Exhibit R-2, RDT&E Budget Item Justification: PB 2017 Navy											Date: February 2016	
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 2015**	**FY 2016**	**FY 2017 Base**	**FY 2017 OCO**	**FY 2017 Total**	**FY 2018**	**FY 2019**	**FY 2020**	**FY 2021**	**Cost To Complete**	**Total Cost**
Total Program Element	1,267.775	28.951	32.456	42.723	-	42.723	70.724	95.394	97.706	61.843	Continuing	Continuing
0253: *Nav & Electro-Optical Supt*	41.534	6.436	7.251	6.992	-	6.992	7.482	36.662	37.277	38.024	Continuing	Continuing
0676: *Improve ID Development*	32.235	1.612	5.404	4.914	-	4.914	2.499	2.488	2.419	2.469	Continuing	Continuing
0921: *NAVSTAR GPS Equipment*	1,016.101	17.703	17.156	26.965	-	26.965	58.187	54.188	56.057	19.354	Continuing	Continuing
1253: *Combat Ident System*	177.905	3.200	2.645	3.852	-	3.852	2.556	2.056	1.953	1.996	Continuing	Continuing

Note

The increase in budget from FY 2016 to FY 2017 is entirely attributable to the GPS Modernization efforts in Proj 0921, which support providing Naval platforms improved access to Global Positioning System (GPS) signals in challenged and jamming environments. Modernized GPS receivers will utilize the new 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 compared to legacy SAASM receivers. Additionally, GPS Modernization delivers increased GPS anti-jam protection and enables blue force GPS electronic attack. Operationalizes risk reduction efforts currently underway by the Air Force and integrates it into Naval ships, submarines, aircraft, weapons systems, and GPS enabled systems imbedded on those platforms.

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. Navy Air and Sea Navigation Warfare (NAVWAR) are major elements of the GPS program. NAVWAR's mission is to provide continued access to GPS information in a denied environment. NAVWAR accomplishes this through the use of enhanced user equipment (UE). The GPS-based Positioning, Navigation, and Timing (PNT) Service (GPNTS) system is being developed to replace stand-alone AN/WRN-6 receivers, integrated NAVSSI systems, and integrated commercial-off-the-shelf GPS systems. Additionally, future capability will migrate toward a Common Computing Environment (CCE) such as Consolidated Afloat Networks Enterprise Services (CANES), and provide a path for the

Exhibit R-2, RDT&E Budget Item Justification: PB 2017 Navy	Date: February 2016
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*

integration of advanced navigation systems and sensors. NAVSTAR GPS supports Anti-Access/Area Denial (A2AD) by providing Assured-PNT (A-PNT) capability to C4ISR and combat systems in standalone and networked architectures throughout the air and maritime domains. GPNTS will support the Joint Aerial Layer Network-Maritime (JALN-M). JALN-M is the Navy implementation of the JALN architecture which provides assured communications in any environment, especially A2AD.

GPS Modernization addresses the Navy's future integration of GPS Directorate Military GPS User Equipment (MGUE) products being developed that will enable the use of new signals in space. 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 to utilize the new 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 compared to legacy receivers. Additionally, GPS Modernization delivers increased GPS anti-jam protection and enables blue force GPS electronic attack

JUSTIFICATION FOR BUDGET ACTIVITY: This program is funded under System Development and Demonstration because it includes those projects that have passed Milestone B approval and are conducting engineering and manufacturing development tasks aimed at meeting validated requirement prior to full-rate production decision.

B. Program Change Summary ($ in Millions)	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
Previous President's Budget	29.504	32.469	35.877	-	35.877
Current President's Budget	28.951	32.456	42.723	-	42.723
Total Adjustments	-0.553	-0.013	6.846	-	6.846
• Congressional General Reductions	-	-0.013			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.552	0.000			
• Rate/Misc Adjustments	-0.001	0.000	6.846	-	6.846

Change Summary Explanation

Decrease in Navigation/ID System by $1.31M as required for the Department of the Navy to comply with the Bipartisan Budget Act of 2015.

Technical: GPS Modernization (0921) was established to accelerate integration of enhanced and protected GPS products being developed into Naval platforms in order to provide improved access to GPS signals in challenged and jamming environments, incorporate enhanced cryptology, deliver greater position and time accuracy, provide improved protection against signal spoofing, deliver increased GPS anti-jam protection, and enable blue force GPS electronic attack. This effort supports Navy compliance with Public Law 111-383 which mandates only M-Code capable receivers can be procured beginning in FY18.

Exhibit R-2, RDT&E Budget Item Justification: PB 2017 Navy	Date: February 2016
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*

Schedule: GPS Modernization (0921) - Integration efforts will be conducted from FY17-20 in order to field MGUE onto the Navy's air, surface, subsurface, and weapons platforms.

Exhibit R-2A, RDT&E Project Justification: PB 2017 Navy			Date: February 2016
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 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total	FY 2018	FY 2019	FY 2020	FY 2021	Cost To Complete	Total Cost
0253: *Nav & Electro-Optical Supt*	41.534	6.436	7.251	6.992	-	6.992	7.482	36.662	37.277	38.024	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

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

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
Title: ISIS and Photonics common software and hardware capabilities development and obsolescence.	1.254	3.053	6.324	0.000	6.324
Articles:	-	-	-	-	-
FY 2015 Accomplishments: ISIS Technical Insertion (TI) development for LOS ANGELES, SEAWOLF, and VIRGINIA classes including hardware and software modifications for integration of LPPM (including prototypes) into ISIS.					
FY 2016 Plans: ISIS Technical Insertion (TI) development for LOS ANGELES, SEAWOLF, and VIRGINIA classes. TI and Advanced Processor Build (APB) productionization efforts include incorporation of significant capability increases over previous TIs including Image Fusion, Auto-detection and Image Tracker Algorithms. FY 2016 efforts also include improvements to system software reliability for increased ISIS Operational Availability (Ao).					
FY 2017 Base Plans: ISIS Technical Insertion (TI) development for LOS ANGELES, SEAWOLF, and VIRGINIA classes. TI and Advanced Processor Build (APB) productionization efforts include incorporation of significant capability increases over previous TIs including Automatic Classification and De-interlacing as well as integration of					

