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 0604777N *I Navigation/Id System*							
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	528.864	32.339	42.723	92.546	-	92.546	120.792	146.628	83.829	66.832	Continuing	Continuing
0253: *Nav & Electro-Optical Supt*	47.970	7.013	6.992	7.477	-	7.477	36.561	37.158	37.901	38.656	Continuing	Continuing
0676: *Improve ID Development*	34.588	7.261	4.914	2.477	-	2.477	2.470	2.399	2.449	2.499	Continuing	Continuing
0921: *NAVSTAR GPS Equipment*	265.201	16.774	26.965	80.044	-	80.044	79.713	105.125	41.489	23.648	Continuing	Continuing
1253: *Combat Ident System*	181.105	1.291	3.852	2.548	-	2.548	2.048	1.946	1.990	2.029	Continuing	Continuing

A. Mission Description and Budget Item Justification

Reliable and secure navigation and positive identification (ID) systems are essential elements of battle management in the naval environment. The Photonics Imaging System (0253) is a non-hull penetrating replacement for existing optical periscopes. The Photonics Imaging System exploits a wide portion of the electro-magnetic spectrum utilizing advanced Electro-Optic/thermal imaging, and communications intercept/Electronic Warfare Support (ES). The Integrated Submarine Imaging System (ISIS) (0253) is a back fit system to integrate all imaging capabilities on existing submarine classes. The Combat Identification System (CIS) project (1253) for Mark XIIA, and Improved Identification Development (0676) for AN/UPX-29(V), covers the Mark XIIA Mode 5 upgrade to the existing Mark XII family of systems that is Joint and North Atlantic Treaty Organization (NATO) interoperable. Per OSD direction, NATO participation is encouraged and performance data is exchanged to ensure the opportunity for interoperability with allied identification systems is maximized. In addition to distinguishing friend from foe for weapons employment, the Navy requires secure, jam resistant Identification Friend or Foe (IFF) systems for battle group air defense management and air traffic control. Identification is multifaceted and includes information received from several sensors (both cooperative and non-cooperative systems).

Navigation Satellite Timing & Ranging (NAVSTAR) Global Positioning System (GPS) project (0921) is a space-based Positioning, Navigation, and Timing (PNT) system that provides authorized users with secure, worldwide, all weather, three dimensional position, velocity, and precise time data. NAVSTAR GPS supports Anti-Access/ Area Denial (A2AD) by providing Assured PNT (A-PNT) capability to C4ISR and combat systems in standalone and networked architectures throughout air and maritime domains. This project is comprised of four distinct efforts: Air and Sea Navigation Warfare (NAVWAR), GPS-based PNT Service (GPNTS), and GPS Modernization. Research, Development, Testing and Evaluation (RDT&E) funds are used to perform all the non-recurring GPS Surface Ship, Submarine and Aircraft Development, Integration, and Testing efforts in support of NAVSTAR GPS.

The Air and Sea NAVWAR programs were established to provide continued access to GPS information in a denied or impeded electronic environment. Development efforts for both programs provide improvements to various platform type antennas and ensure compatibility with the new Military Code (M-Code) signal. The Air NAVWAR program continues integration efforts using GPS Antenna System (GAS-1), Advanced Digital Antenna Production (ADAP), and other anti-jam antennas on air platforms while investigating smaller anti-jam antennas for space constrained platforms and aircraft with unique requirements. The Sea NAVWAR program integrates Anti-Jam (AJ) antennas onto surface and subsurface platforms. Sea NAVWAR will continue to research the viability of smaller anti-jam antennas for space-constrained platforms and to support the Submarine Anti-Jam GPS Enhancement (SAGE) antenna development which integrates AJ capability into the submarine Multi-Function Mast (OE-538B) antenna system.

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 0604777N *I Navigation/Id System*

GPS Modernization addresses the Navy's future integration of the GPS Directorate Military GPS User Equipment (MGUE) products being developed by the Air Force that will enable the use of new GPS signals. This effort supports Navy compliance with Public Law 111-383 which mandates only M-Code capable receivers are to be procured after FY 2017. GPS Modernization consists of multiple parallel efforts that address the Navy's integration of multiple next generation GPS receivers that provide Naval air, surface, subsurface and weapon platforms improved access to GPS signals in challenged and jamming environments. Modernized GPS receivers will utilize the new M-Code GPS Signal in Space, incorporate enhanced cryptology, deliver greater position and time accuracy, and provide improved protection against signal spoofing. Additionally, GPS Modernization delivers increased GPS anti-jam protection and enables blue force GPS electronic attack.

The GPNTS system is being developed to replace stand-alone AN/WRN-6 receivers, integrated Navigation Sensor System Interface (NAVSSI) systems, and integrated commercial-off-the-shelf GPS systems. Additionally, future capability will migrate toward a Common Computing Environment (CCE) such as Consolidated Afloat Networks Enterprise Services (CANES), and provide a path for the integration of advanced navigation systems and sensors.
JUSTIFICATION FOR BUDGET ACTIVITY: This program is funded under Engineering and Manufacturing Development because it includes those projects that have passed Milestone B approval and are conducting engineering and manufacturing development tasks aimed at meeting validated requirement prior to full-rate production decision.

B. Program Change Summary ($ in Millions)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Previous President's Budget	32.456	42.723	70.724	-	70.724
Current President's Budget	32.339	42.723	92.546	-	92.546
Total Adjustments	-0.117	0.000	21.822	-	21.822
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	0.716	0.000			
• SBIR/STTR Transfer	-0.833	0.000			
• Program Adjustments	0.000	0.000	21.539	-	21.539
• Rate/Misc Adjustments	0.000	0.000	0.283	-	0.283

Change Summary Explanation

Technical:
The increase to Air Navigation Warfare (NAVWAR) in FY 2018 is to integrate anti-jam antennas into select aviation platforms in order to provide assured positioning, navigation and timing (PNT) in a Global Positioning System (GPS) jamming environment and for development and integration of miniaturized NAVWAR antennas in AH-1Z, UH-1Y, MQ-4C and MQ-8B/C.
The increase to GPS-based Positioning, Navigation, and Timing (PNT) Service (GPNTS) in FY 2018 is for development of the Pre-planned Product Improvement (P3I) technology insertion and a configuration modification for smaller platforms.

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 0604777N *I Navigation/Id System*

The increase to GPS Modernization in FY 2018 is to integrate Military Global Positioning System User Equipment (MGUE) into select aviation platforms in order to provide assured positioning, navigation and timing (PNT) in a GPS degraded environment and funds MGUE integration into the following platforms: E-6B, MV-22B, CMV-22B, CH-53K and KC-130J.

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 0604777N / *Navigation/Id System*	Project (Number/Name) 0253 / *Nav & Electro-Optical Supt*	

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
0253: *Nav & Electro-Optical Supt*	47.970	7.013	6.992	7.477	-	7.477	36.561	37.158	37.901	38.656	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The navigation and electro-optical (E-O) support program develops submarine E-O and imagery systems and equipment that will improve submarine imaging capability in the areas of: ship safety, Intelligence, Surveillance and Reconnaissance (ISR), and tactical control (contact management in the littorals). The Department of the Navy established the Integrated Submarine Imaging System (ISIS) to rapidly field the Type 18 periscope, Periscope Acquisition, Tracking, and Ranging with Improved Observation Techniques (PATRIOT) rangefinder, Type 8 Mod 4 Infra-Red (IR) periscope systems, and integrate existing periscope imagery systems into a single imaging system for installation on board SSN 688 class and SEAWOLF class submarines. The ISIS baseline also includes the Imaging System with the Photonics Mast (PM) and all configurations of Low Profile Photonics Mast (LPPM) onboard VIRGINIA and Photonics Mast Variant (PMV) onboard SSGN class submarines. The PM, LPPM, and PMV design exploit a wide portion of the electro-magnetic spectrum through advanced E-O and thermal imaging and Electronic Warfare Support (ES)/ communications intercept. The Common Submarine Imaging System (CSIS) capability development document (CDD), that covers both ISIS and Legacy Imaging systems was approved 22 Dec, 2011. The CDD is used to fully integrate the ISIS program of record into the submarines force rapid Technical Insertion/Advanced Processor Build (TI/APB) process and to incorporate Fleet-endorsed requirements such as the LPPM. Future mast development includes the Task-Oriented Technology Insertion Mast (TOTIM), which will provide 360 degree, non-rotating modular mast with vastly increased capability, reduced maintenance costs and increased development flexibility for new mast sensors.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Title: ISIS and Photonics common software and hardware capabilities development and obsolescence.	3.053	6.324	5.794	0.000	5.794
Articles:	-	-	-	-	-
FY 2016 Accomplishments: ISIS Technical Insertion (TI) development for LOS ANGELES, SEAWOLF, and VIRGINIA classes. TI and Advanced Processor Build (APB) productionization efforts include incorporation of significant capability increases over previous TIs including Image Fusion, Auto-detection and Image Tracker Algorithms. FY 2016 efforts also include improvements to system software reliability for increased ISIS Operational Availability (Ao).					
FY 2017 Plans: ISIS Technical Insertion (TI) development for LOS ANGELES, SEAWOLF, VIRGINIA, and SSGN classes. TI and Advanced Processor Build (APB) productionization efforts include incorporation of significant capability increases over previous TIs including Automatic Classification and De-interlacing as well as integration of unique LPPM capabilities. FY 2017 efforts include continued improvements to system and software reliability					

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 0604777N / *Navigation/Id System*	**Project (Number/Name)** 0253 / *Nav & Electro-Optical Supt*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
and increased ISIS Operational Availability (Ao)and LPPM development efforts to address backlog of candidate capabilities to incorporate into ISIS. ***FY 2018 Base Plans:*** ISIS Technical Insertion (TI) development for LOS ANGELES, SEAWOLF, VIRGINIA, and SSGN classes. TI and Advanced Processor Build (APB) productionization efforts include incorporation of significant capability increases over previous TIs including Automatic Target Recognition, Auto Navigation Fix and Augmented Reality for Navigation as well as integration of unique LPPM capabilities. FY 2018 efforts include continued improvements to system and software reliability, modifications required to the ISIS TI-20 baseline integrated with TOTIM (inboard architecture, data storage, display and processing capabilities development) and increased ISIS Operational Availability (Ao). ***FY 2018 OCO Plans:*** N/A					
Title: Imaging Systems Test Efforts. ***Articles:*** ***FY 2016 Accomplishments:*** Cyber Security Operational Testing ***FY 2017 Plans:*** Technical Insertion Build 14 / APB 13 ITRR - Advanced Processor Build 13 Interim Test Readiness Review covering trainer test procedures, Requirements Traceability Verification Matrix (RTVM) to verify specification requirements, Recorded Reliability & Maintainability data, and other requirements covered in the TRR. ***FY 2018 Base Plans:*** Technical Insertion Build 14 / APB 13 VA OT - Advanced Processor Build 13 Virginia Class Operational Testing covering capability increases to previous algorithm builds including 360 Degree Image Stitching, LACE Night Modification (VA Class Only)and Super Position. ***FY 2018 OCO Plans:*** N/A	0.598 -	0.668 -	0.681 -	0.000 -	0.681 -
Title: Task-Oriented Technology Insertion Mast (TOTIM) ***Articles:*** ***FY 2016 Accomplishments:***	0.000 -	0.000 -	1.002 -	0.000 -	1.002 -

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 0604777N / *Navigation/Id System*	**Project (Number/Name)** 0253 / *Nav & Electro-Optical Supt*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
N/A ***FY 2017 Plans:*** N/A ***FY 2018 Base Plans:*** Develop Task Oriented Tech Insertion Mast (TOTIM), and mission modules. Specific efforts include: development of TOTIM and common interface between mast modules. ***FY 2018 OCO Plans:*** N/A					
Title: Low Profile Photonics Mast	3.362	0.000	0.000	0.000	0.000
Articles:	-	-	-	-	-
FY 2016 Accomplishments: Complete LPPM Production Baseline Design ***FY 2017 Plans:*** N/A ***FY 2018 Base Plans:*** N/A ***FY 2018 OCO Plans:*** N/A					
Accomplishments/Planned Programs Subtotals	7.013	6.992	7.477	0.000	7.477

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/201300: *Photonics Mast*	38.774	38.909	39.648	-	39.648	40.442	41.251	21.038	42.918	Continuing	Continuing
• OPN/0831: *Sub Periscopes & Imaging Equip.*	63.109	0.000	0.029	-	0.029	0.024	0.027	0.028	0.029	0.000	686.724
• RDT&E/0604558N: *VIRGINIA Class Design Development*	3.000	3.000	3.000	-	3.000	3.000	3.000	3.000	3.000	Continuing	Continuing

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 0604777N / *Navigation/Id System*	**Project (Number/Name)** 0253 / *Nav & Electro-Optical Supt*

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
• RDT&E/0603562N: *Advanced Submarine Support Equipment (ASSEP)*	4.103	4.429	4.143	-	4.143	4.403	4.725	4.828	4.925	Continuing	Continuing
• OPN/0840: *Sub Periscope, Imaging Equip. and Supt Equip Program*	0.000	154.421	135.798	-	135.798	191.424	243.032	228.266	219.971	Continuing	Continuing

Remarks

D. Acquisition Strategy

The Acquisition Strategy for AN/BVY-1 Integrated Submarine Imaging System (ISIS) is dated 07 Jul 2003. The Aquisition Program Baseline Agreement for ISIS Advanced Processor Builds 11, 13 and 15 is dated 07 Mar 2013. The Single Acquisition Management Plan (SAMP) for the LPPM is dated 01 Jul, 2013. The ISIS will provide mission critical, all weather, visual, and electronic search, digital image management, indication, warning, and platform architecture interface capabilities for SSN 688, SSN 21, SSN 774 and SSGN class submarines. The Single Acquisition Management Plan (SAMP) for the TOTIM approval is planned in 3rd quarter FY17.

