823	29.708	28.364	28.930	752.443	1,099.281

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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
• O&MN/1C2C/0702228N: *0702228N/1C2C Radar Support*	2.184	2.547	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	10.136
• O&MN/1C1C/0702228N: *0702228N/1C1C Radar Support*	0.000	0.000	6.046	-	6.046	5.560	2.973	3.037	3.040	Continuing	Continuing

Remarks

D. Acquisition Strategy

Advanced Radar Technology (ART): ART efforts will develop and test an advanced signal processing capability for X-Band radars (Speed-to-Fleet).
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(R), and LX(R) for Forward-Fit
- CVN, LHA, LPD for back-fit.

EXI: The EXI Acquisition is a planned procurement based on an illuminator specification that incorporates the latest requirements for aviation and amphibious warfare ships, closely conforms to existing combat system interfaces, and includes physical SWAP NTE interface requirements applicable to CVN 79+ and LHA(R).

E. Performance Metrics

Speed-to-Fleet (S2F) Electronic Protection (EP) new firmware/software changes testing
S2F EP Land Based and SDTS testing
S2F EP Final Demonstration on SDTS
S2F Approval to begin the Fleet software transition process
EASR Engineering and Manufacturing Development (E&MD) Contract RFP
EASR Engineering and Manufacturing Development (E&MD) Contract Award
EXI Contract RFP
EXI Contract Award
EASR E&MD
EXI Development
EASR E&MD System PDR
EXI System PDR
EASR E&MD System CDR
EXI System CDR
EASR E&MD Land Based System Integration Testing

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EXI Land Based System Integration Testing
EASR Production Authorization
EXI Production Authorization

Exhibit R-3, RDT&E Project Cost Analysis: FY 2018 Navy		Date: May 2017
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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
Systems Engineering - S2F	C/CPFF	Northrop Grumman - ES : Baltimore, MD	0.308	0.300	May 2016	0.000		0.000		-		0.000	0.000	0.608	-
Systems Engineering - EASR	C/CPFF	EASR E&MD Contractor - Raytheon : Marborough, MA	0.000	12.265	Aug 2016	42.790	Dec 2016	50.721	Dec 2017	-		50.721	0.000	105.776	-
Systems Engineering - EXI	SS/CPFF	Raytheon : Portsmouth, RI	0.000	1.000	Aug 2016	8.000	Mar 2017	0.000		-		0.000	0.000	9.000	-
		Subtotal	0.308	13.565		50.790		50.721		-		50.721	0.000	115.384	-

Remarks

There is no funding required for the EXI Development Contract in FY18 since NATO SEASPARROW will be completing the EXI upgrade effort.

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 - EASR	WR	NSWC/DD : Dahlgren, VA	0.000	3.137	Feb 2016	5.107	Dec 2016	5.406	Nov 2017	-		5.406	0.000	13.650	-
Government Engineering - EASR	WR	NSWC/CR : Crane, IN	0.000	0.594	Mar 2016	1.444	Dec 2016	1.567	Nov 2017	-		1.567	0.000	3.605	-
Government Engineering - EASR	WR	NSWC/PHD : Port Huneme, CA	0.000	0.381	Feb 2016	1.496	Dec 2016	1.619	Nov 2017	-		1.619	0.000	3.496	-
Government Engineering - EASR	WR	NSWC/ PHI : Philadelphia, PA	0.000	0.057	Mar 2016	0.156	Dec 2016	0.265	Nov 2017	-		0.265	0.000	0.478	-
Government Engineering - EASR	WR	NRL : Washington, DC	0.000	0.293	Mar 2016	1.150	Dec 2016	1.162	Nov 2017	-		1.162	0.000	2.605	-
Government Engineering - EASR	SS/CPFF	JHU/APL : Baltimore, MD	0.000	0.635	Apr 2016	4.420	Dec 2016	4.466	Dec 2017	-		4.466	0.000	9.521	-
Government Engineering - EASR	WR	SCSC : Wallops Island, VA	0.000	0.000		1.114	Dec 2016	1.125	Nov 2017	-		1.125	0.000	2.239	-