Exhibit R-2A, RDT&E Project Justification: PB 2017 Navy		Date: February 2016
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 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
unique LPPM capabilities. FY 2017 efforts include continued improvements to system and software reliability and increased ISIS Operational Availability (Ao). ***FY 2017 OCO Plans:*** N/A					
Title: Imaging Systems Test Efforts. ***Articles:*** ***FY 2015 Accomplishments:*** TI-14/APB 13 Testing ***FY 2016 Plans:*** TI-14/APB 13 688 DT ***FY 2017 Base Plans:*** TI-14/ APB 13 VA Class OT ***FY 2017 OCO Plans:*** N/A	0.591 -	0.598 -	0.668 -	0.000 -	0.668 -
Title: Low Profile Photonics Mast ***Articles:*** ***FY 2015 Accomplishments:*** Completion of LPPM Prototype Development Initiation of LPPM Production Baseline Design, including modular design, extended range camera, and multiple fiber capability ***FY 2016 Plans:*** Complete LPPM Production Baseline Design ***FY 2017 Base Plans:*** N/A ***FY 2017 OCO Plans:*** N/A	4.591 -	3.600 -	0.000 -	0.000 -	0.000 -
Accomplishments/Planned Programs Subtotals	6.436	7.251	6.992	0.000	6.992

Exhibit R-2A, RDT&E Project Justification: PB 2017 Navy		Date: February 2016
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 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total	FY 2018	FY 2019	FY 2020	FY 2021	Cost To Complete	Total Cost
• SCN/201300: *Photonics Mast*	38.008	38.774	39.560	-	39.560	40.363	41.170	42.076	45.442	Continuing	Continuing
• OPN/0831: *Sub Periscopes & Imaging Equip.*	57.221	63.109	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	686.587
• RDT&E/0604558N: *VIRGINIA Class Design Development*	4.500	3.000	3.000	-	3.000	3.051	3.112	3.174	3.174	Continuing	Continuing
• RDT&E/0603562N: *Advanced Submarine Support Equipment (ASSEP)*	3.320	4.103	4.429	-	4.429	4.143	4.403	4.725	4.828	Continuing	Continuing
• OPN/0840: *Sub Periscope, Imaging Equip. and Supt Equip Program*	0.000	0.000	136.421	-	136.421	142.104	215.983	249.189	206.465	Continuing	Continuing

Remarks

D. Acquisition Strategy

The Acquisition Strategy for AN/BVS-1 Photonics Mast Program (PMP) is dated 24 Sept 2001. The PMP provides for the development and acquisition of a non-hull penetrating submarine electronic imaging system for VIRGINIA Class submarines. The Acquisition Strategy for Integrated Submarine Imaging System (ISIS) is dated 07 Jul 2003. The Aquisition Program Baseline Agreement for ISIS Advanced Processor Builds 11, 13 and 15 is dated 07 Mar 2013. The Single Acquistion 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.

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 2017 Navy			Date: February 2016
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Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2015 Cost	FY 2015 Award Date	FY 2016 Cost	FY 2016 Award Date	FY 2017 Base Cost	FY 2017 Base Award Date	FY 2017 OCO Cost	FY 2017 OCO Award Date	FY 2017 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Software Development	C/CPIF	Lockheed Martin : Manassas, VA	13.896	0.232	Mar 2015	1.364	Dec 2015	2.678	Dec 2016	-		2.678	Continuing	Continuing	Continuing
Systems Engineering	WR	NUWC : Newport, RI	14.793	0.497	Oct 2014	0.744	Nov 2015	1.017	Oct 2016	-		1.017	Continuing	Continuing	Continuing
Hardware Development	C/CPIF	Lockheed Martin : Manassas, VA	5.074	0.483	Mar 2015	0.903	Dec 2015	2.584	Dec 2016	-		2.584	Continuing	Continuing	Continuing
Hardware Development	C/CPFF	L3-KEO : Northhampton, MA	0.000	4.591	Apr 2015	3.600	Dec 2015	0.000		-		0.000	Continuing	Continuing	Continuing
		Subtotal	33.763	5.803		6.611		6.279		-		6.279	-	-	-

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2015 Cost	FY 2015 Award Date	FY 2016 Cost	FY 2016 Award Date	FY 2017 Base Cost	FY 2017 Base Award Date	FY 2017 OCO Cost	FY 2017 OCO Award Date	FY 2017 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Development Test & Evaluation	WR	NUWC : Newport, RI	6.769	0.291	Oct 2014	0.340	Nov 2015	0.418	Oct 2016	-		0.418	Continuing	Continuing	Continuing
Development Test & Evaluation	WR	COMOPTEVFOR : Norfolk, VA	0.552	0.100	Oct 2014	0.258	Jan 2016	0.250	Oct 2016	-		0.250	Continuing	Continuing	Continuing
Development Test & Evaluation	C/CPFF	Lockheed Martin : Manassas, VA	0.000	0.200	Mar 2015	0.000		0.000	Mar 2017	-		0.000	0.000	0.200	-
		Subtotal	7.321	0.591		0.598		0.668		-		0.668	-	-	-

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2015 Cost	FY 2015 Award Date	FY 2016 Cost	FY 2016 Award Date	FY 2017 Base Cost	FY 2017 Base Award Date	FY 2017 OCO Cost	FY 2017 OCO Award Date	FY 2017 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Travel	WR	NAVSEA : Washington, DC	0.450	0.042	Oct 2014	0.042	Oct 2015	0.045	Oct 2016	-		0.045	Continuing	Continuing	Continuing
		Subtotal	0.450	0.042		0.042		0.045		-		0.045	-	-	-

