Exhibit R-2, RDT&E Budget Item Justification: PB 2019 Navy												Date: February 2018
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 5: *System Development & Demonstration (SDD)*					R-1 Program Element (Number/Name) PE 0604777N *I Navigation/Id System*							
COST ($ in Millions)	**Prior Years**	**FY 2017**	**FY 2018**	**FY 2019 Base**	**FY 2019 OCO**	**FY 2019 Total**	**FY 2020**	**FY 2021**	**FY 2022**	**FY 2023**	**Cost To Complete**	**Total Cost**
Total Program Element	561.203	41.905	92.546	121.026	-	121.026	138.648	101.254	85.693	69.074	Continuing	Continuing
0253: *Nav & Electro-Optical Supt*	54.983	3.904	7.477	35.963	-	35.963	36.612	37.381	38.153	38.942	Continuing	Continuing
0676: *Improve ID Development*	41.849	5.013	2.477	2.405	-	2.405	2.335	9.646	8.768	2.482	Continuing	Continuing
0921: *NAVSTAR GPS Equipment*	281.975	23.668	80.044	80.675	-	80.675	97.814	52.298	36.807	25.645	Continuing	Continuing
1253: *Combat Ident System*	182.396	3.517	2.548	1.983	-	1.983	1.887	1.929	1.965	2.005	Continuing	Continuing
9999: *Congressional Adds*	0.000	5.803	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	5.803

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 provides Assured PNT (A-PNT) capability to Command, Control, Communications, Computer, Intelligence, Surveillance and Reconnaissance (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.

The Global Positioning System (GPS)-Based Positioning, Navigation and Timing (PNT) Service (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 challenged/jammed 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 provides Assured PNT (A-PNT) capability to Command, Control, Communications, Computer, Intelligence, Surveillance and Reconnaissance (C4ISR) and Combat Systems in standalone and networked architectures throughout maritime domains.

GPS Modernization addresses the Navy's future integration of the GPS Directorate 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.

B. Program Change Summary ($ in Millions)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
Previous President's Budget	42.723	92.546	120.792	-	120.792
Current President's Budget	41.905	92.546	121.026	-	121.026
Total Adjustments	-0.818	0.000	0.234	-	0.234
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.806	0.000			
• Program Adjustments	0.000	0.000	-2.000	-	-2.000
• Rate/Misc Adjustments	0.000	0.000	2.234	-	2.234
• Congressional General Reductions Adjustments	-0.012	-	-	-	-

Exhibit R-2, RDT&E Budget Item Justification: PB 2019 Navy					Date: February 2018
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 5: *System Development & Demonstration (SDD)*		R-1 Program Element (Number/Name) PE 0604777N *I Navigation/Id System*			
• Congressional Directed Reductions	-6.000	-	-	-	-
Adjustments					
• Congressional Add Adjustments	6.000	-	-	-	-

Congressional Add Details ($ in Millions, and Includes General Reductions)

	FY 2017	FY 2018
Project: 9999: *Congressional Adds*		
Congressional Add: *Improved GPS*	5.803	0.000
Congressional Add Subtotals for Project: 9999	5.803	0.000
Congressional Add Totals for all Projects	5.803	0.000

Change Summary Explanation

The FY 2019 funding request was reduced by $0.792 million to reflect the Department of Navy's effort to support the Office of Management and Budget directed reforms for Efficiency and Effectiveness that include a lean, accountable, more efficient government.

Technical: The increase to Global Positioning System (GPS) Modernization in FY 2019 supports multiple software intensive updates and non-recurring engineering services specifically for F/A-18E/F, EA-18G and E-2D air platforms for the integration of Military Code (M-Code) capable GPS receivers. FY19 funding also supports a full year of integration, government systems engineering and software development efforts for the integration of M-Code capable GPS receivers for surface ship platforms and seven (7) air platforms: F/A-18E/F, EA-18G, E-2D, MV-22B, CMV-22B, CH-53K, and KC-130J.

Program:
Proj: 0253 Nav & Electro-Optical Supt:FY 2019 $26.830M increase is for the major design, development, fabrication, and verification testing of the new Task Oriented Technical Insertion Mast (TOTIM) required for Columbia Class and VA Class Submarines. TOTIM development will utilize open architecture and a non-rotating modular design to reduce life cycle costs and enable flexibility for future capability upgrades. FY 2019 increase includes developing the TOTIM technical data package, executing design reviews, developing test plans, designing counter detection vulnerability reduction, procuring and fabricating the TOTIM test article, and executing test events and environmental qualification testing of TOTIM.

Proj: 0921 NAVSTAR GPS Equipment:GPS Modernization re-baselined schedule to move E-6B air platform initiation from FY18 to FY20 and surface ships from the out-years into FY18 to begin M-Code capability efforts for Size Weight and Power and Cost (SWaP-C) constrained Surface Platforms that cannot accept Global Positioning System (GPS) - Based Positioning, Navigation and Timing (PNT) Service (GPNTS) such as Military Sealift Command (MSC) surface ships.

Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy			Date: February 2018
Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604777N / *Navigation/Id System*	Project (Number/Name) 0253 / *Nav & Electro-Optical Supt*	

COST ($ in Millions)	Prior Years	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
0253: *Nav & Electro-Optical Supt*	54.983	3.904	7.477	35.963	-	35.963	36.612	37.381	38.153	38.942	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The FY19 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. The $28.486M FY19 increase is a significant and key investment in imaging sensors and algorithms to improve submarine operations in high intensity littoral environments, intelligence gathering, real time imagery and support the safe and effective employment of surveillance and weapons systems. First, a $26.830M increase is to design and develop the Tactically Orientated Technical Insertion Mast (TOTIM) which will provide a 360 degree, non-rotating modular mast with vastly increased capability, reduced maintenance costs and increased development flexibility with new reconfigurable mast sensors. Second, a $1.642M increase is to improve the software algorithms and inboard hardware to process the 30 times increase in data provided by TOTIM. Finally, a $0.014M increase is an inflation increase which funds the TI-16 / APB-15 VA Operational Testing that verifies the software improvements funded in previous fiscal years.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
Title: ISIS and Photonics common software and hardware capabilities development and obsolescence.	3.236	5.794	7.436	0.000	7.436
Articles:	-	-	-	-	-
FY 2018 Plans: ISIS Technical Insertion (TI) development for LOS ANGELES, SEAWOLF, VIRGINIA, SSBN and SSGN classes. Consisting of TI and Advanced Processor Build (APB) productionization efforts including incorporation of Automatic Target Recognition, Auto Navigation Fix and Augmented Reality for Navigation as well as integration of unique LPPM capabilities. Continued improvements to current system and software reliability to improve ISIS Operational Availability (Ao).					

Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604777N / *Navigation/Id System*	**Project (Number/Name)** 0253 / *Nav & Electro-Optical Supt*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
Initiate modifications to the ISIS TI-20 baseline which are required to support TOTIM integration. The baseline modifications update the inboard architecture to support the processing, storage, and display of panoramic imaging data which improves operator effectiveness. While FY18 initiates the design and development of a new system architecture in TI-20 ISIS to support TOTIM, the majority of the design effort occurs in FY19. ***FY 2019 Base Plans:*** The $1.642M increase is to design and develop additional complex and sophisticated imaging algorithms, upgrade software and hardware to process 30 times more imaging data provided by 360 degree TOTIM video and enable system to operate TOTIM. The increased data rates from the 360 degree TOTIM provide enhanced situational awareness and effectiveness. Continue Advanced Processor Build (APB) productionization efforts, to add additional functionality including Image Contact Follower Improvements, Small Craft Detection, and Automatic Target Recognition. ***FY 2019 OCO Plans:*** N/A ***FY 2018 to FY 2019 Increase/Decrease Statement:*** The $1.642M increase is to improve and scale ISIS to receive and evaluate 30 times increase in imaging data to be provided by the 360 degree TOTIM video.					
Title: Task-Oriented Technology Insertion Mast (TOTIM)	0.000	1.002	27.832	0.000	27.832
Articles:	-	-	1	-	1
FY 2018 Plans: Initiate development of Task Orientated Tech 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. Specific efforts include: development of TOTIM preliminary architecture and common interface between mast modules. ***FY 2019 Base Plans:*** The $26.830M increase is for the major design, development, fabrication, and verification testing of the new Task Oriented Technical Insertion Mast (TOTIM). TOTIM development will utilize open architecture and a non-rotating modular design to reduce life cycle costs and enable flexibility for future capability upgrades. Specific efforts include: -Start development of the TOTIM technical data package -Execute design reviews					

Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604777N / *Navigation/Id System*	**Project (Number/Name)** 0253 / *Nav & Electro-Optical Supt*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
-Start developing of the test plans -Start designing counter detection vulnerability reduction -Start procuring and fabricating the TOTIM test article for delivery in FY20 -Execute test events and environmental qualification testing of TOTIM ***FY 2019 OCO Plans:*** N/A ***FY 2018 to FY 2019 Increase/Decrease Statement:*** FY 2019 $26.830M increase is to design, develop, fabricate, and test the new Task Oriented Technical Insertion Mast (TOTIM). TOTIM will provide state of the art visual imagery and other sensors which will increase situational awareness (especially in high intensity littoral operations), improve safety of navigation and tactical decision-making, and further advance the safe and effective employment of surveillance and weapons systems. TOTIM development will utilize open architecture and a non-rotating modular design to reduce life cycle costs and enable flexibility for future capability upgrades. FY 2019 increase includes developing the TOTIM technical data package, executing design reviews, developing test plans, designing counter detection vulnerability reduction, procuring and fabricating the TOTIM test article, and executing test events and environmental qualification testing of TOTIM.					
Title: Imaging Systems Test Efforts. ***Articles:*** ***FY 2018 Plans:*** TI-14 / APB-13 VA Integrated Testing (IT) covering capability increases to previous algorithm builds including 360 Degree Image Stitching, LACE Night Modification (VA Class Only) and Super Position. ***FY 2019 Base Plans:*** The $0.014M increase is for TI-16 / APB-15 VA Operational Testing (OT) to verify capability increases to previous algorithm builds including Image Fusion, Automated Detection/Tracking, and Synthetic Horizon. ***FY 2019 OCO Plans:*** N/A ***FY 2018 to FY 2019 Increase/Decrease Statement:*** The $0.014M increase is an inflation adjustment which will fund the design, manage and evaluate results of the Operational Test for TI-16 / APB 15 for modernizing VIRGINIA boats.	0.668 -	0.681 -	0.695 -	0.000 -	0.695 -
Accomplishments/Planned Programs Subtotals	3.904	7.477	35.963	0.000	35.963

Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604777N / *Navigation/Id System*	**Project (Number/Name)** 0253 / *Nav & Electro-Optical Supt*

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
• SCN/2013: *Photonics Mast*	38.909	39.648	40.442	-	40.442	41.250	42.076	42.918	43.776	Continuing	Continuing
• RDT&E/0604558N: *VIRGINIA Class Design Development*	1.000	1.020	1.040	-	1.040	1.061	1.082	1.104	1.126	Continuing	Continuing
• RDT&E/0603562N: *Advanced Submarine Support Equipment (ASSEP)*	4.419	4.155	4.307	-	4.307	4.672	4.777	4.866	4.977	Continuing	Continuing
• OPN/0840: *Sub Periscope, Imaging Equip. and Supt Equip Program*	151.963	151.240	178.421	-	178.421	199.590	224.643	215.012	255.918	Continuing	Continuing
• RDT&E/0603595N: *COLUMBIA Class Design Development*	0.882	1.024	1.118	-	1.118	1.115	0.898	0.936	0.954	0.000	6.927

Remarks

D. Acquisition Strategy

The Acquisition Strategy for AN/BVY-1 Integrated Submarine Imaging System (ISIS) is dated 07 Jul 2003. The Acquisition 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 is dated 07 Jul, 2017.