Exhibit R-3, RDT&E Project Cost Analysis: FY 2018 Navy			Date: May 2017
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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 - EASR	WR	NSWC/CD : Bethesda, Maryland	0.000	0.160	Mar 2016	0.426	Dec 2016	0.537	Nov 2017	-		0.537	0.000	1.123	-
Government Engineering - EXI	WR	NSWC/DD : Dahlgren, VA	0.000	0.150	Feb 2016	0.150	May 2017	0.150	Nov 2017	-		0.150	0.000	0.450	-
Government Engineering - EXI	WR	NSWC/CR : Crane, IN	0.000	0.075	Mar 2016	0.075	May 2017	0.075	Nov 2017	-		0.075	0.000	0.225	-
Government Engineering - EXI	WR	NSWC/PHD : Port Huneme, CA	0.000	0.075	Feb 2016	0.075	May 2017	0.075	Nov 2017	-		0.075	0.000	0.225	-
		Subtotal	0.000	5.557		15.613		16.447		-		16.447	0.000	37.617	-

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
Systems Engineering - S2F	WR	NRL : Washington, DC	0.281	0.300	Jan 2016	0.000		0.000		-		0.000	0.000	0.581	-
		Subtotal	0.281	0.300		0.000		0.000		-		0.000	0.000	0.581	-

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
Support Management Services	C/CPIF	TBD ESS : TBD	0.000	0.000		0.235	Jun 2017	0.903	Dec 2017	-		0.903	0.000	1.138	-
Travel	Allot	TRAVEL : Washington, DC	0.000	0.043	Jan 2016	0.081	Nov 2016	0.026	Nov 2017	-		0.026	0.000	0.150	-
Support Management Services	C/CPIF	CACI : Washington, DC	0.000	0.142	Feb 2016	0.307	May 2017	0.307	Dec 2017	-		0.307	0.000	0.756	-
Support Management Services	SS/CPIF	SPA : Washington, DC	0.000	0.625	Feb 2016	0.668	Feb 2017	0.000		-		0.000	0.000	1.293	-

Exhibit R-3, RDT&E Project Cost Analysis: FY 2018 Navy			Date: May 2017
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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
Support Management Services	C/CPIF	TMB : Washington, DC	0.000	0.165	Feb 2016	0.261	Jan 2017	0.261	Dec 2017	-		0.261	0.000	0.687	-
Support Management Services	C/CPIF	STRATEGIC INSIGHT : Washington, DC	0.000	0.000		0.082	Jan 2017	0.000		-		0.000	0.000	0.082	-
		Subtotal	0.000	0.975		1.634		1.497		-		1.497	0.000	4.106	-

	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	0.589	20.397		68.037		68.665		-		68.665	0.000	157.688	-