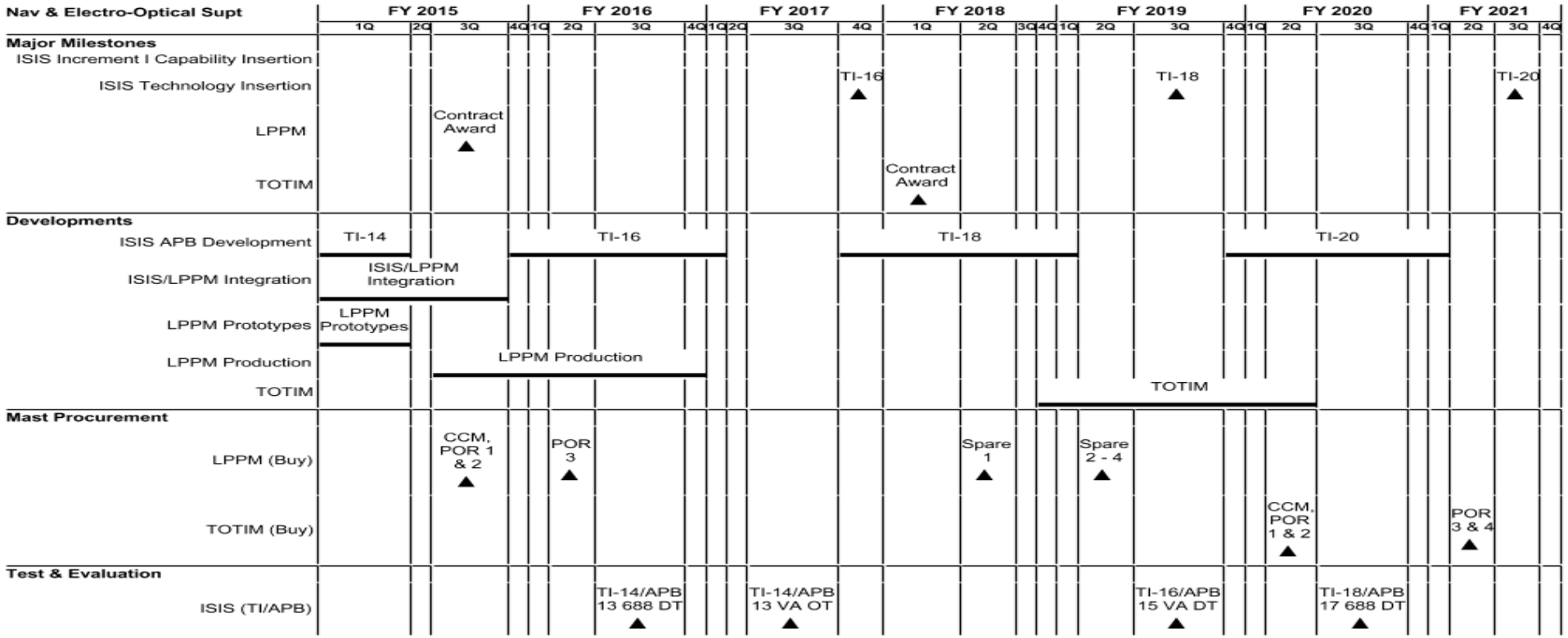
Exhibit R-3, RDT&E Project Cost Analysis: PB 2017 Navy			Date: February 2016
Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604777N / *Navigation/Id System*	Project (Number/Name) 0253 / *Nav & Electro-Optical Supt*	

	Prior Years	FY 2015		FY 2016		FY 2017 Base		FY 2017 OCO		FY 2017 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	41.534	6.436		7.251		6.992		-		6.992	-	-	-

Remarks

Increases in FY19 - FY21 are provided for the 360 Imaging Capability/Task Oriented Tech Insertion Mast (TOTIM) development and modifications required to the ISIS TI-20 baseline to integrate with TOTIM. Specific efforts include: development of a common interface between mast modules, upgrades to the ISIS inboard architecture, data storage, display and processing capabilities, and TOTIM development.

Exhibit R-4, RDT&E Schedule Profile: PB 2017 Navy		Date: February 2016
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604777N / *Navigation/Id System*	**Project (Number/Name)** 0253 / *Nav & Electro-Optical Supt*



2017PB - 0604777N - 0253

Exhibit R-4A, RDT&E Schedule Details: PB 2017 Navy		Date: February 2016
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)	4	2017	4	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: LPPM: Contract Award	3	2015	3	2015
Major Milestones: TOTIM: Contract Award	1	2018	1	2018
Developments: ISIS APB Development: Development: ISIS TI-14	1	2015	1	2015
Developments: ISIS APB Development: Development: ISIS TI-16	4	2015	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/LPPM Integration: ISIS/LPPM Integration	1	2015	3	2015
Developments: LPPM Prototypes: LPPM Protoypes	1	2015	1	2015
Developments: LPPM Production: LPPM Production	3	2015	4	2016
Developments: TOTIM: TOTIM	4	2018	2	2020
Mast Procurement: LPPM (Buy): CCM, POR 1 & 2	3	2015	3	2015
Mast Procurement: LPPM (Buy): POR 3	2	2016	2	2016
Mast Procurement: LPPM (Buy): Spare 1	2	2018	2	2018
Mast Procurement: LPPM (Buy): Spare 2 - 4	2	2019	2	2019
Mast Procurement: TOTIM (Buy): CCM, POR 1 & 2	2	2020	2	2020
Mast Procurement: TOTIM (Buy): POR 3 & 4	2	2021	2	2021
Test & Evaluation: ISIS (TI/APB): Test & Evaluation - ISIS TI-14/APB 13 688 DT	3	2016	3	2016

Exhibit R-4A, RDT&E Schedule Details: PB 2017 Navy		Date: February 2016
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-14/APB 13 VA OT	3	2017	3	2017
Test & Evaluation: ISIS (TI/APB): Test & Evaluation - ISIS TI-16/APB 15 VA DT	3	2019	3	2019
Test & Evaluation: ISIS (TI/APB): Test & Evaluation - ISIS TI-18/APB 17 688 DT	3	2020	3	2020

Exhibit R-2A, RDT&E Project Justification: PB 2017 Navy			Date: February 2016
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 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total	FY 2018	FY 2019	FY 2020	FY 2021	Cost To Complete	Total Cost
0676: *Improve ID Development*	32.235	1.612	5.404	4.914	-	4.914	2.499	2.488	2.419	2.469	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

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

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
Title: AN/UPX-29 (V) - OE-120()/UPX Antenna Tech Refresh	1.310	5.025	4.602	0.000	4.602
Articles:	-	-	-	-	-

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 2015 Accomplishments:
Awarded OE-120 Tech Refresh ECP to BAE Nashua. Completed integration and testing of OE-120 power divider module and completed preliminary design review of the phase shifter module.

FY 2016 Plans:
Continue preliminary design, trade studies, and identify and order long lead items. Initiate and complete detailed design. Initiate unit development and software coding. Initiate procurement of non-long lead items. Initiate test equipment design and update. Initiate Integration and Test (I&T) qualification plan. Conduct range tests for Phase Shifter and Power Divider assemblies. Planned System Engineering Technical Review events include the Preliminary and Critical Design Reviews.