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-3, RDT&E Project Cost Analysis: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604777N / *Navigation/Id System*	**Project (Number/Name)** 0253 / *Nav & Electro-Optical Supt*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Software Development	C/CPIF	Lockheed Martin : Manassas, VA	15.492	1.273	Dec 2016	2.075	Dec 2017	3.142	Dec 2018	-		3.142	Continuing	Continuing	Continuing
Systems Engineering	WR	NUWC : Newport, RI	16.034	0.690	Oct 2016	1.037	Oct 2017	1.558	Dec 2018	-		1.558	Continuing	Continuing	Continuing
Hardware Development	C/CPIF	Lockheed Martin : Manassas, VA	6.460	1.228	Dec 2016	2.636	Dec 2017	2.689	Dec 2018	-		2.689	Continuing	Continuing	Continuing
Hardware Development	TBD	TBD : TBD	0.000	0.000		1.002	Dec 2017	27.832	Dec 2018	-		27.832	Continuing	Continuing	Continuing
Hardware Development	C/CPFF	L3-KEO : Northhampton, MA	7.953	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
		Subtotal	45.939	3.191		6.750		35.221		-		35.221	Continuing	Continuing	N/A

Remarks

FY 2019 increase is for the major design, development, fabrication, and verification testing of the new Task Oriented Technical Insertion Mast (TOTIM) required for Columbia Class and VA Class Submarines. TOTIM development will utilize open architecture and a non-rotating modular design to reduce life cycle costs and enable flexibility for future capability upgrades. FY 2019 increase includes developing the TOTIM technical data package, executing design reviews, developing test plans, designing counter detection vulnerability reduction, procuring and fabricating the TOTIM test article ($8.995 million), and executing test events and environmental qualification testing of TOTIM.

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Development Test & Evaluation	WR	NUWC : Newport, RI	7.400	0.418	Oct 2016	0.426	Oct 2017	0.435	Oct 2018	-		0.435	Continuing	Continuing	Continuing
Development Test & Evaluation	WR	COMOPTEVFOR : Norfolk, VA	0.910	0.250	Oct 2016	0.255	Oct 2017	0.260	Oct 2018	-		0.260	Continuing	Continuing	Continuing
Development Test & Evaluation	C/CPFF	Lockheed Martin : Manassas, VA	0.200	0.000	Mar 2017	0.000		0.000		-		0.000	0.000	0.200	-
		Subtotal	8.510	0.668		0.681		0.695		-		0.695	Continuing	Continuing	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2019 Navy			Date: February 2018
Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604777N / *Navigation/Id System*	Project (Number/Name) 0253 / *Nav & Electro-Optical Supt*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Travel	WR	NAVSEA : Washington, DC	0.534	0.045	Oct 2016	0.046	Oct 2017	0.047	Oct 2018	-		0.047	Continuing	Continuing	Continuing
		Subtotal	0.534	0.045		0.046		0.047		-		0.047	Continuing	Continuing	N/A

	Prior Years	FY 2017		FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	54.983	3.904		7.477		35.963		-		35.963	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604777N / *Navigation/Id System*	**Project (Number/Name)** 0253 / *Nav & Electro-Optical Supt*

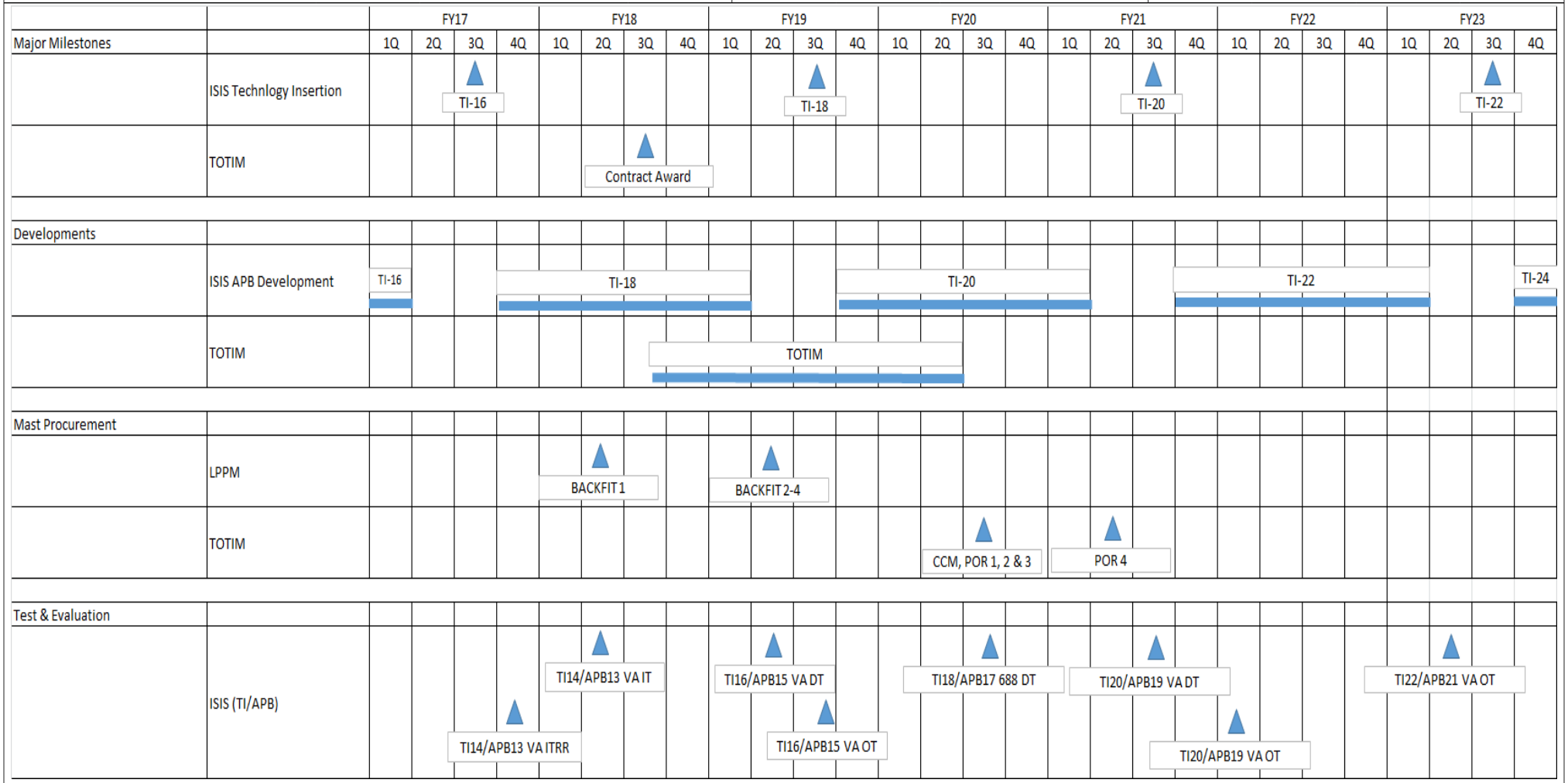


Exhibit R-4A, RDT&E Schedule Details: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604777N / *Navigation/Id System*	**Project (Number/Name)** 0253 / *Nav & Electro-Optical Supt*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Nav & Electro-Optical Supt				
Major Milestones: ISIS Technology Insertion: ISIS Technology Insertion Fielding (TI-16)	3	2017	3	2017
Major Milestones: ISIS Technology Insertion: ISIS Technology Insertion Fielding (TI-18)	3	2019	3	2019
Major Milestones: ISIS Technology Insertion: ISIS Technology Insertion Fielding (TI-20)	3	2021	3	2021
Major Milestones: ISIS Technology Insertion: ISIS Technology Insertion Fielding (TI-22)	3	2023	3	2023
Major Milestones: TOTIM: Contract Award	3	2018	3	2018
Developments: ISIS APB Development: Development: ISIS TI-16	1	2017	1	2017
Developments: ISIS APB Development: Development: ISIS TI-18	4	2017	1	2019
Developments: ISIS APB Development: Development: ISIS TI-20	4	2019	1	2021
Developments: ISIS APB Development: Development: ISIS TI-22	4	2021	1	2023
Developments: ISIS APB Development: Development: ISIS TI-24	4	2023	4	2023
Developments: TOTIM Development: TOTIM	3	2018	2	2020
Mast Procurement: LPPM (Buy): Backfit 1	2	2018	2	2018
Mast Procurement: LPPM (Buy): Backfit 2 - 4	2	2019	2	2019
Mast Procurement: TOTIM (Buy): CCM, POR 1, 2 & 3	3	2020	3	2020
Mast Procurement: TOTIM (Buy): POR 4	2	2021	2	2021
Test & Evaluation: ISIS (TI/APB): Test & Evaluation - ISIS TI-14/APB 13 ITRR	4	2017	4	2017
Test & Evaluation: ISIS (TI/APB): Test & Evaluation - ISIS TI-14/APB 13 VA IT	2	2018	2	2018
Test & Evaluation: ISIS (TI/APB): Test & Evaluation - ISIS TI-16/APB 15 VA DT	2	2019	2	2019
Test & Evaluation: ISIS (TI/APB): Test & Evaluation - ISIS TI-16/APB 15 VA OT	3	2019	3	2019

Exhibit R-4A, RDT&E Schedule Details: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604777N / *Navigation/Id System*	**Project (Number/Name)** 0253 / *Nav & Electro-Optical Supt*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Test & Evaluation: ISIS (TI/APB): Test & Evaluation - ISIS TI-18/APB 17 688 DT	3	2020	3	2020
Test & Evaluation: ISIS (TI/APB): Test & Evaluation - ISIS TI-20/APB 19 VA DT	3	2021	3	2021
Test & Evaluation: ISIS (TI/APB): Test & Evaluation - ISIS TI-20/APB 19 VA OT	1	2022	1	2022
Test & Evaluation: ISIS (TI/APB): Test & Evaluation - ISIS TI-22/APB 21 VA OT	2	2023	2	2023

Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy			Date: February 2018
Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604777N / *Navigation/Id System*	Project (Number/Name) 0676 / *Improve ID Development*	

COST ($ in Millions)	Prior Years	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
0676: *Improve ID Development*	41.849	5.013	2.477	2.405	-	2.405	2.335	9.646	8.768	2.482	Continuing	Continuing
Quantity of RDT&E Articles		-	1	-	-	-	-	-	-	-		

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 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
Title: AN/UPX-29 (V) - OE-120()/UPX Antenna Tech Refresh	4.869	1.720	1.611	0.000	1.611
Articles:	-	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 2018 Plans:*** Complete development of OE-120()/UPX retrofit kit. Complete qualification testing. Complete and deliver the Engineering Development Model (EDM). ***FY 2019 Base Plans:*** Establish tech-refresh configuration at In-Service Engineering Activity lab and land-based test sites. ***FY 2019 OCO Plans:*** N/A ***FY 2018 to FY 2019 Increase/Decrease Statement:*** Decrease of $0.109M from FY 2018 to FY 2019 is due to the OE-120()/UPX development program ramping down.					
Title: Mark XIIA Mode 5 and Mode S Improvement for AN/UPX-29(V)	0.000	0.334	0.371	0.000	0.371

Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604777N / *Navigation/Id System*	**Project (Number/Name)** 0676 / *Improve ID Development*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
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 2018 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 2019 Base Plans:*** Continue 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. Evaluate inter-operability test data to validate planned combat system software design changes. ***FY 2019 OCO Plans:*** N/A ***FY 2018 to FY 2019 Increase/Decrease Statement:*** Increase of $0.037M from FY 2018 to FY 2019 is due to the software development increase for evaluation of Mode 5/Mode S interoperability test data.					
Title: AN/UPX-29(V) Management Support	0.144	0.423	0.423	0.000	0.423
Articles:	-	-	-	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604777N / *Navigation/Id System*	**Project (Number/Name)** 0676 / *Improve ID Development*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
Description: Engineering and Program Management of the AN/UPX 29 (V). Perform system integration efforts. ***FY 2018 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 2019 Base Plans:*** Support logistics and technical data management for the AN/UPX 29 (V) Mode 5/Mode S integration. Evaluate in-service OE-120 antenna systems for maximum service life and create corresponding OE-120 retro-fit schedule. ***FY 2019 OCO Plans:*** N/A					
Accomplishments/Planned Programs Subtotals	5.013	2.477	2.405	0.000	2.405

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
• OPN/2851: *ID Systems*	22.177	21.239	26.163	-	26.163	26.139	25.463	49.655	57.497	348.665	875.227

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-3, RDT&E Project Cost Analysis: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604777N / *Navigation/Id System*	**Project (Number/Name)** 0676 / *Improve ID Development*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Primary Hardware Development	WR	NAWCAD : St Inigoes, MD	9.264	0.049	Nov 2016	0.000		1.139	Nov 2018	-		1.139	Continuing	Continuing	Continuing
Ship Integration	WR	NAWCAD : St Inigoes, MD	2.462	0.000		0.000		0.115	Nov 2018	-		0.115	0.000	2.577	-
Systems Engineering	WR	NAWCAD : St Inigoes, MD	6.229	0.000		0.000		0.357	Nov 2018	-		0.357	0.000	6.586	-
OE-120 Tech Refresh	SS/FFP	BAE : Nashua, NH	8.943	4.820	Nov 2016	1.720	Nov 2017	0.000		-		0.000	0.000	15.483	15.483
		Subtotal	26.898	4.869		1.720		1.611		-		1.611	Continuing	Continuing	N/A

Remarks

Decrease in FY19 for OE-120 Tech Refresh efforts is due to the transition from OEM to USG. Primary Hardware Development, Ship Integration, and Systems Engineering increases in FY19 are due to the transition from OEM to USG for establishment of OE-120 Tech Refresh configuration at In-Service Engineering Activity (ISEA) and Land Base Test Site (LBTS) labs.