E. Performance Metrics

Successful application of system engineering processes. Design and development of improvements. The Rapid Development and Deployment (RDD) program goal is to respond to urgent operational needs within 30 days and provide for rapid development and fielding of prototype solutions within 270 days.

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy											Date: May 2017	
Appropriation/Budget Activity 1319 / 5					R-1 Program Element (Number/Name) PE 0604777N / *Navigation/Id System*				Project (Number/Name) 0676 / *Improve ID Development*			
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**
0676: *Improve ID Development*	34.588	7.261	4.914	2.477	-	2.477	2.470	2.399	2.449	2.499	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Reliable and secure navigation and positive identification (ID) systems are essential elements of battle management in the naval environment. In addition to providing platform identification for weapons employment, the Navy requires secure, jam resistant Identification Friend or Foe (IFF) systems for battle group air defense management and Air Traffic Control. The Improved ID Development project addresses the Mark XIIA Mode 5 and Mode S upgrades to the existing AN/UPX-29(V) Mark XII family of systems that is Joint and North Atlantic Treaty Organization interoperable. The AN/UPX-29(V) Interrogator System is comprised of the Interrogator Set AN/UPX-24(V), OE-120()/UPX Antenna Group, and Mark XII or Mark XIIA equipment such as AN/UPX-37, AN/UPX-41(C) or AN/UPX-45(C) Digital Interrogators and associated equipment. Additionally, the Improved ID Development project may include product improvements designed to be installed through upgrade and deficiency correction studies, which in turn become engineering changes to other IFF solutions.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	**FY 2016**	**FY 2017**	**FY 2018 Base**	**FY 2018 OCO**	**FY 2018 Total**
Title: AN/UPX-29 (V) - OE-120()/UPX Antenna Tech Refresh	7.261	4.602	1.720	0.000	1.720
Articles:	-	-	1	-	1
Description: Engineering and integration development for antenna group OE-120()/UPX antenna tech refresh. Develop design studies and Analysis of Alternatives, draft specifications, and perform system development and integration efforts and support mission requirements, to include engineering investigations and Engineering Change Proposal (ECP) development to support mission readiness for IFF systems.					
FY 2016 Accomplishments: Completed design trade studies, and preliminary design review. Identified and ordered long lead items. Initiated detailed design. Initiated test equipment design and update. Initiated Integration and Test (I&T) qualification plan. Scheduled range tests for Phase Shifter and Power Divider assemblies. Scheduled Critical Design Review.					
FY 2017 Plans: Complete software coding and development testing. Complete procurement of non-long lead items. Complete test equipment design and update. Complete Integration and Test (I&T) qualification plan. Build and conduct unit level I&T activities on OE-120()/UPX Tech Refresh Engineering and Development Model. Initiate system level Integration and Test and qualification testing activities. Conduct Test Readiness Review.					
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 0604777N / *Navigation/Id System*	**Project (Number/Name)** 0676 / *Improve ID Development*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Complete development of OE-120()/UPX retrofit kit. Complete qualification testing. Complete and deliver the Engineering Development Model (EDM). ***FY 2018 OCO Plans:*** N/A					
Title: Mark XIIA Mode 5 and Mode S Improvement for AN/UPX-29(V) ***Articles:*** ***Description:*** Engineering, development, and integration of improvements to Mark XIIA Shipboard Identification Friend or Foe (IFF) Systems, including, but not limited to the AN/UPX-29(V) Interrogator System, which is comprised of the Interrogator Set AN/UPX-24, OE-120()/UPX Antenna Group, and Mark XII or Mark XIIA equipment such as AN/UPX-37, AN/UPX-41 or AN/UPX-45 Digital Interrogators. Funds development and integration of Mark XIIA Mode 5 and Mode Select (S) Improvements to the AN/UPX-29(V) systems on CG47, DDG51, LHD1, LPD17, LHA6, and CVN68, CVN78, and future ship classes. Correct software and performance deficiencies from Integrated Test and Operational Test, Aegis, and other Combat System Integration events to support Combat System integration with Aegis Weapon Systems (AWS), Ship Self Defense System (SSDS), Advanced Combat Direction System (ACDS), or Air Traffic Control Systems using Mark XIIA equipment to include engineering investigations, Engineering Change Proposal development, and testing. Provides core Integrated Logistics Support documentation; formalizes hardware/software configuration: finalizes technical/ design data, resolves testing anomalies, and integrates with shipboard training systems. ***FY 2016 Accomplishments:*** N/A ***FY 2017 Plans:*** N/A ***FY 2018 Base Plans:*** Conduct AN/UPX-29(V) Interrogator System integration testing with Mode 5/Mode S capable AN/UPX-45 Digital Interrogator in preparation for deployment to Aegis and Ship Self Defense System (SSDS) platforms. Support logistics and technical data management for the OE-120()/UPX Antenna Group retrofit kit development, qualification test, and Engineering Development Model (EDM) delivery. ***FY 2018 OCO Plans:*** N/A	0.000 -	0.000 -	0.334 -	0.000 -	0.334 -
Title: AN/UPX-29(V) Management Support	0.000	0.312	0.423	0.000	0.423

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 0604777N / *Navigation/Id System*	**Project (Number/Name)** 0676 / *Improve ID Development*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Articles:	-	-	-	-	-
Description: Engineering and Program Management of the AN/UPX 29 (V). Perform system integration efforts. ***FY 2016 Accomplishments:*** Supported Systems Engineering Technical Reviews for OE-120/UPX according to the tech refresh ECP schedule. Completed events including the Preliminary and Critical Design Reviews (PDR/CDR). ***FY 2017 Plans:*** Support Systems Engineering Technical Reviews for OE-120/UPX according to the tech refresh ECP schedule. Monitor progress from CDR to EDM delivery in preparation for production line updates. ***FY 2018 Base Plans:*** Support logistics and technical data management for the AN/UPX 29 (V) Mode 5/Mode S integration and OE-120/UPX retrofit kit development, qualification test, and Engineering Development Model (EDM) delivery. ***FY 2018 OCO Plans:*** N/A					
Accomplishments/Planned Programs Subtotals	7.261	4.914	2.477	0.000	2.477

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/2851: *ID Systems*	29.676	22.177	21.226	-	21.226	26.792	26.707	26.022	26.539	274.506	721.344

Remarks

D. Acquisition Strategy

The acquisition strategy is to develop Mode 5 Engineering Change Proposals for modern Mark XII Identification Friend or Foe (IFF) equipment and integrate into all Navy Combat Weapons systems platforms and augment the Navy's Cooperative Identification Capability to include Mode 5.

E. Performance Metrics

Achieve Full Rate Production Decision and Initial Operational Capability.

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 0604777N / *Navigation/Id System*				Project (Number/Name) 0921 / *NAVSTAR GPS Equipment*			
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**
0921: *NAVSTAR GPS Equipment*	265.201	16.774	26.965	80.044	-	80.044	79.713	105.125	41.489	23.648	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Navigation Satellite Timing & Ranging (NAVSTAR) Global Positioning System (GPS) project (0921) is a space-based Positioning, Navigation, and Timing (PNT) system that provides authorized users with secure, worldwide, all weather, three dimensional position, velocity, and precise time data. This project is comprised of four distinct efforts: Air and Sea Navigation Warfare (NAVWAR), GPS-based PNT Service (GPNTS), and GPS Modernization. Research, Development, Testing and Evaluation (RDT&E) funds are used to perform all the non- recurring GPS Surface Ship, Submarine and Aircraft Development, Integration, and Testing efforts in support of NAVSTAR GPS.

The Air and Sea NAVWAR programs were established to provide continued access to GPS information in a denied or impeded electronic environment. Development efforts for both programs provide improvements to various platform type antennas and ensure compatibility with the new Military Code (M-Code) signal. The Air NAVWAR program continues integration efforts using GPS Antenna System (GAS-1), Advanced Digital Antenna Production (ADAP), and other anti-jam antennas on air platforms while investigating smaller anti-jam antennas for space constrained platforms and aircraft with unique requirements. The Sea NAVWAR program integrates Anti-Jam (AJ) antennas onto surface and subsurface platforms. The Sea NAVWAR program will continue to research the viability and development of smaller anti-jam antennas for space-constrained platforms. The program continues to support the Submarine Anti-Jam GPS Enhancement (SAGE) antenna development which integrates AJ capability into the submarine Multi-Function Mast (OE-538B) antenna system.

The GPNTS system is being developed to serve as the primary PNT system for the Navy to ensure reliable PNT capability and interoperability insertion into GPS receivers and associated Command, Control, Computers, Communications and Intelligence (C4I), and Combat Systems in a denied environment. GPNTS provides precise PNT data required for combat, weapons, command, control, communications, navigation, and other systems, as well as providing the time synchronization critical to the network environments. GPNTS will back fit current PNT/GPS systems as well as serve as a forward fit for new platforms. GPNTS will host the GPS Directorate-developed Military GPS User Equipment (MGUE) card, allowing access to the new GPS M-Code signal. GPNTS will provide more robust and secure GPS/PNT capabilities than is currently in the Fleet. The system will provide the capability to migrate non-real time GPS data toward a Common Computing Environment (CCE), such as Consolidated Afloat Networks Enterprise Services (CANES), and provide a path for the integration of advanced navigation systems and sensors. GPNTS supports Anti-Access/Area of Denial (A2AD) by providing Assured PNT (A-PNT) capability to C4ISR and Combat Systems in standalone and networked architectures throughout maritime domains.

GPS continues to be integrated in all DoD platforms and the development of enhanced and protected GPS is a national security priority. GPS Modernization executes the Navy's integration of Military GPS User Equipment (MGUE) being developed by the Air Force GPS Directorate. This effort provides Navy platforms improved access to GPS signals in challenged and jamming environments. Because of the number and diversity of all of the Navy's air, surface, subsurface, and weapons platforms, this project will consist of multiple parallel efforts across many program offices with central coordination and management of funding and priorities by GPS Modernization. Modernized GPS receivers will utilize the new M-Code GPS Signal in Space, incorporate enhanced cryptology, deliver greater position and time accuracy, and provide

improved protection against signal spoofing as compared to legacy receivers. Additionally, GPS Modernization delivers increased GPS AJ protection and enables blue force GPS electronic attack. This effort supports Navy compliance with Public Law 111-383 which prohibits spending funds on non-M-Code GPS user equipment after FY 2017. Initial NAVSTAR GPS Modernization efforts were funded by the Air Force in FY2015 and FY2016 as a joint effort with the Air Force GPS Directorate--the Department of Defense office for developing military user equipment.

FY18 funds provide for Air NAVWAR to ramp up integration efforts and flight testing of anti-jam protection on Unmanned Aircraft Systems (UAS) platforms, for integration of anti-jam antennas into select aviation platforms in order to provide A-PNT in a GPS jamming environment, and for development and integration efforts of miniaturized NAVWAR antennas in AH-1Z, UH-1Y, MQ-4C and MQ-8B/C. Sea NAVWAR funds provide for completion of development and integration of SAGE into the submarine OE-538B antenna system mast, initial government testing of the mast, and research for the development of smaller anti-jam antennas for Size, Weight, and Power (SWaP) restricted platforms.