FY 2017 Base Plans:
Complete software coding and development testing. Complete procurement of non-long lead items. Complete test equipment design and update. Complete I&T qualification plan. Build and conduct unit level I&T activities

Exhibit R-2A, RDT&E Project Justification: PB 2017 Navy		Date: February 2016
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 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
on OE-120()/UPX Tech Refresh Engineering and Development Model. Initiate system level Integration and Test and qualification testing activities. Planned event is the Test Readiness Review. ***FY 2017 OCO Plans:*** N/A					
Title: Mark XIIA Mode 5 and Mode S Improvement for AN/UPX-29(V)	0.244	0.000	0.000	0.000	0.000
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 2015 Accomplishments:*** Conducted engineering investigation for AN/UPX-24(V) Software Version 2.1.3 Aegis Integration Event Test Observation report. Subsequently received Combat System certification to deploy AN/UPX-24(V) Software Version 2.1.3 with various Aegis, ACDS and SSDS baselines. ***FY 2016 Plans:*** N/A ***FY 2017 Base Plans:*** N/A ***FY 2017 OCO Plans:*** N/A					
Title: AN/UPX-29(V) Management Support	0.058	0.379	0.312	0.000	0.312
Articles:	-	-	-	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2017 Navy		Date: February 2016
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 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
Description: Engineering and Program Management of the AN/UPX 29 (V). Perform system integration efforts. ***FY 2015 Accomplishments:*** Supported award of the OE-120 Tech Refresh Engineering Change Proposal (ECP). Managed engineering assessments/evaluations/development efforts that provide resolution to engineering investigations and obsolescence issues. ***FY 2016 Plans:*** Support Systems Engineering Technical Reviews for OE-120/UPX according to the tech refresh ECP schedule. Planned events include the Preliminary and Critical Design Reviews (PDR/CDR). ***FY 2017 Base Plans:*** Support Systems Engineering Technical Reviews for OE-120/UPX according to the tech refresh ECP schedule. Monitor progress from CDR to EDM delivery in preparation for production line updates. ***FY 2017 OCO Plans:*** N/A					
Accomplishments/Planned Programs Subtotals	1.612	5.404	4.914	0.000	4.914

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total	FY 2018	FY 2019	FY 2020	FY 2021	Cost To Complete	Total Cost
• OPN/2851: *ID Systems*	28.085	29.676	22.177	-	22.177	26.711	28.650	29.272	29.888	Continuing	Continuing

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 2017 Navy			Date: February 2016
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 2015 Cost	FY 2015 Award Date	FY 2016 Cost	FY 2016 Award Date	FY 2017 Base Cost	FY 2017 Base Award Date	FY 2017 OCO Cost	FY 2017 OCO Award Date	FY 2017 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Primary Hardware Development	WR	NAWCAD : St Inigoes, MD	8.895	0.113	Nov 2014	0.212	Nov 2015	0.049	Nov 2016	-		0.049	Continuing	Continuing	Continuing
Ship Integration	WR	NAWCAD : St Inigoes, MD	2.462	0.000		0.000		0.000		-		0.000	0.000	2.462	2.462
Systems Engineering	WR	NAWCAD : St Inigoes, MD	5.985	0.244	Nov 2014	0.000		0.000		-		0.000	0.000	6.229	6.229
OE-120 Tech Refresh	SS/FFP	BAE : Nashua, NY	0.000	1.197	May 2015	4.563	Nov 2015	4.553	Nov 2016	-		4.553	7.800	18.113	18.113
		Subtotal	17.342	1.554		4.775		4.602		-		4.602	-	-	-

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2015 Cost	FY 2015 Award Date	FY 2016 Cost	FY 2016 Award Date	FY 2017 Base Cost	FY 2017 Base Award Date	FY 2017 OCO Cost	FY 2017 OCO Award Date	FY 2017 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Configuration Management	WR	NAWCAD : St Inigoes, MD	0.169	0.000		0.000		0.000		-		0.000	0.000	0.169	0.169
ILS	WR	NAWCAD : St Inigoes, MD	2.547	0.000		0.000		0.000		-		0.000	0.000	2.547	2.547
Software Development	WR	NAWCAD : St Inigoes, MD	5.535	0.000		0.000		0.000		-		0.000	0.000	5.535	5.535
Technical Data	WR	NAWCAD : St Inigoes, MD	1.874	0.000		0.000		0.000		-		0.000	0.000	1.874	1.874
Training	WR	NAWCAD : St Inigoes, MD	0.200	0.000		0.000		0.000		-		0.000	0.000	0.200	0.200
Engineering	WR	NAWCAD : PAX River, MD	0.244	0.000		0.250	Nov 2015	0.000		-		0.000	0.000	0.494	0.494
		Subtotal	10.569	0.000		0.250		0.000		-		0.000	0.000	10.819	10.819

Exhibit R-3, RDT&E Project Cost Analysis: PB 2017 Navy			Date: February 2016
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Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2015 Cost	FY 2015 Award Date	FY 2016 Cost	FY 2016 Award Date	FY 2017 Base Cost	FY 2017 Base Award Date	FY 2017 OCO Cost	FY 2017 OCO Award Date	FY 2017 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	0.500
Operational Test & Evaluation	WR	NAWCAD : St Inigoes, MD	1.328	0.000		0.000		0.000		-		0.000	0.000	1.328	1.328
Test Assets	WR	NAWCAD : St Inigoes, MD	0.731	0.000		0.000		0.000		-		0.000	0.000	0.731	0.731
		Subtotal	2.559	0.000		0.000		0.000		-		0.000	0.000	2.559	2.559

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2015 Cost	FY 2015 Award Date	FY 2016 Cost	FY 2016 Award Date	FY 2017 Base Cost	FY 2017 Base Award Date	FY 2017 OCO Cost	FY 2017 OCO Award Date	FY 2017 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management Support	C/CPFF	American Electronics : California, MD	1.765	0.058	Nov 2014	0.379	Nov 2015	0.312	Nov 2016	-		0.312	0.000	2.514	2.514
		Subtotal	1.765	0.058		0.379		0.312		-		0.312	0.000	2.514	2.514