Remarks

Exhibit R-4, RDT&E Schedule Profile: FY 2018 Navy		Date: May 2017
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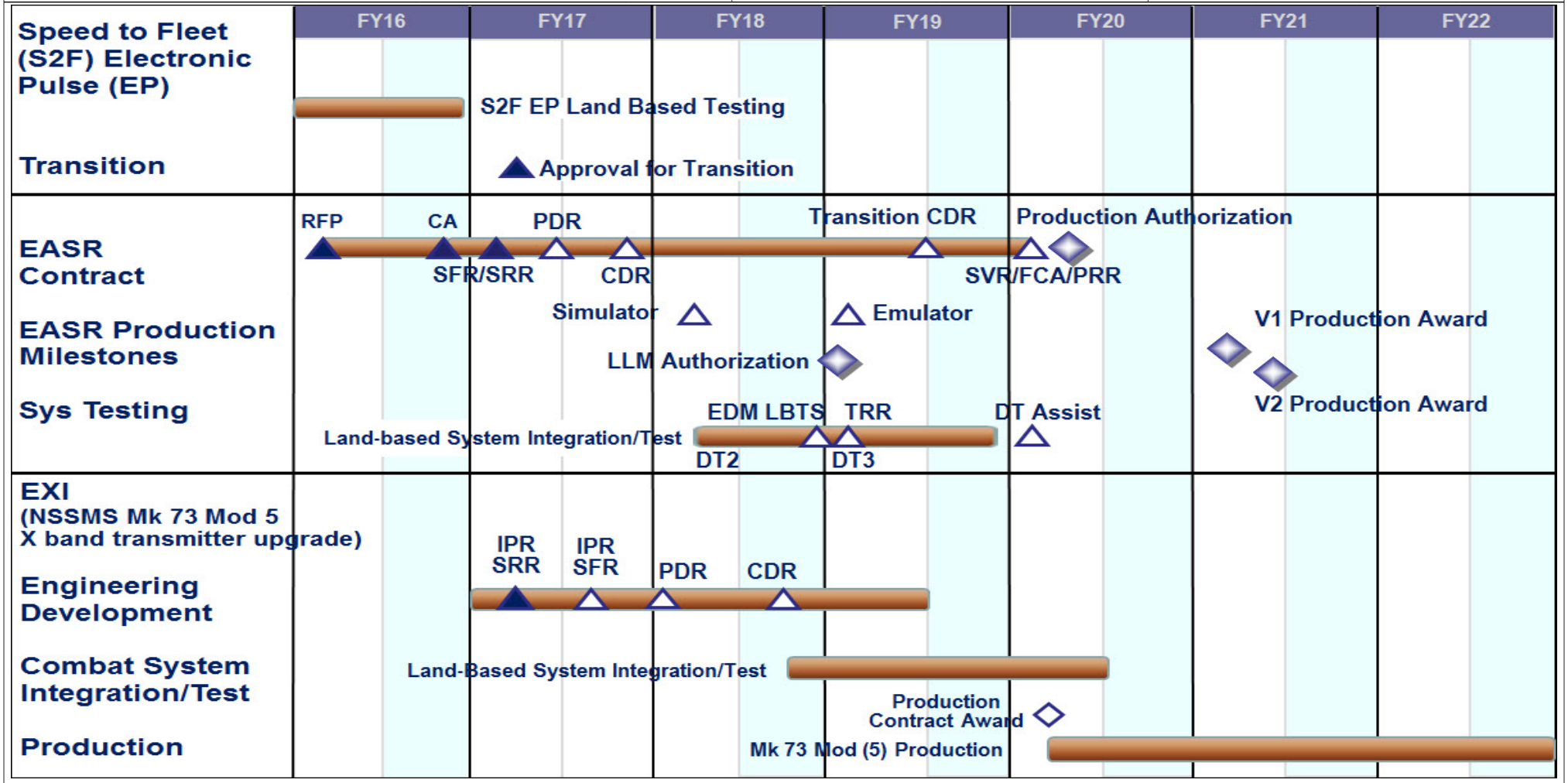

Exhibit R-4A, RDT&E Schedule Details: FY 2018 Navy		Date: May 2017
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Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 3236				
Speed to Fleet (S2F) Electronic Pulse (EP) Land Based Testing	1	2016	4	2016
Enterprise Air Surveillance Radar (EASR) Engineering and Manufacturing Development (E&MD) Contract RFP	1	2016	1	2016
EASR Engineering and Manufacturing Development (E&MD) Contract Award	4	2016	4	2016
EASR E&MD	4	2016	1	2020
Enterprise X-Band Illuminator (EXI) Engineering Development	1	2017	2	2019
EASR System Functional Review (SFR)/System Requirements Review (SRR)	1	2017	1	2017
S2F Approval For Transition	1	2017	1	2017
EXI Interim Program Review (IPR) SRR	2	2017	2	2017
EASR System Preliminary Design Review (PDR)	2	2017	2	2017
EXI IPR SFR	3	2017	3	2017
EASR System Critical Design Review (CDR)	4	2017	4	2017
EXI System PDR	1	2018	1	2018
Delivery of EASR Simulator	2	2018	2	2018
EASR Developmental Test (DT) 2	1	2018	4	2018
EXI System CDR	3	2018	3	2018
EXI Land Based System Integration/Test	4	2018	2	2020
Delivery of EASR Emulator	1	2019	1	2019
EASR Long Lead Material Authorization	1	2019	1	2019
EASR Test Rediness Review (TRR) and DT3	1	2019	4	2019
EASR Transition CDR	3	2019	3	2019

Exhibit R-4A, RDT&E Schedule Details: FY 2018 Navy		Date: May 2017
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	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
EASR System Verification Review (SVR)/Functional Configuration Audit (FCA)/ Production Readiness Review (PRR)	1	2020	1	2020
EASR DT Assist	1	2020	1	2020
EXI Production Contract Award	1	2020	1	2020
EXI Production	1	2020	4	2022
EASR Production Authorization	2	2020	2	2020
EASR V1 Production Award	1	2021	1	2021
EASR V2 Production Award	2	2021	2	2021