In FY18, GPNTS will ramp up efforts in preparation for Initial Operational Test and Evaluation (IOT&E) to include: coordination with Commander, Operational Test and Evaluation Force (COMOPTEVFOR) and the Joint Interoperability Test Command (JITC) for Combat Systems Certification, Technical Evaluation, and Navigation Certification; prepare pre-test plans, procedures and documentation; complete an Operational Test Readiness Review; and prepare the test platforms. An increase in funds provides for the development of the Pre-planned Product Improvement (P3I) technology insertion for software enhancements for Assured-Positioning, Navigation, and Timing (A-PNT) sensor suite integration and for the design, development, build, integration, and test of a single rack solution for smaller surface combatant platforms.

FY18 growth in GPS Modernization funding requirements is due to award of prime vendor GPS integration contracts and procurement of production ready unit (PRU) modernized Military Code (M-Code) capable GPS receiver test articles for the platform integration and test activities of 3 platforms: FA-18E/F, EA-18G, and E-2D, as well as the expansion of GPS Modernization efforts to include the start of government systems engineering and contracting efforts for 5 additional platforms: MV-22, CMV-22, E-6B, CH-53K, and KC-130. Each platform has a unique configuration, which requires separate parallel efforts to integrate and test the modernized GPS receiver into each platform, individual prime vendor contracts, and coordination with each PMA to include management, oversight and support of the effort.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Title: Air Navigation Warfare (NAVWAR)	2.624	2.208	13.237	0.000	13.237
Articles:	-	-	-	-	-
Description: Air Navigation Warfare (NAVWAR) provides the Warfighter continued access to GPS through the use of anti-jam (AJ) Antenna Systems designed to counter GPS Electronic Warfare threats due to intentional and unintentional interference. Air NAVWAR efforts include investigation and testing of emerging technologies to improve anti-jam capability and technologies such as development of miniaturized very small antenna systems to allow for the capability on small variant aircraft. Efforts will also include development to ensure antennas can accept the new Military Code (M-Code) signal.					
FY 2016 Accomplishments:					

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 to work to mature small form factor Anti-Jam (AJ) antenna solutions for Unmanned Aerial Systems (UAS) platforms and AH-1Z/UH-1Y helicopters to counter emerging GPS Electronic Warfare threats. Conducted demonstrations of small AJ antenna variants on multiple platforms. Assisted E-2D platform with integration of AJ capable antennas in conjunction with a refueling probe upgrade. Continued to lead Aviation Assured Position, Navigation and Timing (A-PNT) efforts, to include the Analysis of Alternatives (AoA) by working with Navy Air platforms on defining navigation antenna requirements to ensure reliable A-PNT capability and associated C4I and combat systems in a GPS degraded environment. Continued to support accelerated AJ antenna efforts with H-1 helicopters including a Foreign Comparative Test (FCT) effort. Coordinated H-1/UAS vulnerability testing. Continued to assist the Fleet with GPS Enterprise Selective Availability Anti-Spoofing Module (SAASM) and Architecture Evolution Plan (AEP) developments, providing subject matter expertise to NAVAIR platforms for SAASM integration and monitor future GPS Directorate SAASM upgrades. Participated in joint NAVWAR Memorandum of Understanding (MOU) initiatives and foreign cooperative testing with Canada, United Kingdom and Australia to meet OSD initiatives.					
FY 2017 Plans: Continue to assist air platforms with integration of Anti-Jam (AJ) capable antennas, to include E-2D, AH-1Z/ UH-1Y helicopters, and Unmanned Aircraft Systems (UAS), such as MQ-8B and MQ-8C Fire Scout. Conduct integration and testing of small form factor AJ antenna solution for UAS. Complete Foreign Comparative Test for H-1 platforms to qualify Raytheon Limited Systems Landshield antenna as an alternative for integration onto H-1 helicopter platforms. Continue efforts to assist E-2D platforms with AJ antenna capabilities in conjunction with a refueling probe upgrade. Continue to lead Aviation Assured Position, Navigation and Timing (A-PNT) efforts by working with Navy Air platforms on navigation requirements and coordinating with surface Navy platforms to leverage synergies. Continue efforts to support A-PNT Capability Development Document (CDD) development, including					

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
development of Navy unique Key Performance Parameters (KPP) and requirements, to ensure reliable A-PNT capability and interoperability in a GPS denied environment. Continue to assist the Fleet with GPS Enterprise Selective Availability Anti-Spoofing Module (SAASM) and Architecture Evolution Plan (AEP) developments, providing subject matter expertise to NAVAIR platforms for SAASM integration and monitor future GPS Directorate SAASM upgrades. Continue to participate in joint NAVWAR Memorandum of Understanding (MOU) initiatives with Canada, United Kingdom and Australia to meet OSD initiatives.					
FY 2018 Base Plans: The $11M increase in funding is to integrate Anti-Jam (AJ) antennas into select aviation platforms and to fund development and integration of miniaturized NAVWAR antennas in AH-1Z, UH-1Y, MQ-4C and MQ-8B/C air platforms. Efforts require ramp up of systems engineering to include integration studies; Non-Recurring Engineering for platform interface modifications; GPS antenna test articles; integration testing; test plan development and updates; test support, analysis and reporting; and increased engineering support staff. Efforts will commence to determine air platform specific requirements and determine if existing solutions are available or a new solution needs to be developed. Initiate developmental test effort for common solution for H-1 helicopter variants to include the AH-1Z and UH-1Y. Start integration of solution on platform with MIL-STD-704 Power test, MIL-STD-810 Environmental test, MIL-STD-461 Weapons Replaceable Assembly (WRA) Box-Level Electromagnetic Interference (EMI) Test, and MIL-STD-464 System-Level EMI Tests. Continue integration effort for AJ capability, initiate wiring software, and upgrade main operation software to incorporate Mixed-Mode functionality for MQ-4C and MQ-8B/C Fire Scout platforms. Design antenna solution. Conduct testing of GPS receivers with associated antennas at Facilities for Antenna and Radar Cross Section (RCS) Measurements (FARM). Continue to assist other air platforms with integration of AJ capable antennas to include Unmanned Aircraft Systems (UAS) and E-2D. Conduct testing of small form factor AJ solution. Continue Navigation Warfare (NAVWAR) demonstrations for unmanned platforms, work on miniaturized NAVWAR anti-jam antenna solutions, and assist new unmanned vehicles with navigation issues.					

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
Continue efforts to assist with coordination of E-2D platforms with AJ capable antennas in conjunction with a refueling probe upgrade. Continue to lead Aviation A-PNT efforts by working with Navy Air platforms on navigation requirements and coordinating with surface Navy platforms to leverage synergies. Continue efforts to support Capabilities Development Document (CDD) development, including development of Navy unique Key Performance Parameters (KPPs) and requirements, in order to ensure reliable A-PNT capability and interoperability in a GPS denied environment. Continue to assist the Fleet with GPS Enterprise Selective Availability Anti-Spoofing Module (SAASM) and Architecture Evolution Plan (AEP) developments, providing subject matter expertise to NAVAIR platforms for SAASM integration and monitor future GPS Directorate SAASM upgrades. Continue to participate in joint NAVWAR Memorandum of Understanding (MOU) initiatives with Canada, United Kingdom and Australia to meet OSD initiatives. ***FY 2018 OCO Plans:*** N/A.					
Title: Sea Navigation Warfare (NAVWAR) ***Articles:*** ***Description:*** Sea Navigation Warfare (NAVWAR) provides the Warfighter continued access to GPS through the use of anti-jam (AJ) Antenna Systems designed to counter GPS Electronic Warfare threats due to intentional and unintentional interference on surface and subsurface platforms through the continued development of anti-jam antennas. The program is continuing the Submarine Anti-Jam GPS Enhancement (SAGE) antenna development, which integrates AJ capability into the submarine Multi-Function Mast (OE-538B). Sea NAVWAR will continue to research the viability and development of smaller AJ antennas for platforms with Size, Weight and Power (SWaP) restrictions and ensure compatibility with the Military Code (M-Code) signal. ***FY 2016 Accomplishments:*** Provided government oversight, system engineering, logistics, contracts, and programmatic management efforts for the Submarine Anti-Jam (AJ) GPS Enhancement (SAGE) and integration into the submarine Multi-Function Mast (OE-538B) antenna system development.	4.792 -	7.659 -	6.109 -	0.000 -	6.109 -

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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
Initiated process for design changes required to integrate SAGE and Military Code (M-Code) into the OE-538B antenna system production representative article (PRA). Efforts include: - Completed benchtop testing with thermal loads inside antenna. - Completed changes to the application programming interface and testing of the packet radio control software. - Completed initial radio frequency (RF) characterizations and system functionality testing of the SAGE antenna electronics boards. Continued efforts to support the Preliminary Design Review (PDR), Critical Design Review (CDR), and Test Readiness Review (TRR) for the OE-538B Production Ready Article (PRA). Completed preliminary assessment of design changes to the Radio Frequencies Distribution and Control System (RFDACS), the interface between SAGE and the OE-583B antenna system. Completed update of the Sea NAVWAR Program Life Cycle Cost Estimate (PLCCE). Initiated studies for smaller AJ antennas to meet requirements for Size, Weight, and Power (SWaP) restricted platforms. Continued to participate in joint NAVWAR Memorandum of Understanding (MOU) initiatives with Canada, United Kingdom and Australia to meet OSD initiatives, to include cooperative developmental and environmental testing with Canada, United Kingdom and Australia.					
FY 2017 Plans: Provide government oversight, system engineering, logistics, contracts, and programmatic management efforts for the Submarine Anti-Jam (AJ) GPS Enhancement (SAGE) and integration into the submarine Multi-Function Mast (OE-538B) antenna system development. Complete the Preliminary Design Review (PDR), Critical Design Review (CDR), and finalize design and integration of SAGE production representative article (PRA) into the OE-538B antenna system. Commence efforts in preparation for the OE-538B Mast Functional Configuration Audit (FCA). Commence development process and actions for Radio Frequencies Distribution and Control System (RFDACS) design changes required to implement the interface of GPS AJ into the OE-538B antenna assembly.					

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
Commence Engineering Change (EC) process for implementation of the OE-538B antenna system on all submarine classes. Commence efforts in preparation for delivery, developmental testing, and first article qualification testing (FAQT) of the OE-538B antenna system PRA. Complete update of Sea NAVWAR Cost Analysis Requirements Description (CARD). Continue studies and begin analysis on smaller Anti-Jam antennas to meet requirements for Size, Weight, and Power (SWaP) restricted platforms. Continue to participate in joint NAVWAR Memorandum of Understanding (MOU) initiatives with Canada, United Kingdom and Australia to meet OSD initiatives.					
FY 2018 Base Plans: Continue to provide government oversight, system engineering, logistics, contracts, and programmatic management efforts for the Submarine Anti-Jam GPS Enhancement (SAGE) and integration into the submarine Multi-Function Mast (OE-538B) antenna system development. Complete Test Readiness Review (TRR) and commence OE-538B PRA factory acceptance testing. Complete OE-538B production representative article (PRA) factory acceptance testing and conduct Functional Configuration Audit (FCA). Complete Radio Frequencies Distribution and Control System (RFDACS) development and integration with OE-538B antenna system production representative article (PRA). Accept delivery of OE-538B PRA and conduct Government Acceptance Test. Conduct OE-538B PRA laboratory developmental testing with RFDACS. Commence the following First Article Qualification Testing of SAGE and OE-538B antenna system: - Radio Frequency (RF) Characterization - Structure Borne Noise (SBN) - Electromagnetic Interference (EMI)					

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
- Vibration - Electromagnetic Pulse (EMP)/High Altitude Electromagnetic Pulse (HEMP) - Thermal - Electromagnetic Environmental Effects (E3) Commence efforts for the OE-538B Physical Configuration Audit and development of OE-538B Technical Manual, I-Level Factory Training, and Factory Maintenance Demonstration. Commence preparation for Underwater Explosion (UNDEX) testing of SAGE and OE-583B antenna system. Complete Engineering Change (EC) process for implementation of the OE-538B antenna system on all submarine classes. Commence preparation for OE-538B Developmental Testing/Operational Testing (DT/OT) on operational submarine classes. Continue studies and begin analysis on smaller Anti-Jam antennas to meet requirements for Size, Weight, and Power (SWaP) restricted platforms. Continue to participate in joint NAVWAR Memorandum of Understanding (MOU) initiatives with Canada, United Kingdom and Australia to meet OSD initiatives. ***FY 2018 OCO Plans:*** N/A.					
Title: Global Positioning System (GPS) - Based Positioning, Navigation and Timing (PNT) Service (GPNTS) ***Articles:***	9.358 -	6.007 -	17.689 -	0.000 -	17.689 -
Description: GPNTS is the Navy's next generation Positioning, Navigation, and Timing (PNT) system. GPNTS will provide more robust and secure GPS/PNT capabilities than is currently in the Fleet. GPNTS will replace Navigation Sensor System Interface (NAVSSI) and WRN-6 systems on surface ships. The system contains Selective Availability Anti-spoofing Security Module (SAASM) GPS security architecture with a planned migration to GPS Military Code (M-Code). ***FY 2016 Accomplishments:***					