	Prior Years	FY 2015		FY 2016		FY 2017 Base		FY 2017 OCO		FY 2017 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	32.235	1.612		5.404		4.914		-		4.914	-	-	-

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2017 Navy		Date: February 2016
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604777N / *Navigation/Id System*	**Project (Number/Name)** 0676 / *Improve ID Development*

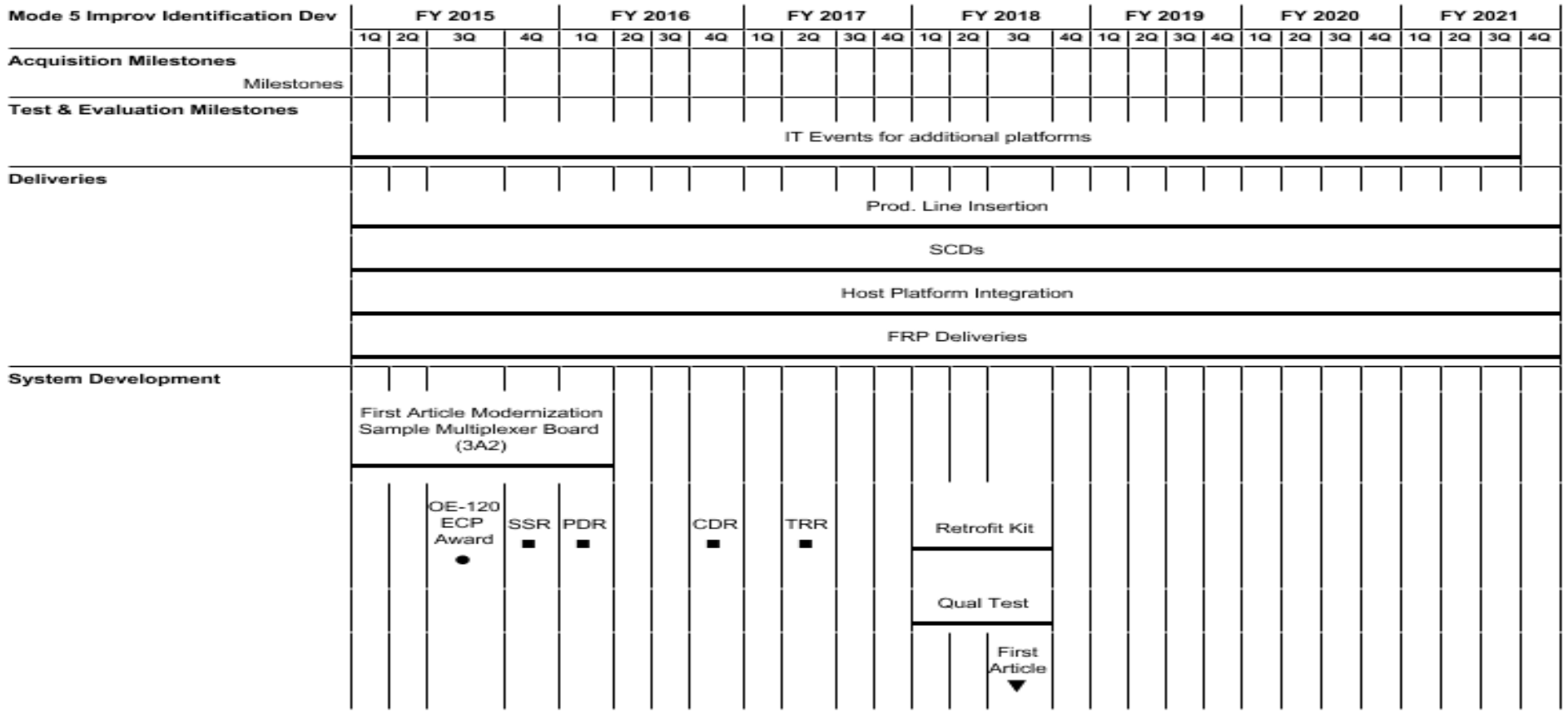

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Exhibit R-4A, RDT&E Schedule Details: PB 2017 Navy		Date: February 2016
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604777N / *Navigation/Id System*	**Project (Number/Name)** 0676 / *Improve ID Development*

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	2015	3	2021
Deliveries: Mode 5 - Production Line Insertion	1	2015	4	2021
Deliveries: Mode 5 - Prepare and Evaluate ECPs/SCDs	1	2015	4	2021
Deliveries: Mode 5 - Host Platform Integrations	1	2015	4	2021
Deliveries: Mode 5 - FRP Deliveries	1	2015	4	2021
System Development: First Article Modernization of Phase Shifter	1	2015	1	2016
System Development: OE-120 Tech Refresh Award	3	2015	3	2015
System Development: SSR	4	2015	4	2015
System Development: PDR	1	2016	1	2016
System Development: CDR	4	2016	4	2016
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

Exhibit R-2A, RDT&E Project Justification: PB 2017 Navy										Date: February 2016		
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 2015**	**FY 2016**	**FY 2017 Base**	**FY 2017 OCO**	**FY 2017 Total**	**FY 2018**	**FY 2019**	**FY 2020**	**FY 2021**	**Cost To Complete**	**Total Cost**
0921: *NAVSTAR GPS Equipment*	1,016.101	17.703	17.156	26.965	-	26.965	58.187	54.188	56.057	19.354	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 Navigation Warfare (NAVWAR) programs were established to provide continued access to GPS information in a denied or impeded electronic environment. The Sea NAVWAR program is executed in two increments: Increment 1 is GPS Antenna System (GAS-1); Increment 2 is Advanced Digital Antenna Production (ADAP). The purpose of Increments 1 and 2 is to integrate Anti-Jam (AJ) antennas on surface platforms. The Sea NAVWAR program will continue research of viability and development of a smaller ADAP variant referred to as the Multi-Platform Anti-Jam GPS Navigation Antenna (MAGNA) for surface ships. The program continues to support the Submarine Anti-Jam GPS Enhancement (SAGE) antenna development integrating AJ capability on submarines for the OE-538 Increment 2 Mast program. The Air NAVWAR program is a single increment with GAS-1, ADAP, and other continuing efforts. RDT&E continues to support platform integration requirements, Developmental Test/Operational Test (DT/OT), the Navy's development of a smaller Anti-Jam (AJ) antenna and a conformal low-observable AJ antenna for aircraft with unique requirements, and new technology AJ solutions for submarines.