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Configuration Management	WR	NAWCAD : St Inigoes, MD	0.169	0.000		0.000		0.075	Nov 2018	-		0.075	0.000	0.244	-
ILS	WR	NAWCAD : St Inigoes, MD	2.547	0.000		0.239	Nov 2017	0.000		-		0.000	0.000	2.786	-
Software Development	WR	NAWCAD : St Inigoes, MD	5.535	0.000		0.000		0.197	Nov 2018	-		0.197	0.000	5.732	-
Technical Data	WR	NAWCAD : St Inigoes, MD	1.874	0.000		0.095	Nov 2017	0.099	Nov 2018	-		0.099	0.000	2.068	-
Training	WR	NAWCAD : St Inigoes, MD	0.200	0.000		0.000		0.000		-		0.000	0.000	0.200	-
Engineering	WR	NAWCAD : PAX River, MD	0.244	0.000		0.000		0.000		-		0.000	0.000	0.244	-
		Subtotal	10.569	0.000		0.334		0.371		-		0.371	0.000	11.274	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2019 Navy			Date: February 2018
Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604777N / *Navigation/Id System*	Project (Number/Name) 0676 / *Improve ID Development*	

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract

Remarks

Software development cost increases for evaluation of Mode 5/Mode S interoperability test data from combat system software design changes.

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Developmental Test & Evaluation	WR	NAWCAD : St Inigoes, MD	0.500	0.000		0.000		0.000		-		0.000	0.000	0.500	-
Operational Test & Evaluation	WR	NAWCAD : St Inigoes, MD	1.328	0.000		0.000		0.000		-		0.000	0.000	1.328	-
Test Assets	WR	NAWCAD : St Inigoes, MD	0.731	0.000		0.000		0.000		-		0.000	0.000	0.731	-
		Subtotal	2.559	0.000		0.000		0.000		-		0.000	0.000	2.559	N/A

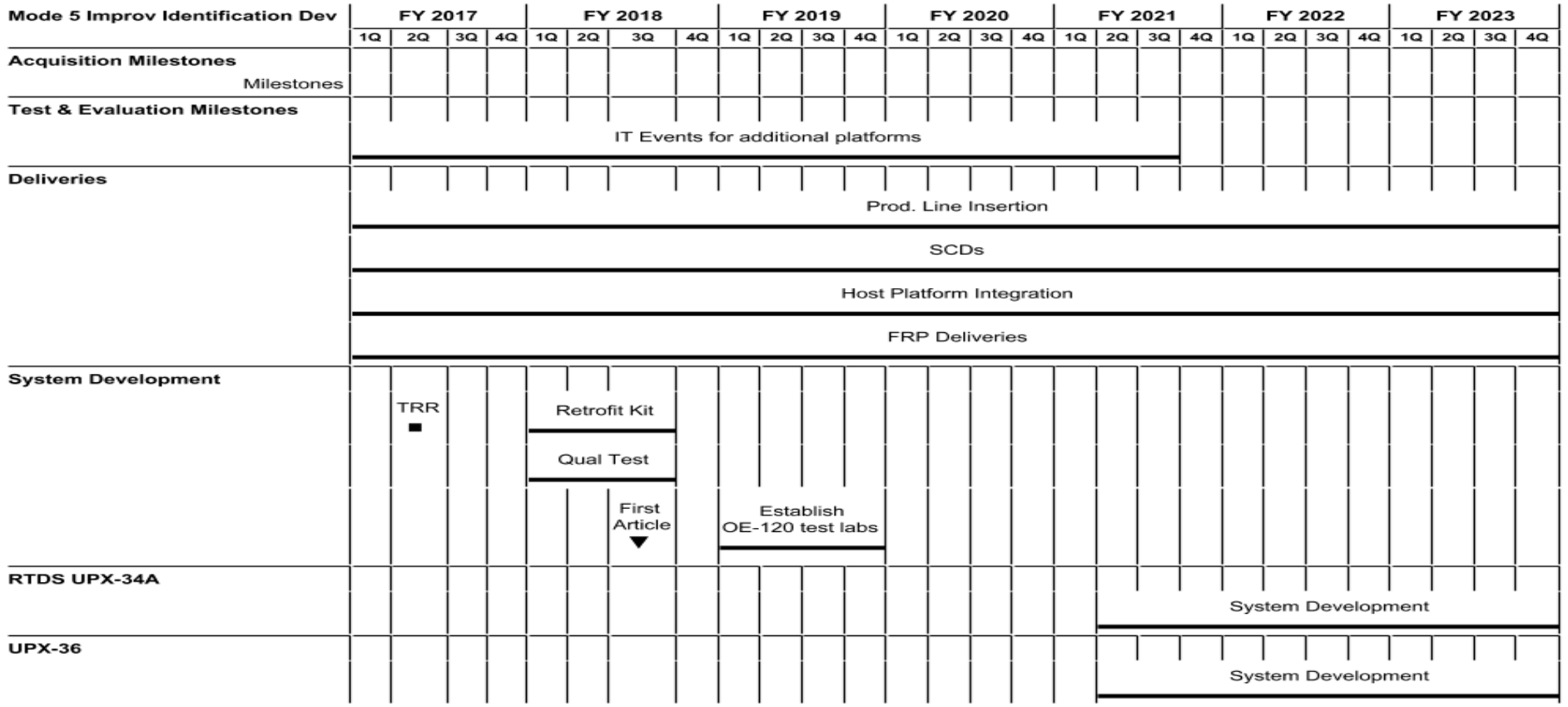
Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management Support	C/CPFF	American Electronics : California, MD	1.823	0.144	Nov 2016	0.423	Nov 2017	0.423	Nov 2018	-		0.423	0.000	2.813	2.813
		Subtotal	1.823	0.144		0.423		0.423		-		0.423	0.000	2.813	N/A

	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	41.849	5.013		2.477		2.405		-		2.405	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604777N / *Navigation/Id System*	**Project (Number/Name)** 0676 / *Improve ID Development*



2019PB - 0604777N - 0676

Exhibit R-4A, RDT&E Schedule Details: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604777N / *Navigation/Id System*	**Project (Number/Name)** 0676 / *Improve ID Development*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Mode 5 Improv Identification Dev				
Test & Evaluation Milestones: IT Events for additional platforms	1	2017	3	2021
Deliveries: Mode 5 - Production Line Insertion	1	2017	4	2023
Deliveries: Mode 5 - Prepare and Evaluate ECPs/SCDs	1	2017	4	2023
Deliveries: Mode 5 - Host Platform Integrations	1	2017	4	2023
Deliveries: Mode 5 - FRP Deliveries	1	2017	4	2023
System Development: TRR	2	2017	2	2017
System Development: Retrofit Kit	1	2018	3	2018
System Development: Qual Test	1	2018	3	2018
System Development: OE-120 Tech Refresh First Article Delivery	3	2018	3	2018
System Development: Establish ISEA and LBTS OE-120 tech refresh labs.	1	2019	4	2019
RTDS UPX-34A: System Development (UPX-34A ECP)	2	2021	4	2023
UPX-36: System Development (UPX-36 ECP)	2	2021	4	2023

Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy			Date: February 2018
Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604777N / *Navigation/Id System*	Project (Number/Name) 0921 / *NAVSTAR GPS Equipment*	

COST ($ in Millions)	Prior Years	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
0921: *NAVSTAR GPS Equipment*	281.975	23.668	80.044	80.675	-	80.675	97.814	52.298	36.807	25.645	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 provides Assured PNT (A-PNT) capability to Command, Control, Communications, Computer, Intelligence, Surveillance and Reconnaissance (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

Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604777N / *Navigation/Id System*	**Project (Number/Name)** 0921 / *NAVSTAR GPS Equipment*

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.

FY19 growth in Global Positioning System (GPS) Modernization is to continue GPS integration efforts for surface platforms and seven (7) air platforms: F/A-18E/F, EA-18G, E-2D, MV-22B, CMV-22B, CH-53K, and KC-130J. 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 Air program office to include management, oversight and support of the effort. To meet the Navy's schedule, efforts must begin before actual delivery of Military GPS User Equipment (MGUE) products from the Air Force.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
Title: Air Navigation Warfare (NAVWAR)	2.208	13.237	8.195	0.000	8.195
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 2018 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 anti-jam antennas in AH-1Z, UH-1Y helicopters, MQ-4C, and MQ-8B/C air platforms. Efforts require ramp up of systems engineering to include integration studies; Non-Recurring Engineering (NRE) for platform interface modifications; Global Positioning System (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 Power test, Environmental test, Weapons Replaceable Assembly (WRA) Box-Level Electromagnetic Interference (EMI) Test, and System-Level EMI Tests. Begin integration of AJ capability and upgrade main operation software to incorporate secure Y-Mode functionality for MV-22, E-2D and MQ-8B/C Fire Scout platforms.					

Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604777N / *Navigation/Id System*	**Project (Number/Name)** 0921 / *NAVSTAR GPS Equipment*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
Design antenna solution. Conduct laboratory 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 Anti-Jam (AJ) capable antennas to include Unmanned Aircraft Systems (UAS) and E-2D. Conduct testing of small form factor AJ solution. Continue Navigation Warfare (NAVWAR) AJ demonstrations for unmanned platforms, work on miniaturized NAVWAR Anti-Jam antenna solutions, and assist new unmanned vehicles with navigation issues. 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 Assured-Position, Navigation and Timing (A-PNT) efforts by working with Navy Air platforms on future navigation requirements and coordinating with surface Navy platforms to leverage synergies. Continue development of Aviation Position, Navigation and Timing (PNT) Capabilities Based Assessment (CBA) and determine Assured Position Velocity and Timing (APVT) requirements for E-2D and P-8A aircraft. Continue to assist the Fleet with Global Positioning System (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 Office of the Secretary of Defense (OSD) initiatives. ***FY 2019 Base Plans:*** Continue to integrate AJ antennas into select aviation platforms and to fund development and integration of miniaturized AJ antennas in AH-1Z, UH-1Y helicopters, MQ-4C, and MQ-8B/C Fire Scout air platforms. Perform systems engineering to include integration studies; follow on testing to resolve discrepancies; Non-Recurring Engineering (NRE) for platform interface modifications; integration testing; test plan development and updates; test support, analysis and reporting; and increased engineering support staff. Efforts will continue to determine air platform specific requirements and solutions. Continue developmental test effort to identify a common solution for H-1 helicopter variants to include the AH-1Z and UH-1Y. Continue integration of solution on platforms to resolve deficiencies through follow on testing					

Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604777N / *Navigation/Id System*	**Project (Number/Name)** 0921 / *NAVSTAR GPS Equipment*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
including Power test, Environmental test, Weapons Replaceable Assembly (WRA) Box-Level Electromagnetic Interference (EMI) Test, and System-Level EMI Tests. Continue developmental effort for AJ capability on MQ-8B and MQ-8C to include hardware integration of solution on platform and software testing for safety of flight certification. Continue effort to upgrade main operation software including development, integration and laboratory testing to incorporate Y-Only mode functionality for MV-22, E-2D, and MQ-8B/C Fire Scout platforms. Conduct in flight testing of Global Positioning System (GPS) receivers with associated antennas at Facilities for Antenna and Radar Cross Section (RCS) Measurements (FARM). Continue efforts to assist with coordination of E-2D platforms with Anti-Jam (AJ) capable antennas in conjunction with a refueling probe upgrade. Continue to support 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. Finalize Aviation Position, Navigation and Timing (PNT) Capabilities Based Assessment (CBA) and determine Assured Position Velocity and Timing (APVT) requirements for F/A-18E/F, MQ-4C and H-60 aircraft according to the OPNAV N2N6 guidance and prioritization. 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 Navigation Warfare (NAVWAR) Memorandum of Understanding (MOU) initiatives with Canada, United Kingdom and Australia to meet Office of the Secretary of Defense (OSD) initiatives. ***FY 2019 OCO Plans:*** N/A ***FY 2018 to FY 2019 Increase/Decrease Statement:***					

Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604777N / *Navigation/Id System*	**Project (Number/Name)** 0921 / *NAVSTAR GPS Equipment*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
Funding decrease from FY 2018 to FY 2019 is due to procurement of multiple test articles and systems engineering efforts that began labor intensive Non-Recurring Engineering (NRE) efforts and integration efforts in FY 2018. FY 2019 funding supports NRE updates and follow on testing to resolve discrepancies.					
Title: Sea Navigation Warfare (NAVWAR)	8.169	6.109	2.870	0.000	2.870
Articles:	-	-	-	-	-
Description: Sea Navigation Warfare (NAVWAR) provides the Warfighter continued access to GPS through the use of 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 Global Positioning System (GPS) Enhancement (SAGE) antenna development, which integrates Anti-Jam (AJ) capability into the submarine Multi-Function Mast (OE-538B). Sea Navigation Warfare (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 2018 Plans: Continue to provide government oversight, system engineering, logistics, contracts, and programmatic management efforts for SAGE and integration into the OE-538B antenna system development. Complete Test Readiness Review (TRR), 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 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 (FAQT) of SAGE and OE-538B antenna system: - Radio Frequency (RF) Characterization - Structure Borne Noise (SBN) - Electromagnetic Interference (EMI) - Vibration					

Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604777N / *Navigation/Id System*	**Project (Number/Name)** 0921 / *NAVSTAR GPS Equipment*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
- Electromagnetic Pulse (EMP)/High Altitude Electromagnetic Pulse (HEMP) - Thermal - Electromagnetic Environmental Effects (E3) - Underwater Explosion (UNDEX) Commence efforts for the OE-538B Physical Configuration Audit and development of OE-538B Technical Manual, I-Level Factory Training, and Factory Maintenance Demonstration. Complete Engineering Change (EC) process for implementation of the OE-538B antenna system on all submarine classes. Commence preparation for submarine Multi-Function Mast (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 Navigation Warfare (NAVWAR) Memorandum of Understanding (MOU) initiatives with Canada, United Kingdom and Australia to meet Office of the Secretary of Defense (OSD) initiatives. OCO: N/A. ***FY 2019 Base Plans:*** Complete government oversight, system engineering, logistics, contracts, and programmatic management efforts for the Submarine Anti-Jam GPS Enhancement (SAGE) and integration into the OE-538B antenna system development. Conduct OE-538B Developmental Testing/Operational Testing (DT/OT) on operational submarine classes. Commence and obtain fielding decision for full implementation of OE-538B antenna system. ***FY 2019 OCO Plans:***					

Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604777N / *Navigation/Id System*	**Project (Number/Name)** 0921 / *NAVSTAR GPS Equipment*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
N/A ***FY 2018 to FY 2019 Increase/Decrease Statement:*** Funding decrease from FY 2018 to FY 2019 is due to conducting final stages of development, integration testing and documentation of SAGE and OE-538B antenna system in FY 2018. FY 2019 funding supports Developmental Testing/Operational Testing (DT/OT) on operational submarine classes and completion of system engineering and programmatic support to obtain OE-538B Fielding Decision for full implementation of the antenna system.					
Title: Global Positioning System (GPS) - Based Positioning, Navigation and Timing (PNT) Service (GPNTS) ***Articles:*** ***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 2018 Plans:*** The $8M increase in funding is for: 1) additional developmental 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 Global Positioning System (GPS)-Based Positioning, Navigation and Timing (PNT) Service (GPNTS) configuration to meet unique requirements for Frigate (FFG-(X)), formerly known as 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 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 Navy Cybersecurity mandates. Commence the design, build, integration, and test of a GPNTS one rack solution for smaller surface combatant platforms to include Dock Landing Ship, United States Coast Guard, patrol crafts, Mine Countermeasure,and Military Sealift Command platforms.	5.497 -	17.689 -	16.625 -	0.000 -	16.625 -

Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604777N / *Navigation/Id System*	**Project (Number/Name)** 0921 / *NAVSTAR GPS Equipment*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
Commence the requirements analysis and initiate the design and development of a GPNTS configuration modification for the FFG-(X) platforms to replace the currently installed commercial navigation systems. Begin development, assembly, and implementation of a Navigation Simulator and Advanced GPS Navigation Simulator 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 prior to formal IOT&E. 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 onboard the test platforms. Continue to develop the GPNTS software in support of IOT&E. Continue development of Initial Operational Test and Evaluation (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 2019 Base Plans:*** Resolve remaining software defects on the Global Positioning System (GPS)-Based Positioning, Navigation and Timing (PNT) Service (GPNTS) software prior to commencing IOT&E. Commence the implementation of GPNTS Pre-planned Product Improvement (P3I) technology software enhancements for Assured-Positioning, Navigation, and Timing (A-PNT) sensor suite integration to include: 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 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.					

Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604777N / *Navigation/Id System*	**Project (Number/Name)** 0921 / *NAVSTAR GPS Equipment*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
Begin integration of the Office of Naval Research (ONR) developed capability, Non-GPS Aided Positioning for Surface and Subsurface (NoGAPSS), into the GPNTS software baseline. The NoGAPSS capability provides additional resiliency for Assured-Positioning, Navigation, and Timing (A-PNT) data required for combat systems, weapons, navigation, command, control, communications, and other systems, as well as providing the time and frequency synchronization critical to the network infrastructure in a GPS interference or denied environment. Obtain an Authority to Operation (ATO) from the Navy Authorization Office (NAO) in order to install and operate a GPNTS system onboard a Navy ship. Conduct GPNTS Technical Evaluation prior to IOT&E. Conduct GPNTS IOT&E for two rack solution. Conduct Navigation Certification following IOT&E on program selected platforms. ***FY 2019 OCO Plans:*** N/A ***FY 2018 to FY 2019 Increase/Decrease Statement:*** Funding decrease from FY 2018 to FY 2019 is due to preparation for Initial Operational Test and Evaluation (IOT&E)efforts in FY 2018. FY 2019 funding supports actual IOT&E event and commencement of software enhancement efforts to support Assured-Positioning, Navigation, and Timing (A-PNT) resiliency.					
Title: Global Positioning System (GPS) Modernization	7.794	43.009	52.985	0.000	52.985
Articles:	-	-	-	-	-
Description: Global Positioning System (GPS) Modernization funds the Navy's integration of Military GPS User Equipment (MGUE), specifically Military Code (M-Code) capable GPS receivers, being developed by the Air Force GPS Directorate into various receivers on Navy air and sea platforms. Integration of these receivers addresses emerging threats to GPS by securing access to the new GPS M-Code signal. 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. This project is 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					

Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604777N / *Navigation/Id System*	**Project (Number/Name)** 0921 / *NAVSTAR GPS Equipment*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
engineering, integration, and testing for multiple platforms. This effort includes use of core expertise and government engineers from multiple Navy platform program offices to conduct systems engineering, provide 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. For aircraft integration, GPS M-Code capable receivers will be procured through existing Air Force Joint Services System Management Office (JSSMO) contracts and integrated on Navy platforms using Prime Vendor contracts held by each platform's program office. Each platform uses a unique GPS receiver requiring individual parallel efforts to integrate MGUE into each specific receiver. Each receiver integration effort requires a separate team to address the unique requirements. Additionally, each platform has a unique GPS system configuration, which requires separate parallel efforts to integrate and test the modernized GPS receiver into 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. To meet the Navy's mandate, system engineering and requirement development efforts must begin before actual delivery of MGUE. ***FY 2018 Plans:*** The increase in funding is to begin integration of Military Code (M-Code) capable Global Positioning System (GPS) receivers and start government systems engineering and contracting efforts for four (4) additional air platforms: MV-22B, CMV-22B, CH-53K, KC-130J as well as continue modernization efforts for three (3) air platforms : F/A-18E/F, EA-18G, and E-2D. Award Prime Vendor GPS contracts for platform integration and test efforts, and procure production ready unit (PRU) test articles for platform integration and test activities. The increase is also required to start integration of M-Code capable GPS receivers and small anti-jam antenna systems into Size Weight and Power and Cost (SWaP-C) constrained Surface Platforms that cannot accept Global Positioning System (GPS) - Based Positioning, Navigation and Timing (PNT) Service (GPNTS). These efforts require separate teams to work with the four (4) GPS receiver vendors, five (5) Air program office organizations, Military Sea Lift Command (MSC), and five (5) Prime Vendors contracts to integrate and test the modernized GPS receiver for each platform. Begin GPS Modernization integration efforts on four (4) additional air platforms: MV-22B, CMV-22B, CH-53K, and KC-130J. - Initiate development of requirements and systems engineering efforts for integrating M-Code GPS receivers into the airframe and aircraft software. - Develop and implement process to integrate M-Code capability into platform receiver and to test modernized receiver into platform.					

Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604777N / *Navigation/Id System*	**Project (Number/Name)** 0921 / *NAVSTAR GPS Equipment*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
- Procure test article receivers to provide production representative M-Code receivers for laboratory and flight testing for two (2) air platforms: MV-22B and CMV-22B. - Begin procurement planning process, award contracts, and commence efforts for integration of M-Code into receiver for two (2) air platforms: MV-22B and CMV-22B. - Begin procurement planning process to award M-Code receiver integration contracts for two (2) air platforms: CH-53K, and KC-130J. - 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. Begin GPS Modernization integration efforts on SWaP-C constrained MSC surface platforms. - Obtain acquisition authority to provide M-Code GPS Receiver with small Anti-Jam (AJ) Antenna system solution for SWaP-C constrained surface platforms. - Procure M-Code GPS Receiver and small AJ Antenna test assets. - Conduct platform requirement analysis including site surveys of targeted platforms, small Anti-Jam Antenna top side studies, and development of installation and related documentation. - Perform risk reduction integration and performance characterization testing of M-Code GPS Receiver and small AJ Antenna system Continue Global Positioning System (GPS) Modernization integration efforts on three (3) air platforms: F/A-18E/F, EA-18G, and E-2D. - Continue development of requirements and systems engineering efforts for integrating Military Code (M-Code) GPS receivers into airframe and aircraft software. - Procure test articles for laboratory and flight testing for all three (3) air platforms. - Complete hardware and software M-Code integration risk reduction studies. - Award contracts and commence efforts for integration of M-Code into receiver for all three (3) air platforms. - 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 2019 Base Plans:*** The increase in FY19 funding is to ramp up GPS Modernization efforts for CH-53K aircraft to include hardware/software Customization of the M-Code Receiver and award prime vendor contract to commence M-Code receiver integration into the aircraft. Continue GPS Modernization integration and test efforts for surface					

Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604777N / *Navigation/Id System*	**Project (Number/Name)** 0921 / *NAVSTAR GPS Equipment*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
platforms, seven (7) air platforms: F/A-18E/F, EA-18G, E-2D, MV-22B, CMV-22B, CH-53K, and KC-130J and procure PRU test articles for certain air platform integration and test activities. These efforts require separate teams to work with four (4) GPS receiver vendors, five (5) Air program office organizations, Military Sea Lift Command, and six (6) aircraft Prime Vendors contracts to integrate and test the modernized GPS receiver for each platform. Continue GPS Modernization efforts on the following five (5) air platforms: F/A-18E/F, EA-18G, E-2D, MV-22B and CMV-22B which have procured test articles and awarded prime vendor integration efforts: - Finalize cybersecurity requirements and Software Statement of Requirements (SOR) - Conduct systems engineering and technical reviews (SETR) including Systems Requirements Review (SRR) and Preliminary Design Review (PDR) - Perform Non-recurring Engineering (NRE) efforts and software updates required for the design and testing of M-Code GPS receivers in support of developmental and operational test events. - Provide overarching management, central coordination, government oversight and guidance, shared expertise, and engineering support to ensure aircraft performance and integration requirements are supported during M-Code receiver development. Continue GPS Modernization efforts on the following two (2) air platforms: CH-53K, and KC-130J - Development of requirements and systems engineering efforts for integrating Military Code (M-Code) Global Positioning System (GPS) receivers into the airframe and aircraft software. - Continue process to integrate M-Code capability into platform receiver and to test modernized receiver into platform. - Procure Embedded GPS/INS (Global Positioning System/Inertial Navigation System) (EGI) test article receivers to provide production representative M-Code receivers for laboratory and flight testing for CH-53K air platform. - Award contracts and commence integration of M-Code into receiver CH-53K air platform. - Provide overarching management, central coordination, government oversight and guidance, shared expertise, and engineering support to ensure aircraft performance and integration requirements are supported during M-Code receiver development. Continue GPS Modernization efforts for Size Weight and Power and Cost (SWaP-C) constrained Military Sealift Command (MSC) surface platforms: - Begin Environment Qualification Testing of M-Code GPS Receiver and small Anti-Jam (AJ) Antenna system.					

Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604777N / *Navigation/Id System*	**Project (Number/Name)** 0921 / *NAVSTAR GPS Equipment*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
- Perform land based Anti-Jam and Anti-Spoof performance testing of M-Code GPS Receiver and small AJ Antenna system. - Perform platform specific integration testing. ***FY 2019 OCO Plans:*** OCO: N/A. ***FY 2018 to FY 2019 Increase/Decrease Statement:*** The increase to GPS Modernization funding requirements in FY 2019 supports multiple software intensive updates and non-recurring engineering services specifically for F/A-18E/F, EA-18G and E-2D air platforms for the integration of M-Code capable GPS receivers. FY19 funding also supports a full year of integration, government systems engineering and software development efforts for the integration of M-Code capable GPS receivers for surface ship platforms and seven (7) air platforms: F/A-18E/F, EA-18G, E-2D, MV-22B, CMV-22B, CH-53K, and KC-130J.					
Accomplishments/Planned Programs Subtotals	23.668	80.044	80.675	0.000	80.675

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
• OPN/2657: *NAVSTAR GPS Receivers (Space)*	7.102	15.923	10.703	-	10.703	32.733	33.815	30.060	23.037	Continuing	Continuing
• APN/0577: *Common Avionics Changes*	7.091	7.417	7.543	-	7.543	8.118	9.469	11.935	34.508	402.100	872.249

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 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.

Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604777N / *Navigation/Id System*	**Project (Number/Name)** 0921 / *NAVSTAR GPS Equipment*

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).

The primary metric used for the GPS Modernization is successful completion of the system development as outlined in the Project Definition Document (PDD) for GPS Modernization.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2019 Navy			Date: February 2018
Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 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 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Air NAVWAR Development Support	WR	NAWC : Pax River, MD	0.000	0.266	Dec 2016	2.215	Nov 2017	2.000	Nov 2018	-		2.000	Continuing	Continuing	Continuing
Air NAVWAR Govt Eng Support	WR	NAWC : Pax River, MD	0.000	0.406	Dec 2016	2.566	Dec 2017	2.250	Dec 2018	-		2.250	Continuing	Continuing	Continuing
Sea NAVWAR Development	C/CPIF	Lockheed : Marion, MA	4.031	5.200	Dec 2016	2.330	Oct 2017	0.000		-		0.000	0.000	11.561	-
Sea NAVWAR Development Support	WR	SSC PAC, NUWC : San Diego, Newport	0.000	0.924	Dec 2016	1.484	Dec 2017	0.800	Dec 2018	-		0.800	Continuing	Continuing	Continuing
Sea NAVWAR Govt Eng Support	WR	SSC PAC, NUWC : San Diego, Newport	0.000	1.401	Dec 2016	0.345	Dec 2017	0.283	Dec 2018	-		0.283	Continuing	Continuing	Continuing
GPNTS HW / SW Development	C/CPIF	Raytheon : San Diego, CA	37.364	2.224	Nov 2016	5.000	Nov 2017	0.000		-		0.000	0.000	44.588	-
GPNTS SW / NoGAPSS Development	C/CPFF	TBD : TBD	0.000	0.000		0.000		7.800	Dec 2018	-		7.800	Continuing	Continuing	Continuing
GPNTS Development Support	WR	SSC PAC : San Diego, CA	0.000	0.725	Dec 2016	2.658	Dec 2017	1.500	Dec 2018	-		1.500	Continuing	Continuing	Continuing
GPNTS Govt Eng Support	WR	SSC PAC : San Diego, CA	0.000	1.105	Dec 2016	4.750	Dec 2017	2.456	Dec 2018	-		2.456	Continuing	Continuing	Continuing
GPS Mod Development F/A-18E/F	C/CPIF	Boeing : St Louis, MO	0.000	0.000		4.075	Apr 2018	11.800	Apr 2019	-		11.800	Continuing	Continuing	Continuing
GPS Mod Development EA-18G	C/CPIF	Boeing : St Louis, MO	0.000	0.000		4.075	Apr 2018	12.779	Apr 2019	-		12.779	Continuing	Continuing	Continuing
GPS Mod Development E-2D	C/CPIF	Northup Gruman : Pax River, MD	0.000	0.000		2.000	Apr 2018	1.900	Apr 2019	-		1.900	Continuing	Continuing	Continuing
GPS Mod Development MV-22B,CMV-22B	C/CPIF	Bell Boeing : Amarillo, TX	0.000	0.000		1.250	Jun 2018	3.800	Jun 2019	-		3.800	Continuing	Continuing	Continuing
GPS Mod Development CH-53K	C/CPIF	Sikorsky : Stratford, CT	0.000	0.000		0.000		1.050	Apr 2019	-		1.050	Continuing	Continuing	Continuing
GPS Mod Hardware F/A-18E/F	C/FFP	Raytheon : El Segundo, CA	0.000	2.200	Aug 2017	0.000		0.000		-		0.000	0.000	2.200	-
GPS Mod Hardware EA-18G	C/FFP	TBD : TBD	0.000	0.000		1.960	Feb 2018	0.000		-		0.000	0.000	1.960	-
GPS Mod Hardware E-2D	C/FFP	TBD : TBD	0.000	0.000		2.900	Feb 2018	0.000		-		0.000	0.000	2.900	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 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 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
GPS Mod Hardware MV-22B,CMV-22B	C/FFP	TBD : TBD	0.000	0.000		0.800	Mar 2018	0.000		-		0.000	0.000	0.800	-
GPS Mod Hardware CH-53K	C/FFP	TBD : TBD	0.000	0.000		0.000		1.000	Dec 2018	-		1.000	Continuing	Continuing	Continuing
GPS Mod Hardware MSC	C/FFP	TBD : TBD	0.000	0.000		1.500	Mar 2018	0.000		-		0.000	0.000	1.500	-
GPS Mod Development Support	WR	SSC PAC, NAWC : San Diego, Pax River	0.000	1.000	Jan 2017	10.308	Nov 2017	0.500	Nov 2018	-		0.500	Continuing	Continuing	Continuing
GPS Mod Govt Eng Support	WR	SSC PAC, NAWC : San Diego, Pax River	0.000	1.755	Jan 2017	7.061	Nov 2017	2.920	Nov 2018	-		2.920	Continuing	Continuing	Continuing
Product Development	WR	GPS Directorate : Los Angeles, CA	4.424	0.500	Dec 2016	1.300	Dec 2017	1.700	Dec 2018	-		1.700	Continuing	Continuing	Continuing
Systems Engineering	WR	Govt, Contractor : San Diego, Newport	23.659	0.150	Nov 2016	0.700	Nov 2017	0.750	Nov 2018	-		0.750	Continuing	Continuing	Continuing
Product Development	TBD	Various : Various	92.033	0.000		0.000		0.000		-		0.000	0.000	92.033	-
		Subtotal	161.511	17.856		59.277		55.288		-		55.288	Continuing	Continuing	N/A

Remarks

FY19 increase in funding requirements is to continue development, test and integration of Military Code (M-Code) capable Global Positioning System (GPS) receivers for surface platforms and seven (7) air platforms: F/A-18E/F, EA-18G, E-2D, MV-22B, CMV-22B, CH-53K, and KC-130J in support of GPS Modernization.

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Contract Engineering Services	WR	BAH : San Diego, Pax River, China Lake	0.000	0.700	Nov 2016	1.830	Nov 2017	2.700	Nov 2018	-		2.700	Continuing	Continuing	Continuing
Enginering Services	WR	SSC PAC, NAWC : San Diego, Pax River	0.000	0.000		1.875	Nov 2017	4.310	Nov 2018	-		4.310	Continuing	Continuing	Continuing

Exhibit R-3, RDT&E Project Cost Analysis: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604777N / *Navigation/Id System*	**Project (Number/Name)** 0921 / *NAVSTAR GPS Equipment*

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Integrated Logistics Support	WR	SSC PAC, NAWC : San Diego, Pax River	0.000	0.677	Dec 2016	1.735	Dec 2017	2.750	Dec 2018	-		2.750	Continuing	Continuing	Continuing
Technical Data	WR	Various : Various	0.401	0.000		0.000		0.000		-		0.000	0.000	0.401	-
Support	Various	Various : Various	54.993	0.000		0.000		0.000		-		0.000	0.000	54.993	-
		Subtotal	55.394	1.377		5.440		9.760		-		9.760	Continuing	Continuing	N/A

Remarks

FY19 increase in funding requirements is essential to support a full year of software updates, Non-recurring Engineering (NRE), and Integrated Logistics Support (ILS) services for integration of Military Code (M-Code) capable Global Positioning System (GPS) receivers for surface ship platforms and air platforms in support of GPS Modernization.

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Air NAVWAR Test & Evaluation	WR	NAWC : Pax River	0.404	0.391	Nov 2016	2.250	Nov 2017	2.100	Nov 2018	-		2.100	Continuing	Continuing	Continuing
Sea NAVWAR Test & Evaluation	WR	SSC PAC, NUWC : San Diego, Newport	0.555	0.662	Nov 2016	0.338	Nov 2017	1.350	Nov 2018	-		1.350	Continuing	Continuing	Continuing
GPNTS Test & Evaluation	WR	SSC PAC : San Diego	0.987	0.820	Nov 2016	3.187	Nov 2017	3.500	Nov 2018	-		3.500	Continuing	Continuing	Continuing
GPS Mod Test & Evaluation	WR	SSC PAC, NAWC : San Diego, Pax River	0.000	0.167	Nov 2016	1.000	Nov 2017	1.900	Nov 2018	-		1.900	Continuing	Continuing	Continuing
Test & Evaluation	Various	Various : Various	45.296	0.000		0.000		0.000		-		0.000	0.000	45.296	-
		Subtotal	47.242	2.040		6.775		8.850		-		8.850	Continuing	Continuing	N/A

Remarks

FY19 increase in funding requirements is necessary to support testing of M-Code capable GPS receivers for integration on surface ship platforms and air platforms, as well as to prepare and conduct Initial Operational Test and Evaluation (IOT&E) for Global Positioning System (GPS) - Based Positioning, Navigation and Timing (PNT) Services (GPNTS).

Exhibit R-3, RDT&E Project Cost Analysis: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604777N / *Navigation/Id System*	**Project (Number/Name)** 0921 / *NAVSTAR GPS Equipment*

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management Support	C/CPAF	BAH : San Diego, Pax River, China Lake	7.494	2.395	Nov 2016	8.552	Nov 2017	6.777	Nov 2018	-		6.777	Continuing	Continuing	Continuing
Management Services	Various	Various : Various	10.334	0.000		0.000		0.000		-		0.000	0.000	10.334	-
		Subtotal	17.828	2.395		8.552		6.777		-		6.777	Continuing	Continuing	N/A

	Prior Years	FY 2017		FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	281.975	23.668		80.044		80.675		-		80.675	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604777N / *Navigation/Id System*	**Project (Number/Name)** 0921 / *NAVSTAR GPS Equipment*