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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
Conducted Final Acceptance of GPNTS Engineering Development Models (EDM) 1 and 2 and received EDM 2 at government laboratory facilities. Continued preparation efforts in support of Government Developmental Testing (DT) and Operational Assessment (OA) to include: - Trained staff, prepared laboratory, developed test plans - Prepared EDMs for transport and delivery to OA test facility, Wallops Island, Virginia Continued development of installation documentation including updating Installation Requirements Drawings (IRD), Testing configurations, Ship Change Documents (SCDs), Ship Installation Drawings (SIDs), Enterprise Change Requests (ECRs), and Engineering Change Orders (ECOs). Commenced Functional and Performance Independent Verification and Validation (IV&V) testing and Positioning, Navigation, and Timing (PNT) Performance testing efforts on GPNTS EDMs. Continued efforts to coordinate OA testing with Commander, Operational Test and Evaluation Force (COMOPTEVFOR) and Mission Readiness Assessment testing. Initiated efforts for Environmental Qualification Testing (EQT) and Aegis integration. Provided support efforts to obtain required Cybersecurity documentation in order to conduct Cybersecurity testing and evaluation events. Continued the development and update of statutory and regulatory acquisition documentation in support of a Milestone C decision including: Test and Evaluation Master Plan (TEMP), Capability Production Document (CPD), Clinger Cohen Act (CCA) documentation, and the GPNTS Acquisition Strategy (AS). Initiated the Independent Logistics Assessment (ILA) documentation in support of a Milestone C decision					
FY 2017 Plans: Complete Functional and Performance Independent Verification and Validation (IV&V) Testing on the GPNTS Engineering Development Models (EDMs). Conduct GPNTS Operational Assessment (OA) at Wallops Island, Virginia Test Facility. Resolve software defects discovered during OA.					

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
Commence formal Environmental Qualification Testing (EQT) on the GPNTS EDM. Commence preparations to support Initial Operational Test and Evaluation (IOT&E) activities which include Navigation Certification, Technical Evaluation, and Combat Systems Certification test plans, test procedures, and coordination with Naval Testing Agencies, Commander, Operational Test and Evaluation Force (COMOPTEVFOR) and the Joint Interoperability Test Command (JITC). Complete development of GPNTS installation documentation based on finalized configurations, such as Installation Requirements Drawings (IRD), Ship Change Documents (SCD), Engineering Change Orders (ECOs) and Enterprise Change Requests (ECR) in support of IOT&E activities. Complete all statutory and regulatory acquisition documentation including the GPNTS Test and Evaluation Master Plan (TEMP), Capability Production Document (CPD), Clinger Cohen Act (CCA), and the GPNTS Acquisition Strategy (AS) in support of a Milestone C decision. Complete the Independent Logistics Assessment (ILA) in support of a Milestone C decision. Begin studies to insert software upgrades and GPNTS Pre-planned Product Improvement (P3I) efforts for Assured-Positioning, Navigation, and Timing (A-PNT) sensor suite integration to include, but not limited to: All Source Position Navigation (ASPN) algorithm, Celestial Navigation, Two Way Satellite Time Transfer (TWSTT), Public Key Infrastructure (PKI), Host-Based Security System (HBSS). Receive a successful Milestone C decision from the Milestone Decision Authority (MDA) for approval to enter into the GPNTS Low Rate Initial Production (LRIP) and IOT&E phase of the Program's Lifecycle.					
FY 2018 Base Plans: The $8M increase in funding is for: 1) ramp up of efforts in preparation for Initial Operational Test and Evaluation (IOT&E), 2) development of the Pre-planned Product Improvement (P3I) technology, 3) development of a single rack solution for smaller surface combatant platforms, and 4) development of a GPNTS configuration to meet unique requirements for Littoral Combat Ship (LCS) platforms. Begin development of GPNTS P3I technology insertion for software enhancements for Assured-Positioning, Navigation, and Timing (A-PNT) sensor suite integration to include, but not limited to: All Source Position Navigation (ASPN) algorithm, Celestial Navigation, Two Way Satellite Time Transfer (TWSTT), Public Key Infrastructure (PKI), Host-Based Security System (HBSS). ASPN, Celestial Navigation, and TWSTT are					

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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
developments to address emerging threats to the GPS signal in a GPS-denied environment. PKI and HBSS provide secure cybersecurity architecture to the GPNTS system to comply with OPNAV Cybersecurity mandates. Commence the design, build, integration, and test of a GPNTS Configuration A one rack solution for smaller surface combatant platforms to include Dock Landing Ship (LSD), United States Coast Guard (USCG), patrol crafts (PC), Mine Countermeasure (MCM), and Military Sealift Command (MSC) platforms. Commence the requirements analysis and initiate the design and development of GPNTS configuration modification for the LCS even and odd platforms configurations to replace the currently installed commercial navigation systems. Begin development, assembly, and implementation of Navigation Simulator (NAVSIM) and Advanced GPS Navigation Simulator (AGNS) tool required for testing and integration of the GPNTS system with all Combat Systems interfaces to support IOT&E. Continue to resolve GPNTS software defects discovered during Operational Assessment (OA) prior to formal IOT&E activities. Continue preparations and coordination of efforts with Commander, Operational Test and Evaluation Force (COMOPTEVFOR) and the Joint Interoperability Test Command (JITC) to support GPNTS Navigation Certification, Technical Evaluation, Combat Systems Certification and IOT&E activities onboard the test platforms. Continue to develop the GPNTS software in support of formal IOT&E activities. Continue development of IOT&E documentation to include test plan, test procedures, and System Operational Verification Test (SOVT) documentation. Conduct GPNTS Aegis Integration Event (AIE) activities at Wallops Island, VA, to ensure compatibility with specific Aegis Combat System baselines. The AIE is required prior to the installation of GPNTS on the Aegis capable DDG IOT&E platform and prior to fielding on platforms with Aegis capability (DDGs and CGs). ***FY 2018 OCO Plans:***					

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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
N/A					
Title: Global Positioning System (GPS) Modernization	0.000	11.091	43.009	0.000	43.009
Articles:	-	-	-	-	-

Description: GPS Modernization funds the Navy's integration of Military GPS User Equipment (MGUE), being developed by the Air Force GPS Directorate into various receivers on Navy air and sea platforms. This project is responsible for the Navy's single voice on providing service requirements to Air Force receiver development programs and coordinate Navy reviews of Air Force GPS receiver documentation. Tasking includes overall centralized planning, coordination and budgeting of the non-recurring engineering required to conduct systems engineering, integration, and testing for multiple individual platform. This effort includes use of core expertise and platform program office government engineers to conduct systems engineering, review and oversight of prime vendor engineering documents, and develop government test plans. The integration timeline is 5+ years from planning to test and is dependent on platform type. Receivers will be procured through existing JSSMO contracts and integrated on Navy platforms using Prime vendor contracts held by each platform's program office. The MGUE card will be integrated into the receiver and tested by the prime vendor for each platform type. Testing will be accomplished by leveraging test events existing in the platform's Program of Record (POR) upgrade cycle.

Integration of MGUE provides access to the GPS M-Code to address emerging threats to use of GPS. This effort supports Navy's compliance with Public Law 111-383 which requires that all GPS user equipment be capable of receiving the new GPS M-Code signal after FY 2017.

FY 2016 Accomplishments:
N/A.

FY 2017 Plans:
Initiate efforts to integrate three (3) modernized M-Code capable GPS receivers into three (3) identified Air platforms: FA-18E/F, EA-18G and E-2D. These efforts require separate teams to work with two (2) GPS receiver vendors, two (2) Program Management Air (PMA) organizations, and two (2) aircraft Prime Vendors contracted to integrate and test the modernized GPS receiver for each platform.

Each platform uses a specific GPS receiver which requires individual parallel efforts to integrate MGUE into each specific receiver. Each receiver integration effort requires a separate team for the integration of MGUE into the identified GPS receivers to address the unique requirements. Additionally, each platform has a unique configuration, which requires separate parallel efforts to integrate and test the modernized GPS receiver into

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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
each platform, to include coordination with each Program Management Air (PMA) organization; management, oversight and support of the effort; and contracting and working with the identified Prime Vendor for the platform. Conduct government systems engineering efforts. Award task orders to airframe prime vendors to initiate hardware and software M-Code integration risk reduction studies and analysis. Procure initial test articles for initial studies, analysis and test efforts. FA-18E/F: - Initiate development of requirements and systems engineering efforts for integrating M-Code capable GPS receivers into the FA-18E/F airframe and aircraft software. - Develop and implement process to integrate M-Code capability into platform receiver and integrate and test modernized receiver into platform. - Procure test article receivers from US Air Force Joint Service Support Management Office (JSSMO) Miniaturized Airborne GPS Receiver 2000 (MAGR2K) M-Code (MAGR2K-M) and Embedded GPS/Inertial Navigation System (INS) M-Code (EGI-M) programs to provide production representative M-Code capable receivers as government furnished equipment (GFE) to FA-18E/F Program Office for laboratory and flight testing. - Initiate hardware and software M-Code integration risk reduction studies and analysis via Program Management Air (PMA) 265 FA-18E/F prime vendor (Boeing) contract. - Initiate contracting efforts to support M-Code receiver integration and test with PMA 265 FA-18E/F prime vendor (Boeing). - Provide overarching management, central coordination, government oversight and guidance, shared expertise, and engineering support to ensure Naval platform performance and integration requirements are supported during M-Code receiver development. EA-18G: - Initiate development of requirements and systems engineering efforts for integrating M-Code capable GPS receivers into the EA-18G airframe and aircraft software. - Develop and implement process to integrate M-Code capability into platform receiver and integrate and test modernized receiver into platform. - Procure test article receivers from US Air Force JSSMO MAGR2K-M and EGI-M programs to provide production representative M-Code capable receivers as government furnished equipment (GFE) to EA-18G Program Office for laboratory and flight testing.					

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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
- Initiate hardware and software M-Code integration risk reduction studies and analysis via PMA 265 EA-18G prime vendor (Boeing) contract. - Initiate contracting efforts to support M-Code receiver integration and test with PMA 265 EA-18G prime vendor (Boeing). - Provide overarching management, central coordination, government oversight and guidance, shared expertise, and engineering support to ensure Naval platform performance and integration requirements are supported during M-Code receiver development. E-2D: - Initiate development of requirements and systems engineering efforts for integrating M-Code capable GPS receivers into the E-2D airframe and aircraft software. - Develop and implement process to integrate M-Code capability into platform receiver and integrate and test modernized receiver into platform. - Procure test article receivers from US Air Force JSSMO EGI-M program to provide production representative M-Code capable receivers as government furnished equipment (GFE) to E-2D Program Office for laboratory and flight testing. - Initiate hardware and software M-Code integration risk reduction studies and analysis via PMA 321 E-2D prime vendor (Northrup Grumman) contract. - Initiate contracting efforts to support M-Code receiver integration and test with PMA 231 E-2D prime vendor (Northrup Grumman). - Provide overarching management, central coordination, government oversight and guidance, shared expertise, and engineering support to ensure Naval platform performance and integration requirements are supported during M-Code receiver development.					
FY 2018 Base Plans: The increase in funding is to begin integration of modernized Military Code (M-Code) capable GPS receivers and start government systems engineering and contracting efforts for five (5) additional platforms: MV-22B, CMV-22B, E-6B, CH-53K and KC-130J as well as continue modernization efforts for three (3) air platforms : FA-18E/F, EA-18G and E-2D to award Prime Vendor GPS contracts for platform integration and test efforts, and procure production ready unit (PRU) modernized GPS receiver test articles for the platform integration and test activities. These efforts require separate teams to work with the GPS receiver vendors, Program Management Air (PMA) organizations, and aircraft Prime Vendors contracts to integrate and test the modernized GPS receiver for each platform.					