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

GPS continues to be integrated in all DoD platforms and the development of enhanced and protected GPS is a national security priority. The acceleration of GPS Modernization addresses the Navy's future integration of GPS Directorate Military GPS User Equipment (MGUE) products being developed that will provide Naval platforms improved access to GPS signals in challenged and jamming environments. Modernized GPS receivers to utilize the new M-Code GPS Signal in Space,

Exhibit R-2A, RDT&E Project Justification: PB 2017 Navy		Date: February 2016
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incorporate enhanced cryptology, deliver greater position and time accuracy, and provide improved protection against signal spoofing as compared to legacy receivers. Additionally, GPS Modernization delivers increased GPS anti-jam protection and enables blue force GPS electronic attack. 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 of funding and priorities. This effort supports Navy compliance with Public Law 111-383 which prohibits spending funds on non M-Code GPS receivers after FY17.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
Title: Air Navigation Warfare (NAVWAR)	2.820	2.788	2.208	0.000	2.208
Articles:	-	-	-	-	-
Description: Overall program efforts include investigation of emerging and mature technologies through study, development and associated testing for feasibility of program insertion to include Global Positioning System (GPS) Protective measures such as receiver modernization, miniaturization and anti-jam integration.					
FY 2015 Accomplishments: Assisted other air platforms with integration of anti-jam (AJ) capability to include Unmanned Air Systems (UAS), early warning platforms (E-2D), H-1 helicopters, and weapons. Led Air Assured Positioning, Navigation, and Timing (A-PNT) efforts by working with Navy Air platforms on determining navigation requirements, key performance parameters (KPP), precise timing, and Capability Development Document (CDD) development. Coordinated with surface Navy platforms to leverage synergies gained through their A-PNT efforts. Provided GPS Modernization Navy unique requirements to GPS Directorate. Developed initial comprehensive roadmap for Military-Code (M-Code) integration into Naval Aviation Platforms. Assisted 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. Participated in joint NAVWAR Memorandum of Understanding (MOU) initiatives and foreign competitive testing with Canada, United Kingdom and Australia to meet OSD initiatives.					
FY 2016 Plans: Continue to assist other air platforms with integration of AJ capability to include UAS, E-2D, AH-1Z/UH-1Y helicopters, and weapons. Continue work to mature small form factor AJ solutions for UAS platforms and assisting E-2D platforms with AJ capabilities tied to refueling upgrades. Conducting demonstrations of small AJ variants on multiple platforms.					

Exhibit R-2A, RDT&E Project Justification: PB 2017 Navy		Date: February 2016
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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
Continue to lead Air A-PNT efforts by working with Navy Air platforms on defining navigation requirements, Navy unique KPPs, precise timing, and CDD development to ensure reliable A-PNT capability and interoperability insertion in GPS receivers and associated C4I and combat systems in a denied environment. Continue supporting accelerated AJ efforts with H-1 helicopters including a Foreign Comparative Test (FCT) effort. Coordinating H-1/UAS vulnerability testing. Continue to assist the Fleet with GPS Enterprise SAASM and AEP developments, providing subject matter expertise to NAVAIR platforms for SAASM integration. Continue to participate in joint NAVWAR MOU initiatives and foreign competitive testing with Canada, United Kingdom and Australia to meet OSD initiatives. ***FY 2017 Base Plans:*** Continue to assist other air platforms with integration of AJ capability to include UAS, E-2D, AH-1Z/UH-1Y helicopters, and weapons. Conduct integration and testing of small form factor AJ solution for UAS and H-1 platforms. Complete efforts to assist E-2D platforms with AJ capabilities tied to refueling upgrades. Continue to lead Air A-PNT efforts by working with Navy Air platforms on navigation requirements and coordinating with surface Navy platforms to leverage synergies. Continue efforts to support CDD development, including development of Navy unique KPPs and requirements, in order to ensure reliable A-PNT capability and interoperability insertion in GPS receivers and associated C4I and combat system in a denied environment, to include precise timing. Continue to participate in joint NAVWAR MOU initiatives and foreign competitive testing with Canada, United Kingdom and Australia to meet OSD initiatives. ***FY 2017 OCO Plans:*** N/A.					
Title: Sea Navigation Warfare (NAVWAR)	2.431	6.750	7.659	0.000	7.659
Articles:	-	-	-	-	-
Description: Overall program efforts include investigation of emerging and mature technologies through study, development and associated testing for feasibility of program insertion to include Global Positioning System (GPS) Protective measures such as receiver modernization, miniaturization and anti-jam (AJ) integration.					
FY 2015 Accomplishments:					

Exhibit R-2A, RDT&E Project Justification: PB 2017 Navy		Date: February 2016
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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
Continued Submarine Anti-Jam (AJ) Global Positioning System (GPS) Enhancement (SAGE) Developmental Testing (DT) to resolve prior inconclusive test results. Continued GPS AJ programmatic and technical support of SAGE efforts. Commenced the SAGE Production Representative Article (PRA) design, development, testing, and integration into the submarine Multi-Function Mast (OE-538B) Antenna System PRA. Commenced government oversight, system engineering, logistics, contracts and programmatic support for the OE-538B antenna system PRA. Researched technology advancements to advise for technology insertion of a smaller Advanced Digital Antenna Production (ADAP) variant, Multi-Platform Anti-Jam GPS Navigation Antenna (MAGNA). Initiated acquisition efforts in support of the development and testing of MAGNA. Completed Technical Requirements Document (TRD). Participated in joint NAVWAR Memorandum of Understanding (MOU) initiatives and foreign competitive testing with Canada, United Kingdom and Australia to meet OSD initiatives.					
FY 2016 Plans: Complete Submarine Anti-Jam (AJ) Global Positioning System (GPS) Enhancement (SAGE) Developmental Testing (DT). Develop process for design changes required to integrate SAGE and Military Code (M-Code) into the submarine Multi-Function Mast (OE-538B) antenna system production representative article (PRA). Continue the design, development, testing, and integration of SAGE PRA into the OE-538B antenna system PRA in support of the Preliminary Design Review(PDR)and Critical Design Review(CDR). Continue government oversight, system engineering, logistics, contracts, and programmatic support of the OE-538B antenna system PRA. Receive MAGNA Production Ready Articles (PRA) as a result of the Rapid Innovation Fund (RIF) technology advancement contract. Continue acquisition efforts in support of Development Test/Operational Test (DT/OT) to include: development of acquisition documentation; review and develop project and test documentation; initiate test preparation activities in support of PRA DT.					