Air Navigation Program Schedule

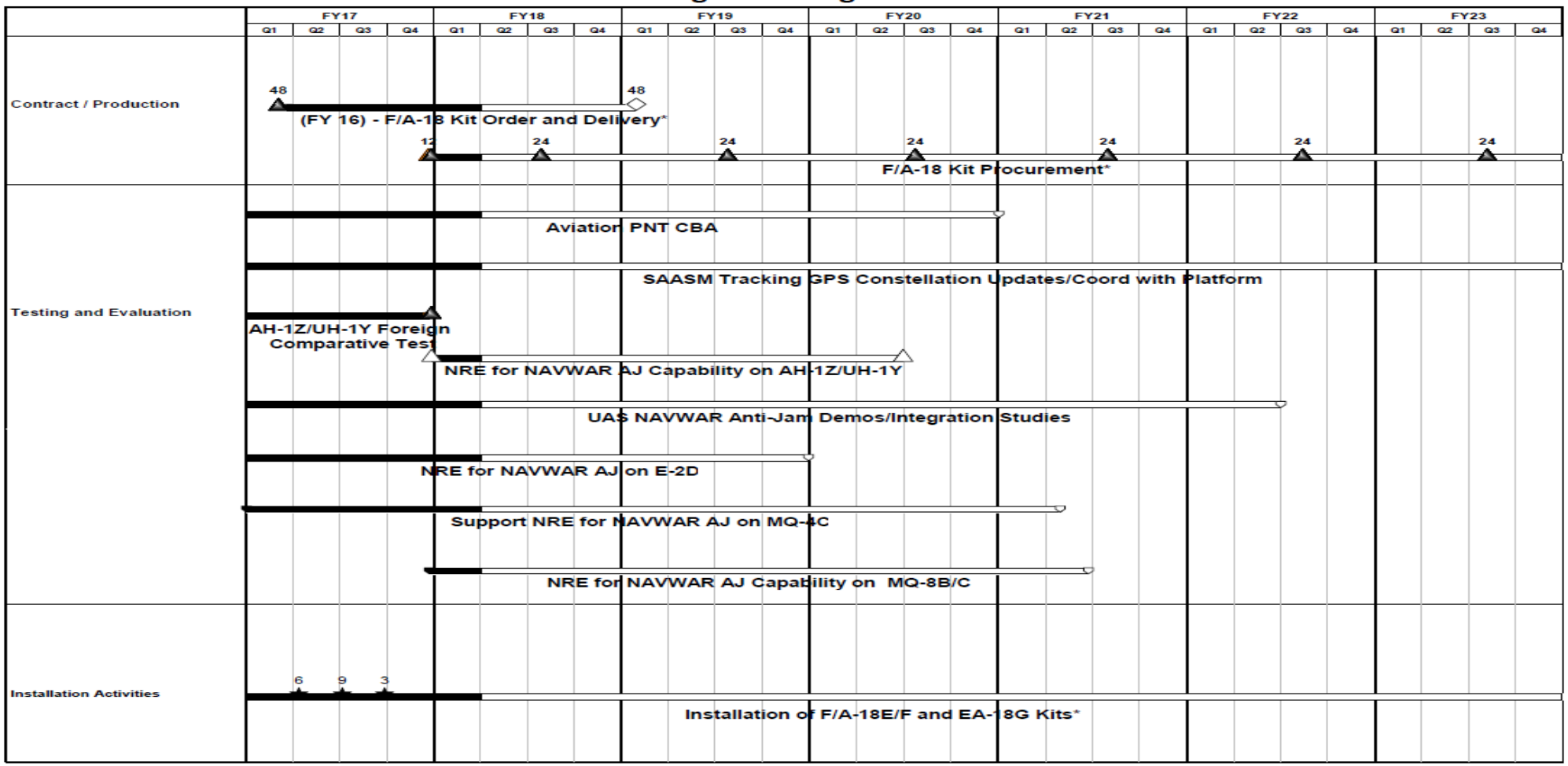


Exhibit R-4, RDT&E Schedule Profile: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604777N / *Navigation/Id System*	**Project (Number/Name)** 0921 / *NAVSTAR GPS Equipment*

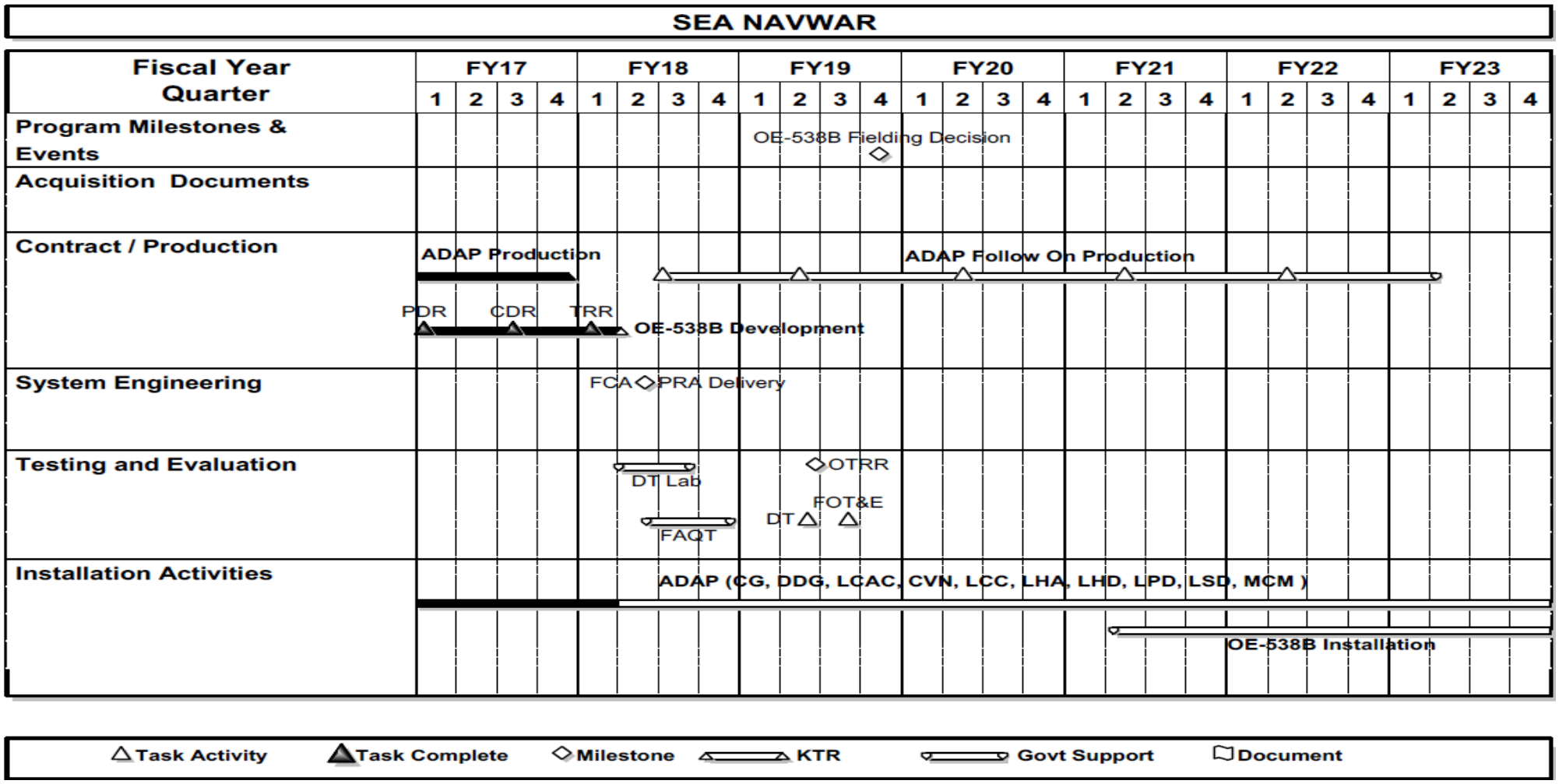


Exhibit R-4, RDT&E Schedule Profile: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604777N / *Navigation/Id System*	**Project (Number/Name)** 0921 / *NAVSTAR GPS Equipment*

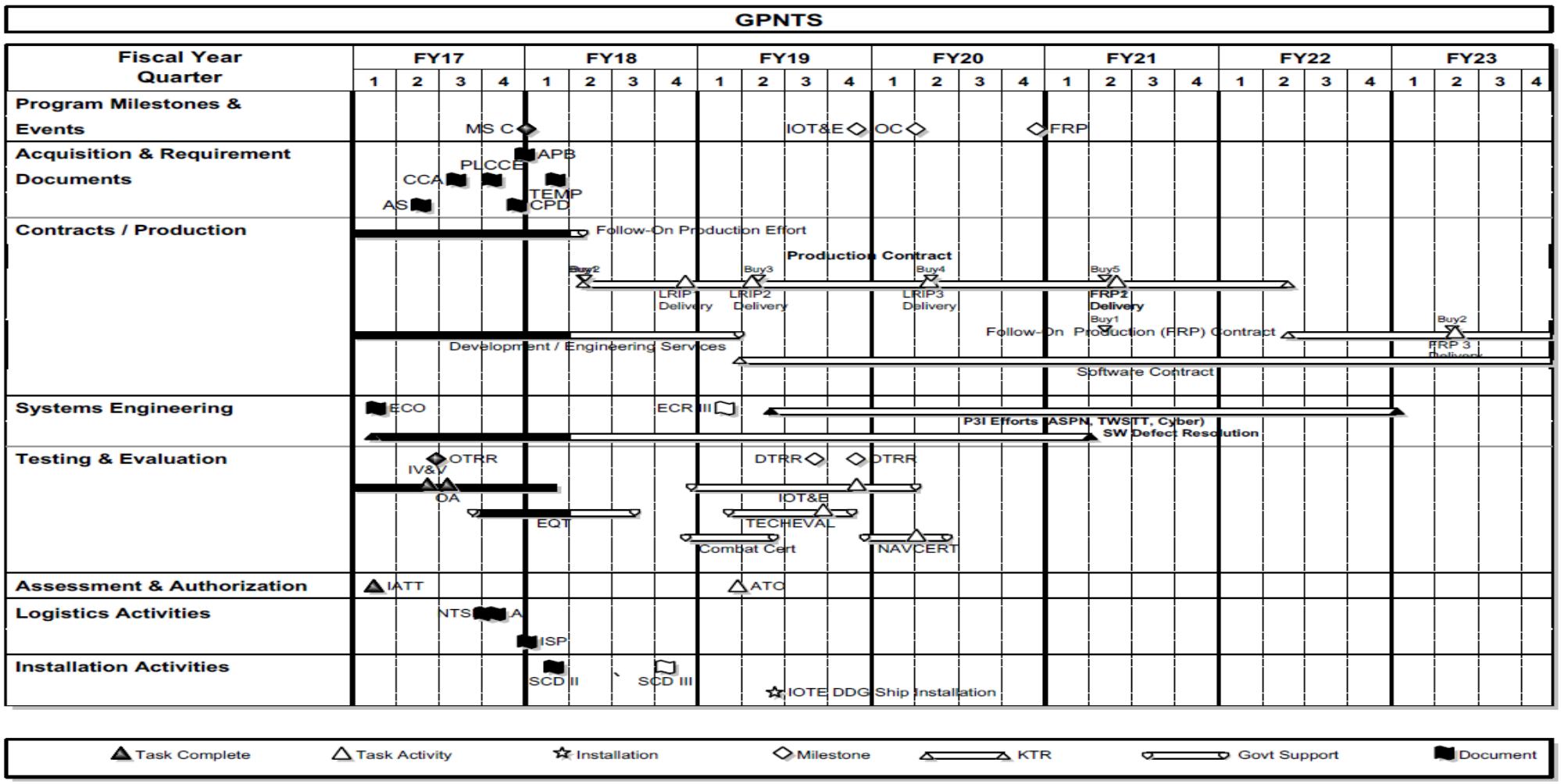


Exhibit R-4, RDT&E Schedule Profile: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604777N / *Navigation/Id System*	**Project (Number/Name)** 0921 / *NAVSTAR GPS Equipment*

GPS Modernization

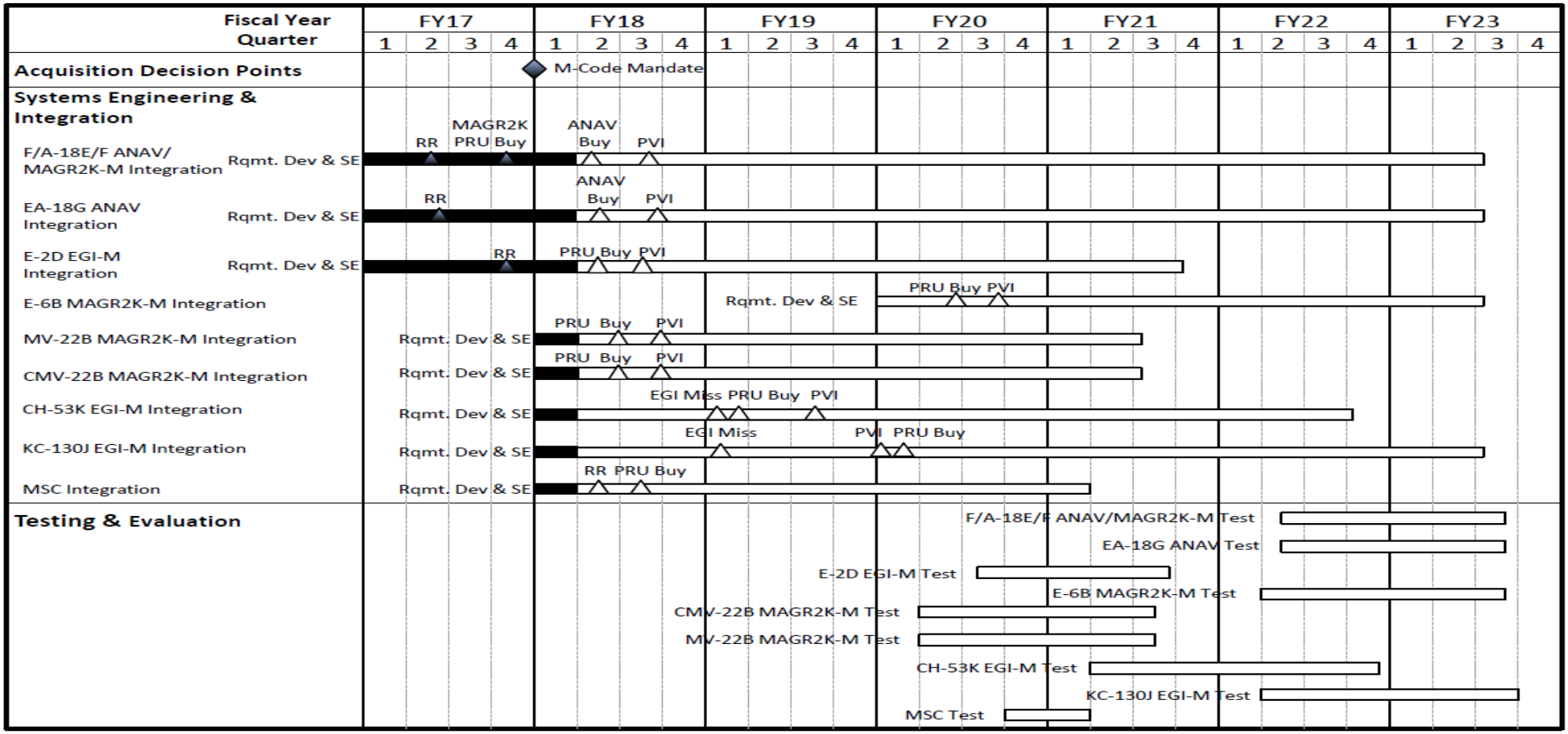


Exhibit R-4A, RDT&E Schedule Details: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604777N / *Navigation/Id System*	**Project (Number/Name)** 0921 / *NAVSTAR GPS Equipment*