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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
Each platform uses a specific GPS receiver which requires individual parallel efforts to integrate Military GPS User Equipment (MGUE) into each specific receiver. Each receiver integration effort requires a separate team for the integration of MGUE into the identified GPS receivers to address the unique requirements. Additionally, each platform has a unique configuration, which requires separate parallel efforts to integrate and test the modernized GPS receiver into each platform, to include coordination with each PMA; management, oversight and support of the effort; and contracting and working with the identified Prime Vendor for the platform. Two of the newly identified platforms (CH-53K and KC130-J) have the added unique requirement to integrate the M-Code capability into the aircraft's Embedded GPS/Inertial Navigation System (INS) (EGI). EGI is a navigation system which combines a GPS receiver card with an INS in an integrated single unit. Begin GPS Modernization efforts on the following five (5) platforms: MV-22B: - Develop and implement process to integrate and test M-Code capable receiver into platform. - Conduct initial requirements development and systems engineering efforts for integrating M-Code GPS receivers into the MV-22B airframe and aircraft software. - Procure test article receivers from US Air Force JSSMO MAGR2K-M program to provide production representative M-Code receivers as government furnished equipment (GFE) to MV-22B Program Office for laboratory and flight testing. - Award Task Order (contract held by PMA 275) and commence efforts for integration of M-Code into test receivers and follow-on test efforts for MV-22B aircraft. - Provide overarching management, central coordination, government oversight and guidance, shared expertise, and engineering support to ensure Naval platform performance and integration requirements are supported during integration of M-Code capable receiver into the platform. CMV-22B: - Develop and implement process to integrate and test M-Code capable receiver into platform. - Conduct initial requirements development and systems engineering efforts for integrating M-Code GPS receivers into the CMV-22B airframe and aircraft software in conjunction with MV-22B efforts. - Procure test article receivers from US Air Force JSSMO MAGR2K-M program to provide production representative M-Code receivers as government furnished equipment (GFE) to MV-22B Program Office for laboratory and flight testing. - Award Task Order (contract held by PMA 275) for integration of M-Code into test receivers and follow-on test efforts for CMV-22B aircraft in as part of MV-22B contract.					

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 0604777N / *Navigation/Id System*	**Project (Number/Name)** 0921 / *NAVSTAR GPS Equipment*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
- Provide overarching management, central coordination, government oversight and guidance, shared expertise, and engineering support to ensure Naval platform performance and integration requirements are supported during integration of M-Code capable receiver into the platform. E-6B: - Develop and implement process to integrate and test M-Code capable receiver into platform. - Conduct initial requirements development and systems engineering efforts for integrating M-Code GPS receivers into the E-6B airframe and aircraft software. - Procure test article receivers from US Air Force JSSMO MAGR2K-M program to provide production representative M-Code receivers as government furnished equipment (GFE) to E-6B Program Office for laboratory and flight testing. - Award Task Order (contract held by PMA 271) and commence efforts for integration of M-Code into test receivers and follow-on test efforts for E-6B aircraft. - Provide overarching management, central coordination, government oversight and guidance, shared expertise, and engineering support to ensure Naval platform performance and integration requirements are supported during integration of M-Code capable receiver into the platform. CH-53K - Develop and implement process to integrate and test M-Code capable receiver into platform. - Conduct initial requirements development and systems engineering efforts for integrating M-Code GPS receivers into the CH-53K airframe and aircraft software. - Begin efforts for integration of specific M-Code capable Embedded GPS/INS (EGI) receivers into the CH-53K aircraft. - Provide overarching management, central coordination, government oversight and guidance, shared expertise, and engineering support to ensure Naval platform performance and integration requirements are supported during integration of M-Code capable receiver into the platform. KC-130J: - Develop and implement process to integrate and test M-Code capable receiver into platform. - Conduct initial requirements development and systems engineering efforts for integrating M-Code GPS receivers into the KC-130J airframe and aircraft software, to include working with US Air Force JSSMO to customize the modernized receiver to meet the added unique EGI-M requirement. - Begin efforts for integration of specific M-Code capable EGI receivers into the KC-130J aircraft.					

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 0604777N / *Navigation/Id System*	**Project (Number/Name)** 0921 / *NAVSTAR GPS Equipment*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
- Provide overarching management, central coordination, government oversight and guidance, shared expertise, and engineering support to ensure Naval platform performance and integration requirements are supported during integration of M-Code capable receiver into the platform. Ramp up efforts to integrate and test modernized M-Code capable GPS receivers and continue government systems engineering efforts for three (3) air platforms: FA-18E/F, EA-18G and E-2D aircraft, each requiring specific receivers and unique integration requirements due to various platform requirements configurations: Continue GPS Modernization efforts on the following three (3) platforms: FA-18E/F: - Finalize requirements and continue systems engineering efforts for integrating M-Code GPS receivers into the FA-18E/F airframe and aircraft software. - Procure test article receivers from US Air Force JSSMO EGI-M program to provide production representative M-Code receivers as government furnished equipment (GFE) to FA-18E/F Program Office for laboratory and flight testing. - Complete hardware and software M-Code integration risk reduction studies. - Award Task Order (contract held by PMA 265) and commence efforts for integration of M-Code into receiver and follow-on test efforts for FA-18E/F aircraft. - Provide overarching management, central coordination, government oversight and guidance, shared expertise, and engineering support to ensure Naval platform performance and integration requirements are supported during M-Code receiver development and integration into the platform. EA-18G: - Finalize requirements and continue systems engineering efforts for integrating M-Code GPS receivers into the EA-18G airframe and aircraft software. - Procure test article receivers from US Air Force JSSMO EGI-M program to provide production representative M-Code receivers as government furnished equipment (GFE) to EA-18G Program Office for laboratory and flight testing. - Complete hardware and software M-Code integration risk reduction studies. - Award Task Order (contract held by PMA 265) and commence efforts for integration of M-Code into receiver and follow-on test efforts for EA-18G aircraft.					

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 0604777N / *Navigation/Id System*	**Project (Number/Name)** 0921 / *NAVSTAR GPS Equipment*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
- Provide overarching management, central coordination, government oversight and guidance, shared expertise, and engineering support to ensure Naval platform performance and integration requirements are supported during M-Code receiver development and integration into the platform. E-2D: - Finalize requirements and continue systems engineering efforts for integrating M-Code GPS receivers into the E-2D airframe and aircraft software. - Complete hardware and software M-Code integration risk reduction studies. - Award contract (held by PMA 231) and commence efforts for integration of M-Code into receiver and follow-on test efforts for E-2D aircraft. - Provide overarching management, central coordination, government oversight and guidance, shared expertise, and engineering support to ensure Naval platform performance and integration requirements are supported during M-Code receiver development and integration into the platform. ***FY 2018 OCO Plans:*** N/A.					
Accomplishments/Planned Programs Subtotals	16.774	26.965	80.044	0.000	80.044

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/2657: *NAVSTAR GPS Receivers (Space)*	11.129	12.752	15.923	-	15.923	17.686	17.918	18.288	18.651	Continuing	Continuing
• APN/0577: *Common Avionics Changes*	6.699	7.091	7.439	-	7.439	7.529	10.305	35.404	36.077	Continuing	Continuing
• APN/0544: *E-2 Series*	0.000	0.000	0.000	-	0.000	1.300	3.800	10.400	0.000	Continuing	Continuing

Remarks

D. Acquisition Strategy

Both the Navigation Warfare (NAVWAR) Air and Sea programs will continue to integrate improved anti-jam (AJ) capability onto air and sea platforms and ensure compatibility with new Military Code (M-Code) signal.

GPS-based Positioning, Navigation, and Timing (PNT) Service (GPNTS) program will develop, acquire, and field the GPNTS, a scalable Selective Availability/Anti-Spoofing Module (SAASM) GPS-based service-oriented architecture PNT system that will provide an open, extensible, modernized replacement for the current fleet

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
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PNT systems, GPNTS will also integrate Military GPS User Equipment (MGUE). A firm fixed price contract is planned for an FY 2017 award to procure LRIP and FRP systems.

GPS Modernization will manage the non-recurring engineering required to conduct systems engineering, integration and test of Air Force GPS Directorate developed MGUE receivers. Existing platform hardware contracts and support infrastructure will be utilized to complete integration efforts by Air platform.

E. Performance Metrics

The primary metric used for the Air Navigation Warfare (NAVWAR) Program is acceptable system performance in a Global Positioning System (GPS) denied environment which is defined by classified values of jamming to signal ratio (J/S) identified in the Enhanced GPS User Equipment (UE) Operational Requirements Document (ORD) 562-06-00 of 7 June 2000. The performance goal is met if acceptable system performance is achieved in the threshold J/S environment cited in the classified appendix.

The primary metric used for the Sea NAVWAR is acceptable system performance in a GPS denial environment defined by classified values of jamming to J/S identified in the Sea NAVWAR Increment 2 Capabilities Production Document (CPD) (12/08). The performance goal is met if acceptable system performance is achieved in the threshold J/S environment cited in the CPD.

The primary metric used for the GPS-based Positioning, Navigation and Timing (PNT) Service (GPNTS) is successful completion of the system development as outlined in the GPNTS Technical Requirements Document (TRD).

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 0604777N / *Navigation/Id System*	Project (Number/Name) 0921 / *NAVSTAR GPS Equipment*	

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
Air NAVWAR Development Support	WR	NAWC : Pax River	0.000	0.381	Dec 2015	0.266	Dec 2016	2.215	Nov 2017	-		2.215	Continuing	Continuing	Continuing
Air NAVWAR Govt Eng Support	WR	NAWC : Pax River	0.000	0.221	Dec 2015	0.406	Dec 2016	2.566	Dec 2017	-		2.566	Continuing	Continuing	Continuing
Sea NAVWAR Development	C/CPIF	Lockheed : Marion, MA	1.860	3.071	Dec 2015	4.690	Dec 2016	2.330	Oct 2017	-		2.330	Continuing	Continuing	Continuing
Sea NAVWAR Development Support	WR	SSC PAC, NUWC : San Diego, Newport	0.000	0.696	Dec 2015	0.924	Dec 2016	1.484	Dec 2017	-		1.484	Continuing	Continuing	Continuing
Sea NAVWAR Govt Eng Support	WR	SSC PAC, NUWC : San Diego, Newport	0.000	0.404	Dec 2015	1.401	Dec 2016	0.345	Dec 2017	-		0.345	Continuing	Continuing	Continuing
GPNTS HW Development	C/CPIF	Raytheon : San Diego	33.534	2.930	Jan 2016	2.734	Nov 2016	0.000		-		0.000	0.000	39.198	-
GPNTS SW Development	TBD	TBD : TBD	0.000	0.000		0.000		5.000	Jan 2018	-		5.000	Continuing	Continuing	Continuing
GPNTS Development Support	WR	SSC PAC : San Diego	0.000	1.360	Dec 2015	0.725	Dec 2016	2.658	Dec 2017	-		2.658	Continuing	Continuing	Continuing
GPNTS Govt Eng Support	WR	SSC PAC : San Diego	0.000	0.788	Dec 2015	1.105	Dec 2016	4.750	Dec 2017	-		4.750	Continuing	Continuing	Continuing
GPS Mod Development	TBD	TBD : TBD	0.000	0.000		2.150	May 2017	11.300	Jan 2018	-		11.300	Continuing	Continuing	Continuing
GPS Mod Hardware	TBD	TBD : TBD	0.000	0.000		1.900	May 2017	9.679	Dec 2017	-		9.679	Continuing	Continuing	Continuing
GPS Mod Development Support	WR	SSC PAC, NAWC : San Diego, Pax River	0.000	0.000		1.338	Jan 2017	10.308	Nov 2017	-		10.308	Continuing	Continuing	Continuing
GPS Mod Govt Eng Support	WR	SSC PAC, NAWC : San Diego, Pax River	0.000	0.000		2.040	Jan 2017	5.642	Nov 2017	-		5.642	Continuing	Continuing	Continuing
Product Development	WR	GPS Directorate : Los Angeles	3.740	0.684	Dec 2015	0.500	Dec 2016	1.300	Dec 2017	-		1.300	Continuing	Continuing	Continuing
Systems Engineering	WR	Govt, Contractor : San Diego, Newport	21.942	0.304	Nov 2015	0.150	Nov 2016	0.700	Nov 2017	-		0.700	Continuing	Continuing	Continuing
Product Development	TBD	Various : Various	89.596	0.000		0.000		0.000		-		0.000	0.000	89.596	-
		Subtotal	150.672	10.839		20.329		60.277		-		60.277	-	-	-

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 0604777N / *Navigation/Id System*	Project (Number/Name) 0921 / *NAVSTAR GPS Equipment*	

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

Remarks

FY18 increases: Air NAVWAR for Non-Recurring Engineering for platform interface modifications and GPS antenna test article integration efforts; GPNTS for pre-planned product improvement (P3I) software development and single rack solution for smaller platforms; GPS Modernization for MGUE M-Code risk reduction and integration, platform test articles and test efforts across eight (8) platforms.