Exhibit R-2A, RDT&E Project Justification: PB 2017 Navy		Date: February 2016
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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
Initiate efforts in preparation to award a Small Business Innovation Research (SBIR) Phase III contract for MAGNA. Continue to participate in joint NAVWAR MOU initiatives and foreign competitive testing with Canada, United Kingdom and Australia to meet OSD initiatives. ***FY 2017 Base Plans:*** Continue the design, development, testing, and integration of SAGE Production Representative Article (PRA) into the submarine Multi-Function Mast (OE-538B) antenna system PRA in support the CDR and the Test Readiness Review(TRR). Continue government oversight, system engineering, logistics, contracts, and programmatic support of the OE-538B antenna system. Commence efforts in preparation for the OE-538B Mast Functional Configuration Audit and PRA delivery. Commence preparation for developmental testing and first article testing of OE-538B PRA. Complete contracting efforts in support of the MAGNA SBIR Phase III contract. Continue to participate in joint NAVWAR MOU initiatives and foreign competitive testing with Canada, United Kingdom and Australia to meet OSD initiatives. ***FY 2017 OCO Plans:*** N/A.					
Title: Global Positioning System (GPS) Modernization ***Articles:*** ***Description:*** GPS Modernization efforts support providing Naval platforms improved access to Global Positioning System (GPS) signals in challenged and jamming environments. Modernized GPS receivers will utilize the new 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 compared to legacy SAASM receivers. Additionally, GPS Modernization delivers increased GPS anti-jam protection and enables blue force GPS electronic attack. Operationalizes risk reduction efforts currently underway by the Air Force and integrates it into Naval ships, submarines, aircraft, weapons systems, and GPS enabled systems imbedded on those platforms. ***FY 2015 Accomplishments:***	0.000 -	0.000 -	11.091 -	0.000 -	11.091 -

Exhibit R-2A, RDT&E Project Justification: PB 2017 Navy		Date: February 2016
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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
N/A. ***FY 2016 Plans:*** N/A. ***FY 2017 Base Plans:*** Establish and begin execution of a plan for multiple concurrent projects to integrate and test Military-Code (M-Code) capability on Navy ships, submarines, aircraft, weapons systems, and GPS enabled systems imbedded on those platforms. Provide engineering support to the M-code receiver development programs outside this project to ensure Navy platform performance and integration requirements are supported. Conduct initial requirements development and system engineering for integration of Tier 0 Priority platforms and Tier 1 current production Platforms. Procure production representative M-Code receivers from various platforms' vendors for follow-on integration risk reduction efforts and Navy qualification testing. Initiate contracting efforts with platform vendors for M-Code receiver integration engineering and testing. ***FY 2017 OCO Plans:*** N/A.					
Title: Global Positioning System (GPS) - Based Positioning, Navigation and Timing (PNT) Service (GPNTS) ***Articles:*** ***Description:*** Overall program efforts include investigation of emerging and mature technologies through study, development and associated testing for feasibility of program insertion to include GPS Protective measures such as receiver modernization, miniaturization and anti-jam integration. ***FY 2015 Accomplishments:*** Completed Government witnessing of the contractor's Functional Configuration Audit (FCA) and Factory Acceptance Testing (FAT) on the Engineering Development Models (EDM). Received delivery of first of two GPNTS EDMs. Completed staff training on EDM. Finalized laboratory preparations for the conduct of Independent Verification and Validation (IV&V) and initiated efforts to prepare for Developmental Testing (DT). Completed requests and received laboratory certification from COMOPTEVFOR. Completed a program Test Readiness Review (TRR) for IV&V and DT events. Completed test report for initial IV&V events. Completed the program's Provisioning Conference with Naval Inventory Control Point (NAVICP).	12.452 2	7.618 -	6.007 -	0.000 -	6.007 -

Exhibit R-2A, RDT&E Project Justification: PB 2017 Navy		Date: February 2016
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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
Continued update of all statutory and regulatory acquisition documentation, including the Test and Evaluation Master Plan (TEMP), Capabilities Production Document (CPD), and Acquisition Strategy (AS), in support of a Milestone (MS) C decision. Continued installation Readiness Drawings (IRD) for all configurations in preparation for a MS C decision. Continued to conduct monthly Earned Value Management (EVM) analysis and reporting. Supported development of Positioning, Navigation and Timing (PNT) requirements in support of a Joint Aerial Layer Network-Maritime (JALN-M) demonstration in FY18. ***FY 2016 Plans:*** Conduct Final Acceptance of GPNTS EDM 1 and 2 and receive delivery of second EDM at government lab facilities. Continue efforts in support of Government Developmental Testing (DT) and Operational Acceptance; to include staff training, Government witnessing of events, and reporting; preparing laboratory, developing test plans, and installing EDMs in laboratory; continuing development of installation documentation including updating IRDs test configuration, Ship Installation Drawings (SIDs), and Engineering Change Orders (ECOs). Continue efforts to complete function and performance IV&V and conduct PNT Performance Testing on GPNTS EDMs. Developing test reports. Providing efforts to complete developmental test with COMOPTEVFOR and complete Mission Readiness Assessment testing. Initiate efforts for Environmental Qualification Testing and AEGIS integration. Providing support efforts to obtain required Information Assurance documentation in order to conduct testing and evaluation events. Continue update of all statutory and regulatory acquisition documentation including the TEMP, CPD, and AS, in support of a MS C decision. Initiate the Independent Logistics Assessment (ILA) in support of a MS C decision. ***FY 2017 Base Plans:*** Complete Operational Acceptance, AEGIS integration, and receive AEGIS Certification. Continue Environmental Qualification Testing. Commence follow on test efforts for Navy Certification, Technical Evaluation, Combat Systems Certification and Initial Operational Test and Evaluation (IOT&E) activities.					