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 F/A-18 Kit Procurement 2023	3	2023	3	2023
Air NAVWAR: Air Navigation Aviation PNT CBA	1	2017	4	2020
Air NAVWAR: Air Navigation SAASM Tracking GPS Constellation Updates	1	2017	4	2023
Air NAVWAR: Air Navigation AH-1Z/UH-1Y Foreign Comparative Test	4	2017	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	2017	3	2022
Air NAVWAR: Air Navigation E-2D Ant-Jam Platform Coordination	1	2017	4	2019
Air NAVWAR: Air Navigation Support NRE for NAVWAR AJ on MQ-4C	1	2017	2	2021
Air NAVWAR: Air Navigation Integration for NAVWAR AJ Capability on MQ-8B/8C	1	2018	2	2021
Air NAVWAR: Air Navigation Installation of F/A-18 & EA-18 Kits	1	2017	4	2023
Sea NAVWAR: Sea Navigation OE-538B Fielding Decision	4	2019	4	2019
Sea NAVWAR: Sea Navigation ADAP Follow On Production FY18	3	2018	3	2018
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

Exhibit R-4A, RDT&E Schedule Details: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604777N / *Navigation/Id System*	**Project (Number/Name)** 0921 / *NAVSTAR GPS Equipment*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Sea NAVWAR: Sea Navigation ADAP Follow On Production FY22	2	2022	2	2022
Sea NAVWAR: Sea Navigation OE-538B Development	1	2017	2	2018
Sea NAVWAR: Sea Navigation Preliminary Design Review (PDR)CDR	1	2017	1	2017
Sea NAVWAR: Sea Navigation Critical Design Review (CDR)	3	2017	3	2017
Sea NAVWAR: Sea Navigation Test Readiness Review (TRR)	1	2018	1	2018
Sea NAVWAR: Sea Navigation Functional Configuarion Audit (FCA)	2	2018	2	2018
Sea NAVWAR: Sea Navigation Production Representative Article (PRA) Delivery	2	2018	2	2018
Sea NAVWAR: Sea Navigation Development Test (DT) LAB	2	2018	3	2018
Sea NAVWAR: Sea Navigation Operational Test Readiness Review (OTRR)	2	2019	2	2019
Sea NAVWAR: Sea Navigation First Article Qualification Testing (FAQT)	2	2018	4	2018
Sea NAVWAR: Sea Navigation Development Test (DT)	2	2019	2	2019
Sea NAVWAR: Sea Navigation Full Operational Test & Evaluation (FOT&E)	3	2019	3	2019
Sea NAVWAR: Sea Navigation ADAP Installations	1	2017	4	2023
Sea NAVWAR: Sea Navigation OE-538B Installations	2	2021	4	2023
GPS-based PNT Service (GPNTS): GPNTS Milestone C	4	2017	4	2017
GPS-based PNT Service (GPNTS): GPNTS Initial Operational Test & Evaluation (IOT&E)	4	2019	4	2019
GPS-based PNT Service (GPNTS): GPNTS Initial Operational Capability (IOC)	2	2020	2	2020
GPS-based PNT Service (GPNTS): GPNTS Full Rate Production (FRP)	4	2020	4	2020
GPS-based PNT Service (GPNTS): GPNTS Acquistion Program Baseline (APB)	1	2018	1	2018
GPS-based PNT Service (GPNTS): GPNTS PLCCE	4	2017	4	2017
GPS-based PNT Service (GPNTS): GPNTS Test and Evaluation Master Plan (TEMP)	1	2018	1	2018
GPS-based PNT Service (GPNTS): GPNTS Clinger Cohen Act (CCA)	3	2017	3	2017
GPS-based PNT Service (GPNTS): GPNTS Capability Production Document (CPD)	4	2017	4	2017
GPS-based PNT Service (GPNTS): GPNTS Acquisition Strategy (AS)	2	2017	2	2017
GPS-based PNT Service (GPNTS): GPNTS Follow-On Production Effort	1	2017	2	2018

Exhibit R-4A, RDT&E Schedule Details: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 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 Development/ Engineering Services	1	2017	1	2019
GPS-based PNT Service (GPNTS): GPNTS Production Contract	2	2018	2	2022
GPS-based PNT Service (GPNTS): GPNTS Buy 1	2	2018	2	2018
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	2	2022	4	2023
GPS-based PNT Service (GPNTS): GPNTS Software Contract	1	2019	4	2023
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	2019	1	2019
GPS-based PNT Service (GPNTS): GPNTS P3I Efforts	2	2019	1	2023
GPS-based PNT Service (GPNTS): GPNTS SW Defect Resolution	1	2017	1	2021
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)	3	2019	3	2019
GPS-based PNT Service (GPNTS): GPNTS Operational Test Readiness Review (OTRR) 2	4	2019	4	2019
GPS-based PNT Service (GPNTS): GPNTS Government Testing	1	2017	1	2018
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)	3	2017	3	2017
GPS-based PNT Service (GPNTS): GPNTS Initial Operational Test and Evaluation (IOT&E)	4	2018	1	2020
GPS-based PNT Service (GPNTS): GPNTS Environmental Quality Testing (EQT)	3	2017	3	2018

Exhibit R-4A, RDT&E Schedule Details: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 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 Technical Evaluation	1	2019	4	2019
GPS-based PNT Service (GPNTS): GPNTS NAVCERT	4	2019	2	2020
GPS-based PNT Service (GPNTS): GPNTS Combat Certification	4	2018	2	2019
GPS-based PNT Service (GPNTS): GPNTS Interim Authority to Test (IATT)	1	2017	1	2017
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)	1	2018	1	2018
GPS-based PNT Service (GPNTS): GPNTS Ship Change Document (SCD) II	1	2018	1	2018
GPS-based PNT Service (GPNTS): GPNTS SCD III	4	2018	4	2018
GPS-based PNT Service (GPNTS): GPNTS DDG Installation for IOT&E	2	2019	2	2019
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	3	2023
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	4	2017	4	2017
GPS Modernization: GPS Modernization F-18E/F ANAV 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 Rqmts. Dev. & System Eng.	1	2017	3	2023
GPS Modernization: GPS Modernization EA-18G ANAV Risk Reduction Task Order	2	2017	2	2017
GPS Modernization: GPS Modernization EA-18G ANAV PRU Buy	2	2018	2	2018
GPS Modernization: GPS Modernization EA-18G ANAV Prime Vendor Integration (PVI)	3	2018	3	2018
GPS Modernization: GPS Modernization E-2D EGI-M Rqmts. Dev. & System Eng.	1	2017	4	2021
GPS Modernization: GPS Modernization E-2D EGI-M Risk Reduction Task Order	4	2017	4	2017

Exhibit R-4A, RDT&E Schedule Details: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 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 PRU Buy	2	2018	2	2018
GPS Modernization: GPS Modernization E-2D Prime Vendor Integration	3	2018	3	2018
GPS Modernization: GPS Modernization E-6B MAGR2K-M Rqmts. Dev. & System Eng.	1	2020	3	2023
GPS Modernization: GPS Modernization E-6B MAGR2K-M PRU Buy	2	2020	2	2020
GPS Modernization: GPS Modernization E-6B MAGR2K-M Prime Vendor Integration	3	2020	3	2020
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	2022
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	3	2023
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 MSC Rqmts. Dev. & System Eng.	1	2018	1	2021
GPS Modernization: GPS Modernization MSC Risk Reduction Task Order	2	2018	2	2018
GPS Modernization: GPS Modernization MSC PRU Buy	3	2018	3	2018

Exhibit R-4A, RDT&E Schedule Details: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 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 F-18E/F MAGR2K-M/EGI-M Pre-Test & Test	2	2022	3	2023
GPS Modernization: GPS Modernization EA-18G MAGR2K-M/EGI-M Pre-Test & Test	2	2022	3	2023
GPS Modernization: GPS Modernization E-2D EGI-M Pre-Test & Test	3	2020	3	2021
GPS Modernization: GPS Modernization E-6B MAGR2K-M Pre-Test & Test	2	2022	3	2023
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	2	2022	3	2023
GPS Modernization: GPS Modernization MSC Pre-Test & Test	4	2020	1	2021

Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy											Date: February 2018	
Appropriation/Budget Activity 1319 / 5					R-1 Program Element (Number/Name) PE 0604777N / *Navigation/Id System*				Project (Number/Name) 1253 / *Combat Ident System*			
COST ($ in Millions)	**Prior Years**	**FY 2017**	**FY 2018**	**FY 2019 Base**	**FY 2019 OCO**	**FY 2019 Total**	**FY 2020**	**FY 2021**	**FY 2022**	**FY 2023**	**Cost To Complete**	**Total Cost**
1253: *Combat Ident System*	182.396	3.517	2.548	1.983	-	1.983	1.887	1.929	1.965	2.005	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, test aircraft, and unmanned aircraft systems.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	**FY 2017**	**FY 2018**	**FY 2019 Base**	**FY 2019 OCO**	**FY 2019 Total**
Title: Mode 5 prototype hardware, cryptographic module	1.905	1.661	0.164	0.000	0.164
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 to include small form factors. 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 2018 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 2019 Base Plans:					

Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604777N / *Navigation/Id System*	**Project (Number/Name)** 1253 / *Combat Ident System*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
Begin T&E efforts testing the functionality of the Mode 5 capability in the CH-53K aircraft. ***FY 2019 OCO Plans:*** N/A ***FY 2018 to FY 2019 Increase/Decrease Statement:*** Decrease of $1.497M from FY 2018 to FY 2019 is due to the ramp down of the Mode 5 integration into the CH-53K platform.					
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 (IFF) 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 2018 Plans:*** Finalize ECP for fleet installation of Mode 5 capability in CH-53K aircraft to support fleet fielding in late FY19. ***FY 2019 Base Plans:*** Development of small form factor IFF for unmanned aircraft systems. Support developmental test of Mode 5 capability in CH-53K aircraft. ***FY 2019 OCO Plans:*** N/A ***FY 2018 to FY 2019 Increase/Decrease Statement:*** Increase of $0.461M from FY 2018 to FY 2019 is due to the developmental testing requirements for the Mode 5 integration into the CH-53K platform.	0.412 -	0.338 -	0.799 -	0.000 -	0.799 -
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.	1.200 -	0.549 -	1.020 -	0.000 -	1.020 -

Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604777N / *Navigation/Id System*	**Project (Number/Name)** 1253 / *Combat Ident System*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
FY 2018 Plans: Perform initial ground testing of Mode 5 in the CH-53K aircraft in support of FY19 flight testing and certification efforts. ***FY 2019 Base Plans:*** Perform CH-53K flight testing and certification efforts. ***FY 2019 OCO Plans:*** N/A ***FY 2018 to FY 2019 Increase/Decrease Statement:*** Increase of $.471M from FY 2018 to FY 2019 is due to the support required for CH-53K flight testing (and certification) with Mode 5.					
Accomplishments/Planned Programs Subtotals	3.517	2.548	1.983	0.000	1.983

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
• OPN/2851: *ID Systems*	22.177	21.239	26.163	-	26.163	26.139	25.463	49.655	57.497	348.665	875.227
• APN/0582: *ID Sys*	42.262	49.524	40.696	-	40.696	41.494	35.895	13.554	9.848	0.042	503.970

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.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2019 Navy			Date: February 2018
Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604777N / *Navigation/Id System*	Project (Number/Name) 1253 / *Combat Ident System*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Systems Engineering	WR	NAWCAD : PAX River, MD	15.377	0.248	Nov 2016	0.204	Nov 2017	0.092	Nov 2018	-		0.092	Continuing	Continuing	Continuing
Systems Engineering	WR	NAWCAD : St Inigoes, MD	14.751	0.051	Nov 2016	0.051	Nov 2017	0.655	Nov 2018	-		0.655	Continuing	Continuing	Continuing
Primary Hardware Development	WR	NAWCWD : China Lake, CA	17.218	0.000		0.000		0.000		-		0.000	0.000	17.218	-
Primary Hardware Development	Various	Sikorsky : Stratford, CT	0.890	1.905	Jan 2017	1.661	Jan 2018	0.164	Jan 2019	-		0.164	0.164	4.784	4.784
Primary Hardware Development	Various	Boeing : St Louis, MO	30.426	0.000		0.000		0.000		-		0.000	0.000	30.426	30.426
Prior Year Prod Dev Services costs no longer funded in FYDP	Various	Various : Various	43.213	0.000		0.000		0.000		-		0.000	0.000	43.213	43.213
		Subtotal	121.875	2.204		1.916		0.911		-		0.911	Continuing	Continuing	N/A

Remarks

The Product Development increase from FY18 to FY19 is due to systems engineering requirements for the development of small form factor IFF for unmanned aircraft systems.