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
Contract Engineering Services	WR	BAH : San Diego, Pax River, China Lake	0.000	1.899	Nov 2015	0.932	Nov 2016	1.830	Nov 2017	-		1.830	Continuing	Continuing	Continuing
Integrated Logistics Support	WR	SSC PAC, NAWC : San Diego, Pax River	0.000	0.210	Dec 2015	0.677	Dec 2016	1.735	Dec 2017	-		1.735	Continuing	Continuing	Continuing
Training Development	WR	SSC PAC, NAWC : San Diego, Pax River	0.000	0.054	Dec 2015	0.000		0.000		-		0.000	0.000	0.054	-
Technical Data	WR	Various : Various	0.000	0.401	Dec 2015	0.000		0.000		-		0.000	0.000	0.401	-
Support	Various	Various : Various	52.830	0.000		0.000		0.000		-		0.000	0.000	52.830	-
		Subtotal	52.830	2.564		1.609		3.565		-		3.565	-	-	-

Remarks

FY18 increase for ramp up of systems engineering efforts and integration studies for Air NAVWAR and GPS Modernization.

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
Air NAVWAR Test & Evaluation	WR	NAWC : Pax River	0.000	0.404	Nov 2015	0.391	Nov 2016	2.250	Nov 2017	-		2.250	Continuing	Continuing	Continuing
Sea NAVWAR Test & Evaluation	WR	SSC PAC, NUWC : San Diego, Newport	0.000	0.555	Nov 2015	0.662	Nov 2016	0.338	Nov 2017	-		0.338	Continuing	Continuing	Continuing

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 0604777N / *Navigation/Id System*	**Project (Number/Name)** 0921 / *NAVSTAR GPS Equipment*

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
GPNTS Test & Evaluation	WR	SSC PAC : San Diego	0.000	0.987	Nov 2015	0.820	Nov 2016	3.187	Nov 2017	-		3.187	Continuing	Continuing	Continuing
GPS Mod Test & Evaluation	WR	SSC PAC, NAWC : San Diego, Pax River	0.000	0.000		0.459	Nov 2016	1.875	Nov 2017	-		1.875	Continuing	Continuing	Continuing
Test & Evaluation	Various	Various : Various	45.296	0.000		0.000		0.000		-		0.000	0.000	45.296	-
		Subtotal	45.296	1.946		2.332		7.650		-		7.650	-	-	-

Remarks

FY18 increases: Air NAVWAR for analysis, integration and test efforts for miniaturized anti-jam solution; GPNTS for OT&E and certification efforts in preparation for formal IOT&E; GPS Modernization for integration and test activities across five (5) new and three (3) current platforms.

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
Program Management Support	C/CPAF	BAH : San Diego, Pax River, China Lake	6.069	1.425	Nov 2015	2.695	Nov 2016	8.552	Nov 2017	-		8.552	Continuing	Continuing	Continuing
Management Services	Various	Various : Various	10.334	0.000		0.000		0.000		-		0.000	0.000	10.334	-
		Subtotal	16.403	1.425		2.695		8.552		-		8.552	-	-	-

Remarks

FY18 increase to support overall growth in efforts and requirements across division.

	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	265.201	16.774		26.965		80.044		-		80.044	-	-	-

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 0604777N / *Navigation/Id System*	**Project (Number/Name)** 0921 / *NAVSTAR GPS Equipment*

Air Navigation Program Schedule

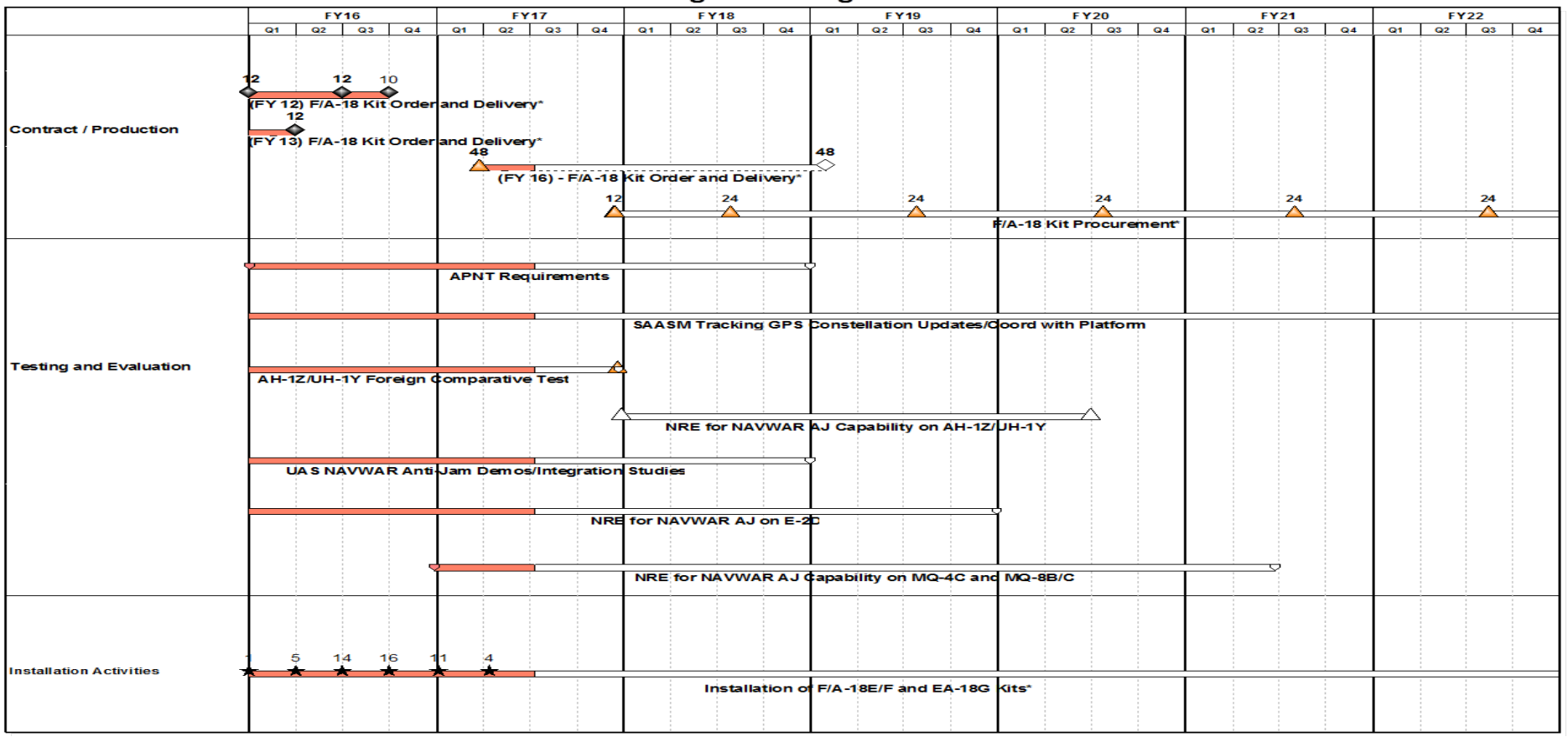

Exhibit R-4, RDT&E Schedule Profile: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604777N / *Navigation/Id System*	**Project (Number/Name)** 0921 / *NAVSTAR GPS Equipment*

Sea NAVWAR

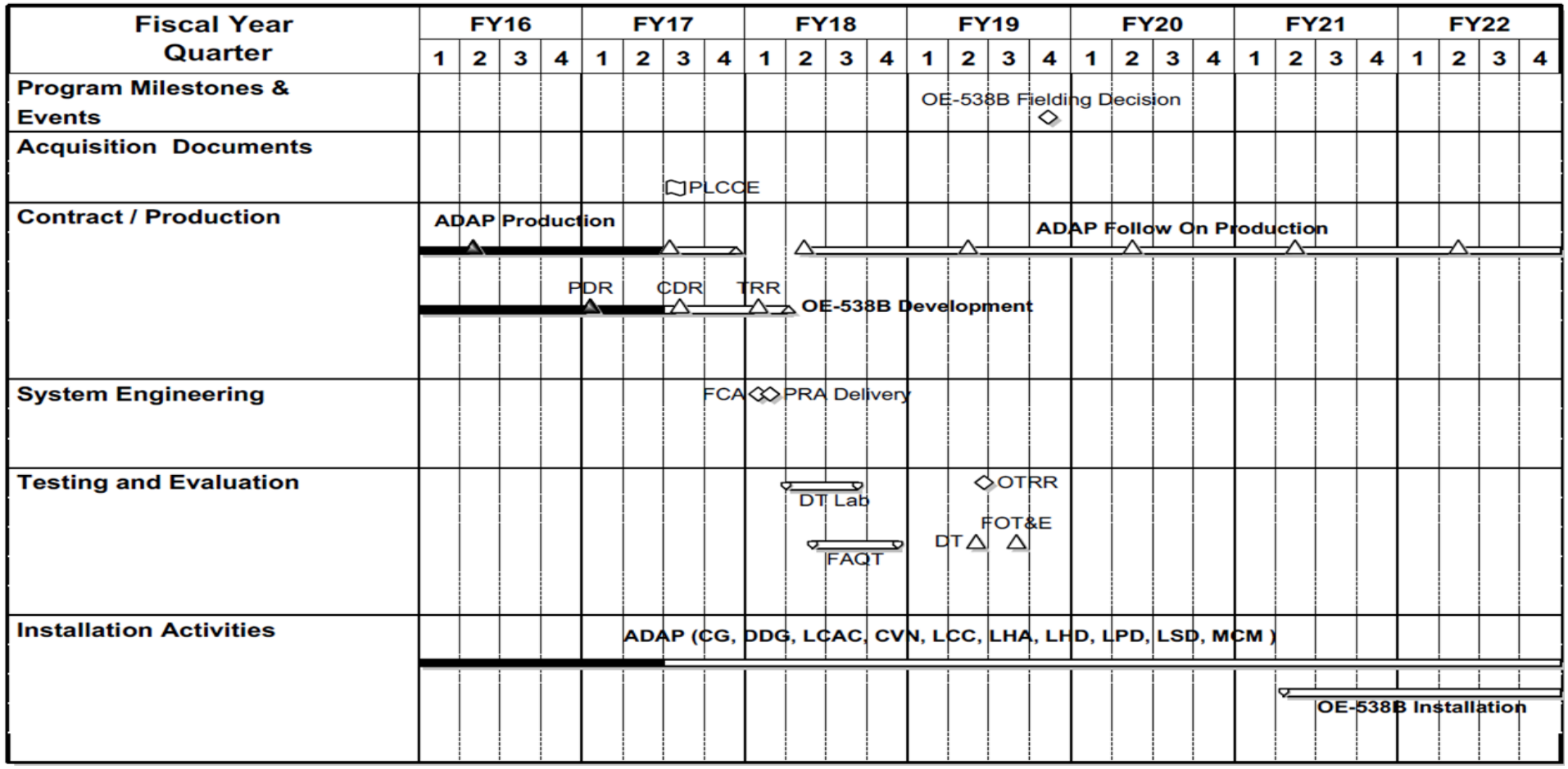

Exhibit R-4, RDT&E Schedule Profile: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604777N / *Navigation/Id System*	**Project (Number/Name)** 0921 / *NAVSTAR GPS Equipment*