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 0604501N / *Advanced Above Water Sensors*	Project (Number/Name) 3301 / *Improved Capabilities SPY-1 Radar*	

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
3301: *Improved Capabilities SPY-1 Radar*	14.174	0.774	10.744	10.961	-	10.961	11.151	11.710	11.842	12.030	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 will develop algorithms to provide classification for targets. Transition of Advanced Calibration Experiment (ACE) from Baseline 7 into Baseline 9. Electronic Attack (EA) and Rapid Radar Capability Improvement Program (R2CIP) develop solutions for evolving EA threats. FY18 includes the continuation of development for ACE Phase 1, SBNCTR Phase 2, TNC, EA improvements, and 10KW Amp/CFA Solid State GaN.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Title: Improved Capabilities SPY-1 Radar	0.774	10.744	10.961	0.000	10.961
Articles:	-	-	-	-	-
FY 2016 Accomplishments:					
- Completed Microwave Tube (MWT) improvement design/development					
- Continued technology development for Gallium Nitride (GaN) Based 40W/400W Solid State Amplifier					
- Initiated technology development for 10KW Amplifier/Cross Field Amplifier (CFA) Solid State GaN replacement					
- Continued development of additional cost reduction initiatives					
- Completed System Design Review (SDR) reliability improvements					
FY 2017 Plans:					
- Complete Technology Development for GaN Based 40W/400W Solid State Amplifier					
- Continue Technology Development for 10KW Amplifier/CFA Solid State GaN replacement					
- Continue development of additional cost reduction initiatives					
- Initiate Transmitter Noise Cancellation (TNC) requirements analysis and conduct SDR					
- Perform concept development for Electronic Attack Improvements					

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 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 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
- Initiate requirements development and design reviews for Ship-Based Non-Cooperative Target Recognition (SBNCTR) - Initiate Radar Integrated Product Team (IPT) support for all baselines - Initiate and Complete ACE Phase 1 requirements definition ***FY 2018 Base Plans:*** - Continue development of additional cost reduction initiatives - Continue TNC conduct PDR - 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 - Complete ACE Phase 1 Demo - Complete ACE Phase 1 testing ***FY 2018 OCO Plans:*** N/A					
Accomplishments/Planned Programs Subtotals	0.774	10.744	10.961	0.000	10.961

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
• OPN/2980: *Items Less Than $5M*	17.866	18.602	36.855	-	36.855	26.592	26.483	29.827	15.360	Continuing	Continuing
• O&MN/1C2C/0702228N: *O&M,N AEGIS Wholeness SPY Transmitter Reliability*	3.716	4.040	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	0.000	4.222	-	4.222	4.332	4.414	4.504	4.596	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 will be incorporated into Baselines 7 and 9.

E. Performance Metrics

- Complete 10KW Traveling Wave Tube/Continuous Wave Illumination Microwave Tube (TWT/CWI MWT) Improvement Design/Development/Monitoring
- Complete A/B EI Switch Improvement Design/Development
- Complete Sidewall Capacitor Monitoring Circuit
- Complete 10KW Monitoring Circuit development
- Complete Crossed Field Amplifier/Switch Tube (CFA/SWT) MWT Improvement Design Development
- Complete MWT Improvement Design/Development
- Complete Water Cooled Vane (WCV) to Double Duty (DD) engineering development
- Complete Simplified Driver (SDR) reliability design improvements
- Complete Gallium Nitride (GaN) based 40W/400W solid state amplifier development
- Complete 10KW GaN based amplifier for Pre-Drivers development
- Complete Switch Tube Drawer (STD) Reliability Project
- 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
- 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