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
ILS	Various	Various : Various	4.927	0.113	Nov 2016	0.083	Nov 2017	0.052	Nov 2018	-		0.052	Continuing	Continuing	Continuing
Prior Year Support Services costs no longer funded in FYDP	Various	Various : Various	2.761	0.000		0.000		0.000		-		0.000	0.000	2.761	2.761
		Subtotal	7.688	0.113		0.083		0.052		-		0.052	Continuing	Continuing	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2019 Navy			Date: February 2018
Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604777N / *Navigation/Id System*	Project (Number/Name) 1253 / *Combat Ident System*	

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Developmental T & E	WR	NAWCAD : PAX River, MD	28.067	1.200	Nov 2016	0.549	Nov 2017	1.020	Nov 2018	-		1.020	7.705	38.541	-
Develop/Operational T & E	WR	COMOPTEVFOR : Norfolk, VA	0.291	0.000		0.000		0.000		-		0.000	0.000	0.291	-
Operational T & E	WR	NAWCAD : PAX River, MD	16.623	0.000		0.000		0.000		-		0.000	0.000	16.623	-
Test Assets	Various	Various : Various	3.456	0.000		0.000		0.000		-		0.000	0.000	3.456	3.456
		Subtotal	48.437	1.200		0.549		1.020		-		1.020	7.705	58.911	N/A

Remarks

The development T&E increase from FY18 to FY19 is due to testing of the small form factor development and flight test efforts associated with CH-53K testing.

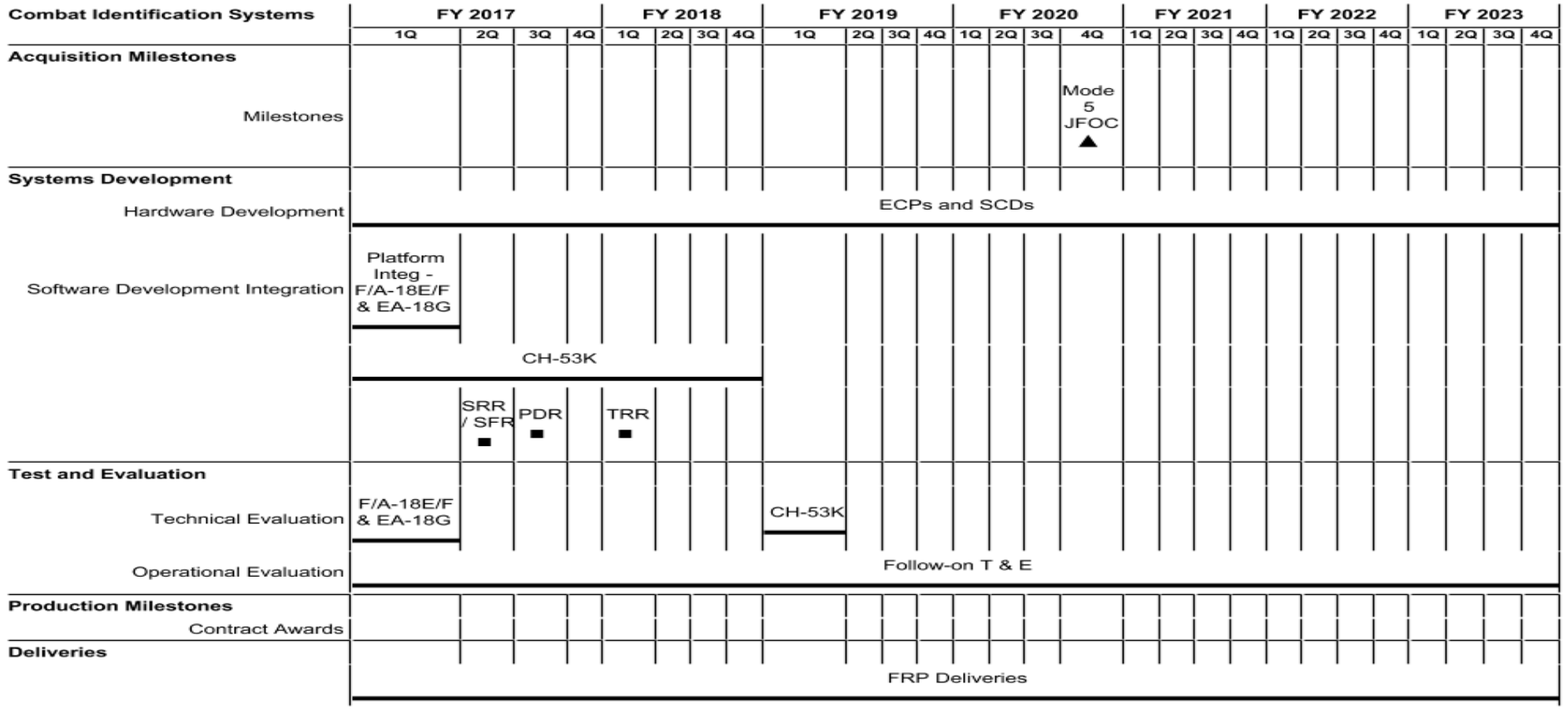
Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Prior Year Mgmt Services costs no longer funded in FYDP	Various	Various : Various	4.396	0.000		0.000		0.000		-		0.000	0.000	4.396	4.396
		Subtotal	4.396	0.000		0.000		0.000		-		0.000	0.000	4.396	N/A

	Prior Years	FY 2017		FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	182.396	3.517		2.548		1.983		-		1.983	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604777N / *Navigation/Id System*	**Project (Number/Name)** 1253 / *Combat Ident System*



2019PB - 0604777N - 1253

Exhibit R-4A, RDT&E Schedule Details: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604777N / *Navigation/Id System*	**Project (Number/Name)** 1253 / *Combat Ident System*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Combat Identification Systems				
Acquisition Milestones: Milestones: Mode 5 JFOC	4	2020	4	2020
Systems Development: Hardware Development: Prepare & Evaluate ECPs/SCDs	1	2017	4	2023
Systems Development: Software Development Integration: Platform Integration	1	2017	1	2017
Systems Development: Software Development Integration: CH-53K	1	2017	4	2018
Systems Development: Software Development Integration: System Requirements Review / System Functional Review	2	2017	2	2017
Systems Development: Software Development Integration: Preliminary Design Review	3	2017	3	2017
Systems Development: Software Development Integration: Test Readiness Review	1	2018	1	2018
Test and Evaluation: Technical Evaluation: F/A-18E/F & EA-18G	1	2017	1	2017
Test and Evaluation: Technical Evaluation: CH-53K	1	2019	1	2019
Test and Evaluation: Technical Evaluation: F/A-18E/F Verification	1	2017	1	2017
Test and Evaluation: Operational Evaluation: Follow-on Test and Evaluation	1	2017	4	2023
Deliveries: FRP Deliveries	1	2017	4	2023

Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy			Date: February 2018
Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604777N / *Navigation/Id System*	Project (Number/Name) 9999 / *Congressional Adds*	

COST ($ in Millions)	Prior Years	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
9999: *Congressional Adds*	0.000	5.803	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	5.803
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

$6M congressional increase received for development of an M-Code capable GPS receiver for the Advanced Anti-Radiation Guided Missile (AARGM). GPS receivers will utilize the military code (M-Code) GPS Signal in Space, incorporate enhanced cryptology, deliver greater position and time accuracy, and provide improved protection against signal spoofing as compare to legacy Selective Availability Anti-Spoofing Module (SAASM) receivers. After development and test is complete, integration of GPS receiver into the AARGM will be completed with AARGM program of record funding. Efforts support 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.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2017	FY 2018
Congressional Add: Improved GPS	5.803	0.000
FY 2017 Accomplishments: FY17 funding will complete development and test of a NAVSTRIKE-M M-Code capable GPS receiver with AARGM specific requirements included over an 18 month period of performance starting from receipt of funding. Specifically this effort will: - Develop and add AARGM specific software to NAVSTRIKE-M receiver - Procure two (2) prototype NAVSTRIKE-M receiver cards with AARGM software update for testing and performance characterization with the AARGM missile. - Conduct developmental Testing (DT) of NAVSTRIKE-M receiver cards with AARGM software. - Update two (2) prototype cards with final software after correction of deficiencies found during testing. - Procure and provide two (2) additional qualified, security certified and Military (M) code-capable NAVSTRIKE receiver cards with final software to AARGM program of record for integration into AARGM. - Provide overarching management, central coordination, government oversight and guidance, shared expertise, and engineering support to ensure AARGM performance and integration requirements are supported during NAVSTRIKE receiver development.		
FY 2018 Plans: N/A		
Congressional Adds Subtotals	5.803	0.000

C. Other Program Funding Summary ($ in Millions)

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604777N / *Navigation/Id System*	**Project (Number/Name)** 9999 / *Congressional Adds*

C. Other Program Funding Summary ($ in Millions)

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

The performance goal is met if successful development test and evaluation is achieved.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2019 Navy			Date: February 2018
Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604777N / *Navigation/Id System*	Project (Number/Name) 9999 / *Congressional Adds*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
AARGM Product Development	C/CPFF	Rockwell : Cedar Rapids, IA	0.000	4.000	Aug 2017	0.000		0.000		-		0.000	0.000	4.000	-
AARGM Development Support	WR	SSC PAC : San Diego, CA	0.000	0.300	Jun 2017	0.000		0.000		-		0.000	0.000	0.300	-
		Subtotal	0.000	4.300		0.000		0.000		-		0.000	0.000	4.300	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
DT&E	C/FFP	Rockwell : Cedar Rapids, IA	0.000	0.803	Aug 2017	0.000		0.000		-		0.000	0.000	0.803	-
		Subtotal	0.000	0.803		0.000		0.000		-		0.000	0.000	0.803	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management Support	C/CPAF	TBD : San Diego, Pax River, China Lake	0.000	0.700	Aug 2017	0.000		0.000		-		0.000	0.000	0.700	-
		Subtotal	0.000	0.700		0.000		0.000		-		0.000	0.000	0.700	N/A

	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	5.803		0.000		0.000		-		0.000	0.000	5.803	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604777N / *Navigation/Id System*	**Project (Number/Name)** 9999 / *Congressional Adds*

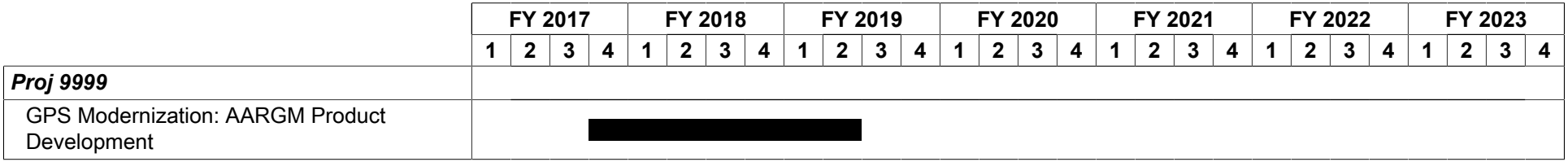


Exhibit R-4A, RDT&E Schedule Details: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604777N / *Navigation/Id System*	**Project (Number/Name)** 9999 / *Congressional Adds*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 9999				
GPS Modernization: AARGM Product Development	4	2017	2	2019