GPS Modernization

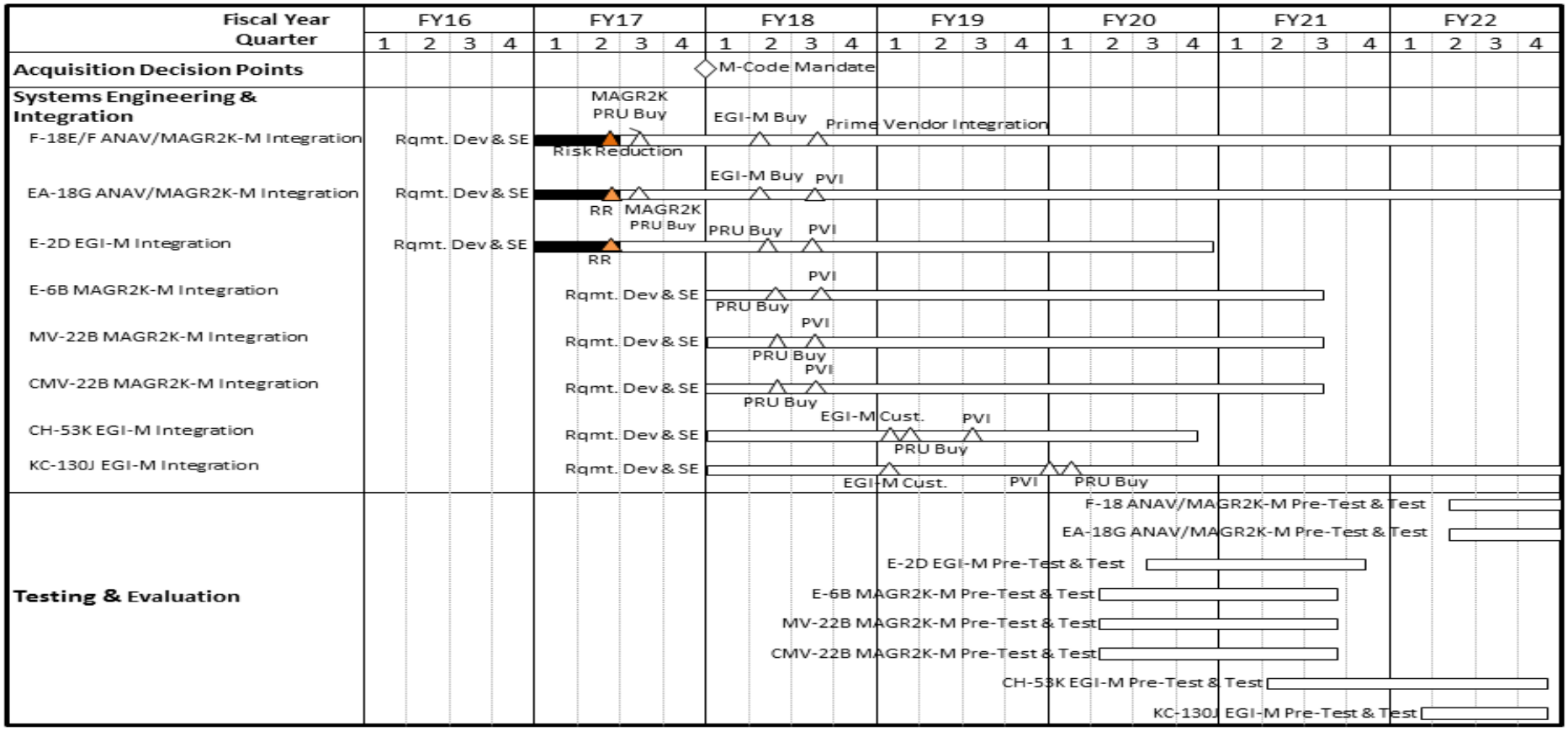

Exhibit R-4, RDT&E Schedule Profile: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604777N / *Navigation/Id System*	**Project (Number/Name)** 0921 / *NAVSTAR GPS Equipment*

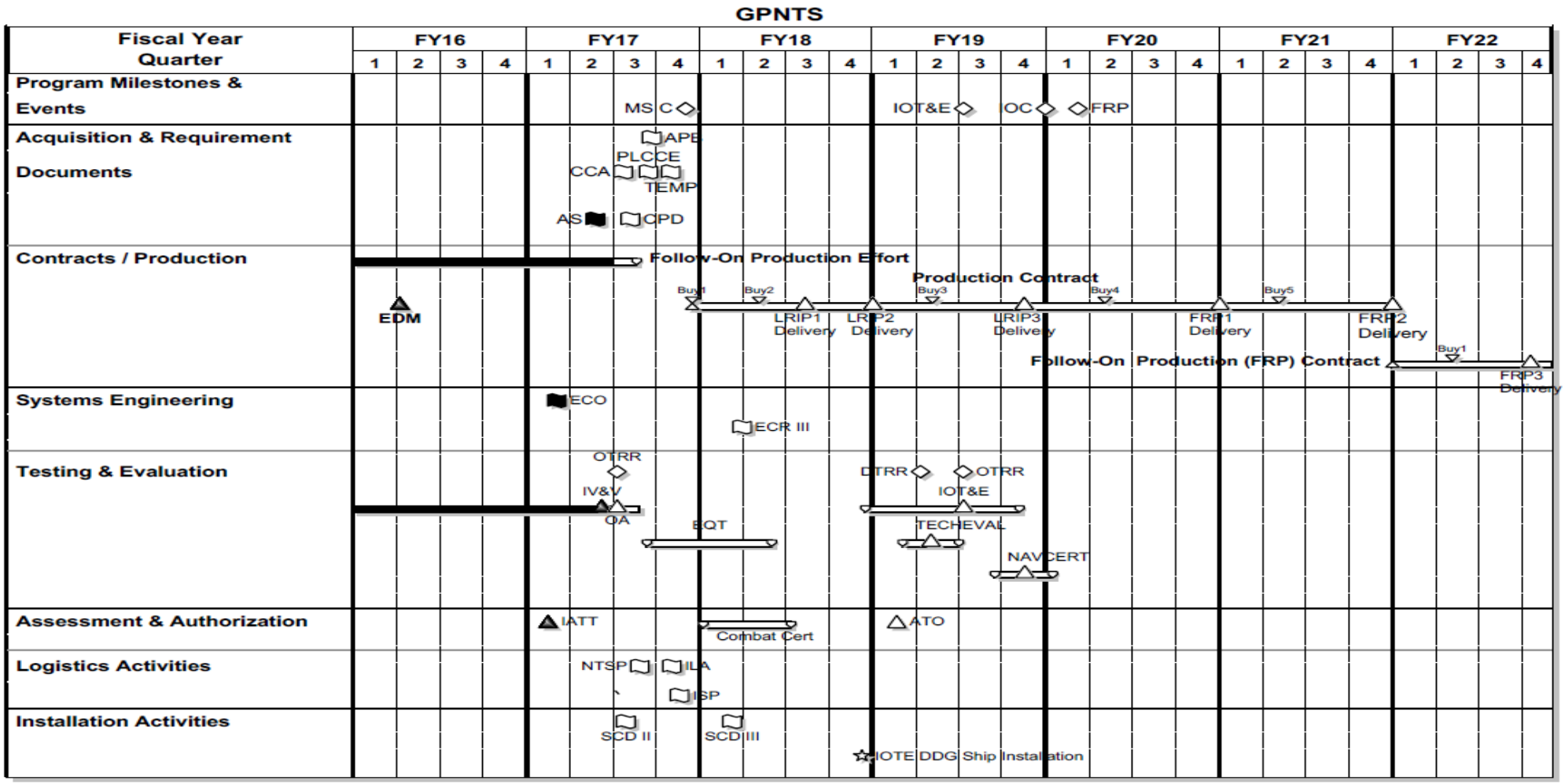

Exhibit R-4A, RDT&E Schedule Details: FY 2018 Navy		Date: May 2017
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Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 0921				
Air NAVWAR: Air Navigation F/A-18 Kit Procurement 2016 Funds	1	2017	1	2017
Air NAVWAR: Air Navigation F/A-18 Kit Procurement 2017	4	2017	4	2017
Air NAVWAR: Air Navigation F/A-18 Kit Procurement 2018	3	2018	3	2018
Air NAVWAR: Air Navigation F/A-18 Kit Procurement 2019	3	2019	3	2019
Air NAVWAR: Air Navigation F/A-18 Kit Procurement 2020	3	2020	3	2020
Air NAVWAR: Air Navigation F/A-18 Kit Procurement 2021	3	2021	3	2021
Air NAVWAR: Air Navigation F/A-18 Kit Procurement 2022	3	2022	3	2022
Air NAVWAR: Air Navigation APNT Requirements & AIR Analysis of Alternatives (AOA)	1	2016	4	2018
Air NAVWAR: Air Navigation SAASM Tracking GPS Constellation Updates	1	2016	4	2022
Air NAVWAR: Air Navigation AH-1Z/UH-1Y Foreign Comparative Test	1	2016	4	2017
Air NAVWAR: Air Navigation NRE Integration for NAVWAR AJ on AH-1 Z/UH-1Y	1	2018	2	2020
Air NAVWAR: Air Navigation UAS NAVWAR Anti-Jam Demos/Integration Studies	1	2016	4	2018
Air NAVWAR: Air Navigation E-2D Ant-Jam Platform Coordination	1	2016	4	2019
Air NAVWAR: Air Navigation Integration for NAVWAR AJ Capability on MQ-4C & MQ-8B/8C	1	2017	2	2021
Air NAVWAR: Air Navigation Installation of F/A-18 & EA-18 Kits	1	2016	4	2022
Sea NAVWAR: Sea Navigation OE-538B Fielding Decision	4	2019	4	2019
Sea NAVWAR: Sea Navigation Project Life Cycle Cost Estimate (PLCCE)	3	2016	3	2016
Sea NAVWAR: Sea Navigation ADAP Production FY16	2	2016	2	2016
Sea NAVWAR: Sea Navigation ADAP Production FY17	3	2017	3	2017
Sea NAVWAR: Sea Navigation ADAP Follow On Production FY18	2	2018	2	2018

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**
Sea NAVWAR: Sea Navigation ADAP Follow On Production FY19	2	2019	2	2019
Sea NAVWAR: Sea Navigation ADAP Follow On Production FY20	2	2020	2	2020
Sea NAVWAR: Sea Navigation ADAP Follow On Production FY21	2	2021	2	2021
Sea NAVWAR: Sea Navigation ADAP Follow On Production FY22	2	2022	2	2022
Sea NAVWAR: Sea Navigation OE-538B Development	1	2016	2	2018
Sea NAVWAR: Sea Navigation PDR	1	2017	1	2017
Sea NAVWAR: Sea Navigation CDR	3	2017	3	2017
Sea NAVWAR: Sea Navigation TRR	1	2018	1	2018
Sea NAVWAR: Sea Navigation FCA	1	2018	1	2018
Sea NAVWAR: Sea Navigation PRA Delivery	1	2018	1	2018
Sea NAVWAR: Sea Navigation DT LAB	2	2018	3	2018
Sea NAVWAR: Sea Navigation OTRR	2	2019	2	2019
Sea NAVWAR: Sea Navigation FAQT	2	2018	4	2018
Sea NAVWAR: Sea Navigation DT	2	2019	2	2019
Sea NAVWAR: Sea Navigation FOT&E	3	2019	3	2019
Sea NAVWAR: Sea Navigation ADAP Installations	1	2016	4	2022
Sea NAVWAR: Sea Navigation OE-538B Installations	2	2021	4	2022
GPS-based PNT Service (GPNTS): GPNTS Milestone C	4	2017	4	2017
GPS-based PNT Service (GPNTS): GPNTS IOT&E	3	2019	3	2019
GPS-based PNT Service (GPNTS): GPNTS Initial Operational Capability (IOC)	1	2020	1	2020
GPS-based PNT Service (GPNTS): GPNTS Full Rate Production (FRP)	1	2020	1	2020
GPS-based PNT Service (GPNTS): GPNTS Acquistion Program Baseline (APB)	3	2017	3	2017
GPS-based PNT Service (GPNTS): GPNTS PLCCE	3	2017	3	2017
GPS-based PNT Service (GPNTS): GPNTS Test and Evaluation Master Plan (TEMP)	4	2017	4	2017
GPS-based PNT Service (GPNTS): GPNTS Clinger Cohen Act (CCA)	3	2017	3	2017
GPS-based PNT Service (GPNTS): GPNTS Capability Production Document (CPD)	3	2017	3	2017

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**
GPS-based PNT Service (GPNTS): GPNTS Acquisition Strategy (AS)	2	2017	2	2017
GPS-based PNT Service (GPNTS): GPNTS Follow-On Production Effort	1	2016	3	2017
GPS-based PNT Service (GPNTS): GPNTS Engineering Development Model (EDM) 2 Delivery	1	2016	1	2016
GPS-based PNT Service (GPNTS): GPNTS Production Contract	4	2017	4	2021
GPS-based PNT Service (GPNTS): GPNTS Buy 1	4	2017	4	2017
GPS-based PNT Service (GPNTS): GPNTS Buy 2	2	2018	2	2018
GPS-based PNT Service (GPNTS): GPNTS Buy 3	2	2019	2	2019
GPS-based PNT Service (GPNTS): GPNTS Buy 4	2	2020	2	2020
GPS-based PNT Service (GPNTS): GPNTS Buy 5	2	2021	2	2021
GPS-based PNT Service (GPNTS): GPNTS Follow On Production Contract	1	2022	4	2022
GPS-based PNT Service (GPNTS): GPNTS Engineering Change Order (ECO)	1	2017	1	2017
GPS-based PNT Service (GPNTS): GPNTS Engineering Change Request (ECR) Phase III	1	2018	1	2018
GPS-based PNT Service (GPNTS): GPNTS Operational Test Readiness Review (OTRR) 1	2	2017	2	2017
GPS-based PNT Service (GPNTS): GPNTS Development Test Readiness Review (DTRR)	2	2019	2	2019
GPS-based PNT Service (GPNTS): GPNTS Operational Test Readiness Review (OTRR) 2	3	2019	3	2019
GPS-based PNT Service (GPNTS): GPNTS Government Testing	1	2016	3	2017
GPS-based PNT Service (GPNTS): GPNTS Govt Testing: Independent Verification and Validation (IV&V)	2	2017	2	2017
GPS-based PNT Service (GPNTS): GPNTS Govt Testing: Operational Assessment (OA)	2	2017	2	2017
GPS-based PNT Service (GPNTS): GPNTS Operational Test and Evaluation (OT&E)	4	2018	4	2019
GPS-based PNT Service (GPNTS): GPNTS Environmental Quality Testing (EQT)	3	2017	2	2018
GPS-based PNT Service (GPNTS): GPNTS Technical Evaluation	1	2019	2	2019