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 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 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
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	11.233	0.774	Jan 2016	1.370	Nov 2016	1.257	Dec 2017	-		1.257	Continuing	Continuing	Continuing
SYSTEM ENGINEERING	SS/CPFF	Lockheed Martin : Moorestown, NJ	0.000	0.000		4.936	Feb 2017	5.748	Dec 2017	-		5.748	Continuing	Continuing	Continuing
SYSTEM ENGINEERING	SS/CPFF	AEGIS Techrep : Moorestown, NJ	0.000	0.000		0.409	Mar 2017	0.417	Dec 2017	-		0.417	Continuing	Continuing	Continuing
SYSTEM ENGINEERING	SS/FP	APL/JHU : Laurel, MD	0.000	0.000		0.465	Jan 2017	0.305	Feb 2018	-		0.305	Continuing	Continuing	Continuing
SYSTEM ENGINEERING	WR	CSCS : Dahlgren, VA	0.000	0.000		0.194	Jan 2017	0.198	Dec 2017	-		0.198	Continuing	Continuing	Continuing
SYSTEM ENGINEERING	WR	NRL : Washington, DC	0.000	0.000		0.395	Nov 2016	0.357	Dec 2017	-		0.357	Continuing	Continuing	Continuing
SYSTEM ENGINEERING	MIPR	MIT/LL : Lexington, MA	0.000	0.000		0.350	Mar 2017	0.350	Mar 2018	-		0.350	Continuing	Continuing	Continuing
SYSTEM ENGINEERING	WR	NSWC DD : Dahlgren, VA	0.000	0.000		1.739	Nov 2016	1.375	Nov 2017	-		1.375	Continuing	Continuing	Continuing
SYSTEM ENGINEERING	WR	NSWC/PHD : Port Hueneme, CA	0.000	0.000		0.230	Nov 2016	0.200	Dec 2017	-		0.200	Continuing	Continuing	Continuing
		Subtotal	14.174	0.774		10.088		10.207		-		10.207	-	-	-

Remarks

FY17-FY21 funding realigned from Project 3232 to 3301.

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 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 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	PEOIWS2 : Washington, DC	0.000	0.000		0.020	Feb 2017	0.020	Jan 2018	-		0.020	Continuing	Continuing	Continuing
Support Management Services	C/CPIF	TBD ESS : TBD	0.000	0.000		0.636	Jun 2017	0.606	Dec 2017	-		0.606	Continuing	Continuing	Continuing
Support Management Services	C/CPFF	CACI : Washington, DC	0.000	0.000		0.000		0.046	Dec 2017	-		0.046	Continuing	Continuing	Continuing
Support Management Services	C/CPFF	TMB : Washington, DC	0.000	0.000		0.000		0.040	Dec 2017	-		0.040	Continuing	Continuing	Continuing
Support Management Services	C/CPFF	Strategic Insight : Washington, DC	0.000	0.000		0.000		0.042	Dec 2017	-		0.042	Continuing	Continuing	Continuing
		Subtotal	0.000	0.000		0.656		0.754		-		0.754	-	-	-

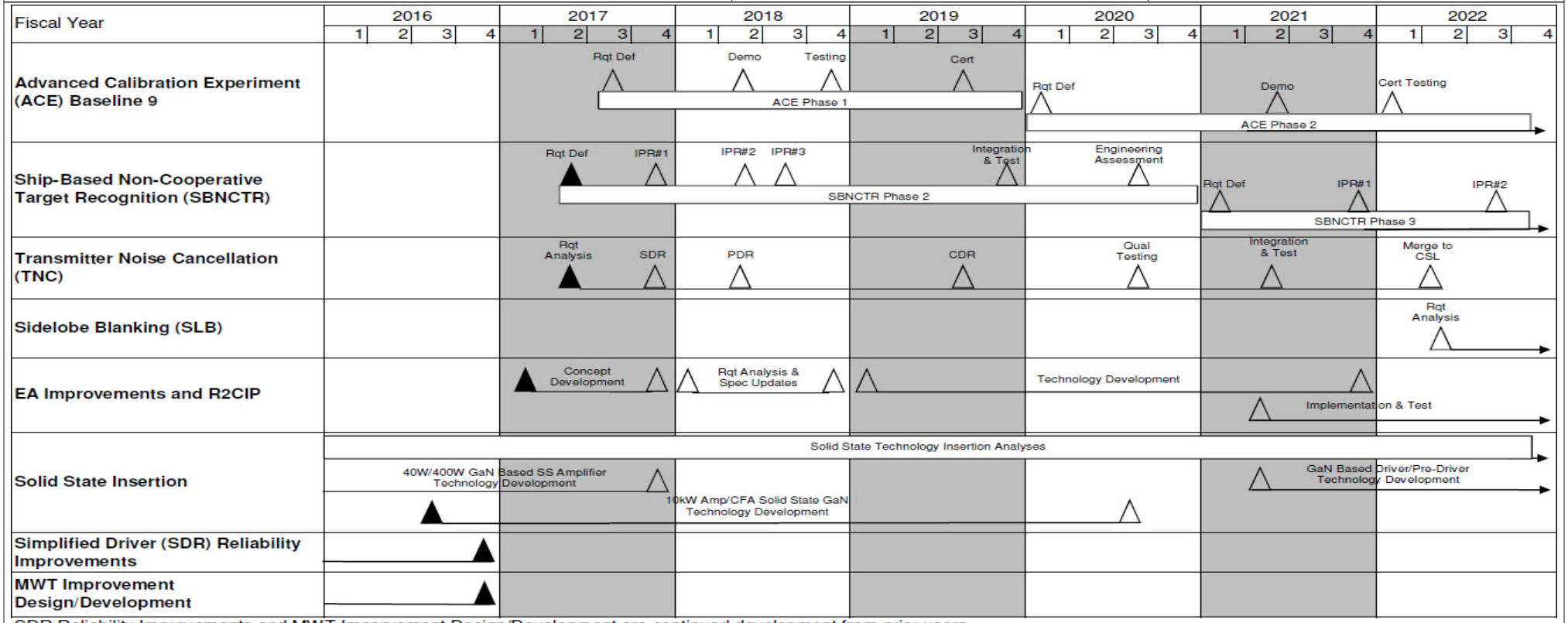
Remarks

TBD ESS: Engineering Support Services (ESS) recompete is in process. Contract award will occur in FY17.

	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	14.174	0.774		10.744		10.961		-		10.961	-	-	-

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 0604501N / *Advanced Above Water Sensors*	**Project (Number/Name)** 3301 / *Improved Capabilities SPY-1 Radar*



SDR Reliability Improvements and MWT Imporvement Design/Development are continued development from prior years.
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
GaN: Gallium Nitride
IPR: In-Progress Review
MWT: Microwave Tube
PDR: Preliminary Design Review
R2CIP: Rapid Radar Capability Improvement Program
SDR: System Design Review
SS: Solid State

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 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				
MWT Improvement Design/Development	1	2016	4	2016
Simplified Driver (SDR) Reliability Improvements	1	2016	4	2016
40W/400W GaN Based Solid State Amplifier Technology Development	1	2016	4	2017
Solid State Technology Insertion Analyses	1	2016	4	2022
10KW GaN Amplifier/CFA Solid State Technology Development	3	2016	3	2020
EA Improvements and R2CIP Concept Development	1	2017	4	2017
Ship-Based Non-Cooperative Target Recognition Phase 1 (SBNCTR) Rqts Definition	2	2017	2	2017
Transmitter Noise Cancelation (TNC) Requirements Analysis	2	2017	2	2017
Advanced Calibration Experiment (ACE) Phase 1 Requirements Definition	3	2017	3	2017
SBNCTR Phase 2 IPR #1	4	2017	4	2017
TNC System Design Review (SDR)	4	2017	4	2017
EA Improvements and R2CIP Rqt Analysis & Spec Updates	1	2018	4	2018
TNC PDR	2	2018	2	2018
ACE Phase 1 Demo	2	2018	2	2018
SBNCTR Phase 2 IPR #2	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
ACE Phase 1 Certification	3	2019	3	2019
TNC CDR	3	2019	3	2019
SBNCTR Phase 2 Integration & Test	4	2019	4	2019

Exhibit R-4A, RDT&E Schedule Details: FY 2018 Navy		Date: May 2017
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	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
ACE Phase 2 Requirements Definition	1	2020	1	2020
SBNCTR Phase 2 Engineering Assessment	3	2020	3	2020
TNC Qualification Testing	3	2020	3	2020
SBNCTR Phase 3 Requirements Definition	1	2021	1	2021
GaN based Driver/Pre-Driver Technology Development	2	2021	4	2022
ACE Phase 2 Demo	2	2021	2	2021
EA Improvements and R2CIP	2	2021	4	2022
TNC Integration & Test	2	2021	2	2021
SBNCTR Phase 3 IPR #1	4	2021	4	2021
ACE Phase 2 Certification Testing	1	2022	1	2022
SLB Requirements Analysis	2	2022	4	2022
TNC Merge to Common Source Library	2	2022	2	2022
SBNCTR Phase 3 IPR #2	3	2022	3	2022