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 0604777N / *Navigation/Id System*	**Project (Number/Name)** 0921 / *NAVSTAR GPS Equipment*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
GPS-based PNT Service (GPNTS): GPNTS NAVCERT	3	2019	1	2020
GPS-based PNT Service (GPNTS): GPNTS Interim Authority to Test (IATT)	1	2017	1	2017
GPS-based PNT Service (GPNTS): GPNTS Combat Certification	1	2018	3	2018
GPS-based PNT Service (GPNTS): GPNTS Authority to Operate (ATO)	1	2019	1	2019
GPS-based PNT Service (GPNTS): GPNTS Naval Training Support Plan (NTSP)	3	2017	3	2017
GPS-based PNT Service (GPNTS): GPNTS Initial Logistics Assessment (ILA)	4	2017	4	2017
GPS-based PNT Service (GPNTS): GPNTS Initial Security Plan (ISP)	4	2017	4	2017
GPS-based PNT Service (GPNTS): GPNTS Ship Change Document (SCD) II	3	2017	3	2017
GPS-based PNT Service (GPNTS): GPNTS SCD III	1	2018	1	2018
GPS-based PNT Service (GPNTS): GPNTS DDG Installation for IOT&E	4	2018	4	2018
GPS Modernization: GPS Modernization M-Code Mandate	1	2018	1	2018
GPS Modernization: GPS Modernization F-18E/F ANAV/MAGR2K-M Rqmts. Dev. & System Eng.	1	2017	4	2022
GPS Modernization: GPS Modernization F-18E/F ANAV/MAGR2K-M Risk Reduction Task Order	2	2017	2	2017
GPS Modernization: GPS Modernization F-18E/F MAGR2K-M PRU Buy	3	2017	3	2017
GPS Modernization: GPS Modernization F-18E/F EGI-M PRU Buy 1	2	2018	2	2018
GPS Modernization: GPS Modernization F-18E/F ANAV/MAGR2K-M Prime Vendor Integration	3	2018	3	2018
GPS Modernization: GPS Modernization EA-18G ANAV/MAGR2K-M Rqmts. Dev. & System Eng.	1	2017	4	2022
GPS Modernization: GPS Modernization EA-18G ANAV/MAGR2K-M Risk Reduction Task Order	2	2017	2	2017
GPS Modernization: GPS Modernization EA-18G MAGR2K-M PRU Buy	3	2017	3	2017
GPS Modernization: GPS Modernization E-18G MAGR2K-M Buy	2	2018	2	2018
GPS Modernization: GPS Modernization EA-18G ANAV/MAGR2K-M Prime Vendor Integration (PVI)	3	2018	3	2018
GPS Modernization: GPS Modernization E-2D EGI-M Rqmts. Dev. & System Eng.	1	2017	4	2020

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 0604777N / *Navigation/Id System*	**Project (Number/Name)** 0921 / *NAVSTAR GPS Equipment*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
GPS Modernization: GPS Modernization E-2D EGI-M Risk Reduction Task Order	2	2017	2	2017
GPS Modernization: GPS Modernization E-2D PRU Buy	2	2018	2	2018
GPS Modernization: GPS Modernization E-2D EGI-M Prime Vendor Integration	3	2018	3	2018
GPS Modernization: GPS Modernization E-6B MAGR2K-M Rqmts. Dev. & System Eng.	1	2018	3	2021
GPS Modernization: GPS Modernization E-6B MAGR2K-M PRU Buy	2	2018	2	2018
GPS Modernization: GPS Modernization E-6B MAGR2K-M Prime Vendor Integration	3	2018	3	2018
GPS Modernization: GPS Modernization MV-22B MAGR2K-M Rqmts. Dev. & System Eng.	1	2018	3	2021
GPS Modernization: GPS Modernization MV-22B MAGR2K-M PRU Buy	2	2018	2	2018
GPS Modernization: GPS Modernization MV-22B MAGR2K-M Prime Vendor Integration	3	2018	3	2018
GPS Modernization: GPS Modernization CMV-22B MAGR2K-M Rqmts. Dev. & System Eng.	1	2018	3	2021
GPS Modernization: GPS Modernization CMV-22B MAGR2K-M PRU Buy	2	2018	2	2018
GPS Modernization: GPS Modernization CMV-22B MAGR2K-M Prime Vendor Integration	3	2018	3	2018
GPS Modernization: GPS Modernization CH-53K EGI-M Rqmts. Dev. & System Eng.	1	2018	4	2020
GPS Modernization: GPS Modernization CH-53K EGI-M Customization	1	2019	1	2019
GPS Modernization: GPS Modernization CH-53K EGI-M PRU Buy	1	2019	1	2019
GPS Modernization: GPS Modernization CH-53K EGI-M Prime Vendor Integration	3	2019	3	2019
GPS Modernization: GPS Modernization KC-130J EGI-M Rqmts. Dev. & System Eng.	1	2018	1	2022
GPS Modernization: GPS Modernization KC-130J EGI-M Customization	1	2019	1	2019
GPS Modernization: GPS Modernization KC-130J EGI-M PRU Buy	1	2020	1	2020
GPS Modernization: GPS Modernization KC-130J EGI-M Prime Vendor Integration	1	2020	1	2020
GPS Modernization: GPS Modernization F-18E/F MAGR2K-M/EGI-M Pre-Test & Test	2	2022	4	2022
GPS Modernization: GPS Modernization EA-18G MAGR2K-M/EGI-M Pre-Test & Test	2	2022	4	2022

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 0604777N / *Navigation/Id System*	**Project (Number/Name)** 0921 / *NAVSTAR GPS Equipment*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
GPS Modernization: GPS Modernization E-2D EGI-M Pre-Test & Test	3	2019	4	2021
GPS Modernization: GPS Modernization E-6B MAGR2K-M Pre-Test & Test	2	2020	3	2021
GPS Modernization: GPS Modernization MV-22B MAGR2K-M Pre-Test & Test	2	2020	3	2021
GPS Modernization: GPS Modernization CMV-22B MAGR2K-M Pre-Test & Test	2	2020	3	2021
GPS Modernization: GPS Modernization CH-53K EGI-M Pre-Test & Test	2	2021	4	2022
GPS Modernization: GPS Modernization KC 130J EGI-M Pre-Test & Test	1	2022	4	2022

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy			Date: May 2017
Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604777N / *Navigation/Id System*	Project (Number/Name) 1253 / *Combat Ident System*	

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
1253: *Combat Ident System*	181.105	1.291	3.852	2.548	-	2.548	2.048	1.946	1.990	2.029	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

MARK (MK) XIIA Mode 5 provides improved secure cooperative combat identification via Identification Friend or Foe (IFF). Mode 5 is developed in cooperation with North Atlantic Treaty Organization, with the DoD implementation governed by AIMS 03-1000A, AIMS 03-1000B and USN requirements defined in ORD # 577-06-01. IFF product improvements are designed to be installed through upgrade and deficiency correction studies, which in turn, become engineering changes to IFF interrogators and transponders and their associated cryptographic material.

The Navy MK XIIA Mode 5 program was approved for entry in Systems Development and Demonstration phase in August 2003 and into the Production and Deployment Phase and Low Rate Initial Production in July 2006, and Full Rate Production July 2012. The Navy Mode 5 program achieved Initial Operational Capability (IOC) in 2012 in accordance with the ORD. Mode 5 capable equipment was fielded in USN/USMC platforms in accordance with Joint Requirements Oversight Council Memorandums (047-07, 122-08 and 108-13) in support of Joint Mode 5 IOC in 2014 and is expected to meet Joint Full Operational Capability in FY2020.

RDT&E articles include Mode 5 cryptographic modules and associated hardware and software changes for IFF interrogators and transponders, including, but not limited to: AN/APX-118/123, AN/APX-119, and AN/APX-111 equipment. RDT&E units are required for government and contractor labs to support aircraft and ship integrations, test sites and test aircraft.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Title: Mode 5 prototype hardware, cryptographic module	0.890	2.240	1.661	0.000	1.661
Articles:	-	-	-	-	-
Description: Develop kits for installation into existing fleet assets including AN/APX-118/123 Common Digital Transponder, and AN/APX-111 Combined Interrogator Transponder or other interrogator/transponder equipment. Repair and correct deficiencies identified during integration and test. Procure IFF interrogators and transponders, including, but not limited to: AN/APX-123, AN/APX-119, AN/APX-111, cryptographic modules and Mode 5 modification kits to support platform integration and testing. Perform platform integration efforts of Mode 5 equipment for various Type/Model/Series aircraft.					
FY 2016 Accomplishments: Initiated contract action for integration design and development for incorporation of Mode 5 capability in CH-53K aircraft.					
FY 2017 Plans:					

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
Begin platform integration design and development for incorporation of Mode 5 capability in the CH-53K aircraft, including System Requirements and Preliminary Design Reviews. ***FY 2018 Base Plans:*** Complete laboratory verification testing of the functionality of the Mode 5 capability in the CH-53K aircraft prior to FY2019 T&E efforts. ***FY 2018 OCO Plans:*** N/A					
Title: Mode 5 Systems Engineering and Integrated Logistics Support (ILS) ***Articles:*** ***Description:*** Performed systems engineering and analysis in support of Mode 5 hardware/software development and engineering change proposals on Identification Friend or Foe interrogators and transponders, including but not limited to: AN/APX-123 Common Digital Transponder, AN/APX-119 Transponder, AN/APX-111 Combined Interrogator Transponder, Cryptographic Modules, Mode 5 Engineering Test Equipment, and Mode 5 support equipment. ***FY 2016 Accomplishments:*** Continued systems engineering integration design and development and logistics planning efforts for various platforms. ***FY 2017 Plans:*** Continue systems engineering efforts for integration of Mode 5 capability in aircraft platforms, to include CH-53K. Perform logistics efforts to develop fleet pubs, training and retrofit Engineering Change Proposal for achieving Mode 5 capability in CH-53K. ***FY 2018 Base Plans:*** Finalize ECP for fleet installation of Mode 5 capability in CH-53K aircraft to support fleet fielding in late FY19. ***FY 2018 OCO Plans:*** N/A	0.370 -	0.412 -	0.338 -	0.000 -	0.338 -
Title: Mode 5 Upgrade Developmental Test & Operational Test ***Articles:*** ***Description:*** Perform Mode 5 integrated and operational test phases for AN/APX-123 Common Transponder, AN/APX-119 Transponder, and AN/APX-111 Combined Interrogator Transponder.	0.031 -	1.200 -	0.549 -	0.000 -	0.549 -

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
FY 2016 Accomplishments: Continued testing of Mode 5 modified equipment including crypto logical devices. Completed Mode 5 Follow on Test and Evaluation for Mode 5 capable AN/APX-111 in F/A-18E/F and EA-18G aircraft. ***FY 2017 Plans:*** Continue testing of Mode 5 modified equipment including crypto logical devices. Perform test planning and execution in support of Mode 5 APX-123 integration on CH-53K platform. ***FY 2018 Base Plans:*** Perform initial ground testing of Mode 5 in the CH-53K aircraft in support of FY19 flight testing and certification efforts. ***FY 2018 OCO Plans:*** N/A					
Accomplishments/Planned Programs Subtotals	1.291	3.852	2.548	0.000	2.548

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/2851: *ID Systems*	29.676	22.177	21.226	-	21.226	26.792	26.707	26.022	26.539	274.506	721.344
• APN/0582: *ID Sys*	41.031	45.768	49.511	-	49.511	41.827	42.668	48.375	49.341	6.388	554.533

Remarks

D. Acquisition Strategy

The Acquisition Strategy is to develop Mode 5 Engineering Change Proposals to modernize Mark XII Identification Friend or Foe (IFF) equipment or insert Mode 5 into existing platforms by JROC memorandums (047-07, 122-08 and 108-13). After integration into all Navy Combat Weapons systems platforms, the Navy will transition Cooperative Identification Capability to Mode 5.

E. Performance Metrics

Continue Full Rate Production and assist in achieving Joint Full Operational Capability in FY2020. Perform studies and analysis for future road mapping of IFF capability.