Exhibit R-2A, RDT&E Project Justification: PB 2017 Navy		Date: February 2016
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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
Complete development of GPNTS installation documentation based on finalized configurations, such as Ship Change Documentation (SCD), Enterprise Change Requests (ECR) and IRDs for EDMs in support of IOT&E activities. Complete all statutory and regulatory acquisition documentation including the TEMP, CPD, and AS, in support of a MS C decision. Complete ILA in support of a MS C decision. Receive MS C decision from the Milestone Decision Authority (MDA) for approval of GPNTS Low Rate Initial Production (LRIP). ***FY 2017 OCO Plans:*** N/A.					
Accomplishments/Planned Programs Subtotals	17.703	17.156	26.965	0.000	26.965

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total	FY 2018	FY 2019	FY 2020	FY 2021	Cost To Complete	Total Cost
• OPN/2657: *NAVSTAR GPS Receivers (Space)*	15.232	12.359	12.752	-	12.752	15.803	17.577	21.224	21.655	Continuing	Continuing
• APN/0577: *Common Avionics Changes*	2.060	6.699	7.091	-	7.091	7.439	7.529	10.305	35.404	Continuing	Continuing
• APN/0544: *E-2 Series*	0.000	0.000	0.000	-	0.000	0.000	1.300	3.800	10.400	Continuing	Continuing

Remarks

D. Acquisition Strategy

Navigation Warfare (NAVWAR): The SeaNAVWAR program is executed in two increments and supports integration of the Submarine Anti-Jam (AJ) GPS Enhancement (SAGE). Increment 1 has been completed. Increment 2 is Advanced Digital Antenna Production (ADAP). The purpose of Increments 1 and 2 is to integrate AJ antennas on surface platforms. In support of accelerated Global Positioning System (GPS) modernization and AJ efforts, the Sea NAVWAR program will continue to support the SAGE antenna development integrating AJ capability on submarines for the OE-538B antenna and continue research and development of a small form factor Multi-Platform AJ GPS Navigation Antenna for surface ships. The Air NAVWAR program is executed in a single increment to integrate AJ capability on air platforms and develop a smaller AJ antenna and a conformal low-observable AJ antenna for aircraft with unique requirements in support of GPS modernization efforts in support of accelerated GPS Modernization and AJ efforts.

Exhibit R-2A, RDT&E Project Justification: PB 2017 Navy		Date: February 2016
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604777N / *Navigation/Id System*	**Project (Number/Name)** 0921 / *NAVSTAR GPS Equipment*

GPS-based Positioning, Navigation, and Timing (PNT) Service (GPNTS): The 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, while targeting Common Computing Environments (CCE). GPNTS will also integrate Military GPS User Equipment (MGUE) that will allow the U.S. Navy to leverage current and future technology development provided by the GPS Wing, formerly known as the GPS Directorate. GPNTS will operate at the UNCLASSIFIED level and can provide the PNT data to higher classified systems.

GPS Modernization will fund the non-recurring engineering required to conduct systems engineering, integration and test of Air Force developed Military GPS User Equipment (MGUE) receivers to implement Military-Code (M-CODE) on Naval air, surface, subsurface, and weapons platforms as well as other GPS systems imbedded in those platforms. Navy will use a tiered approach for implementing M-Code starting with specified priority platforms (Tier 0), then platforms currently in production to comply with Public Law 111-383 (Tier 1), followed by back fit of existing platforms (Tier 2). For Navy Air Platforms the current platform contracts will be utilized in a multi-increment approach for integration and test.

E. Performance Metrics

The primary metric used for the Air NAVWAR Program is acceptable system performance in a 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 signal ratio (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 metrics used for the GPNTS is successful completion of the system development as outlined in the GPNTS Technical Requirements Document (TRD).

Exhibit R-3, RDT&E Project Cost Analysis: PB 2017 Navy			Date: February 2016
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Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2015 Cost	FY 2015 Award Date	FY 2016 Cost	FY 2016 Award Date	FY 2017 Base Cost	FY 2017 Base Award Date	FY 2017 OCO Cost	FY 2017 OCO Award Date	FY 2017 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Product Development	WR	SSC PAC : San Diego	73.088	0.680	Dec 2014	0.684	Dec 2015	0.500	Dec 2016	-		0.500	Continuing	Continuing	Continuing
Systems Engineering	WR	Govt/Contractor : San Diego, Newport	21.428	0.302	Nov 2014	0.304	Nov 2015	0.150	Nov 2016	-		0.150	Continuing	Continuing	Continuing
Product Development	C/CPIF	Raytheon : San Diego	27.283	5.926	Oct 2014	1.501	Jan 2016	2.024	Nov 2016	-		2.024	Continuing	Continuing	Continuing
Product Development	C/CPIF	Lockheed : Marion, MA	0.000	1.860	Sep 2015	4.882	Dec 2015	6.500	Dec 2016	-		6.500	Continuing	Continuing	Continuing
Product Development	Various	Various : Various	730.116	0.000		0.000		0.000		-		0.000	0.000	730.116	-
		Subtotal	851.915	8.768		7.371		9.174		-		9.174	-	-	-

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2015 Cost	FY 2015 Award Date	FY 2016 Cost	FY 2016 Award Date	FY 2017 Base Cost	FY 2017 Base Award Date	FY 2017 OCO Cost	FY 2017 OCO Award Date	FY 2017 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Development Support	WR	SSC PAC/NAWC : San Diego/Pax River/ China Lake	14.393	2.424	Dec 2014	2.437	Dec 2015	3.000	Dec 2016	-		3.000	Continuing	Continuing	Continuing
Software Development	WR	SSC PAC/NAWC : San Diego/Pax River/ China Lake	10.450	0.000		0.000		0.314	Nov 2016	-		0.314	Continuing	Continuing	Continuing
Integrated Logistics Support	WR	SSC PAC/NAWC : San Diego/Pax River	8.202	0.209	Dec 2014	0.210	Dec 2015	0.677	Dec 2016	-		0.677	Continuing	Continuing	Continuing
Contract Engineering Services	C/FPAF	BAH : San Diego, Pax River, China Lake	0.000	1.516	Nov 2014	1.899	Nov 2015	0.472	Nov 2016	-		0.472	Continuing	Continuing	Continuing
Government Engineering Services	WR	SSC PAC, NAWC : San Diego, China Lake, Pax River	0.000	1.405	Dec 2014	1.413	Dec 2015	9.000	Dec 2016	-		9.000	Continuing	Continuing	Continuing
Training Development	WR	SSC PAC/NAWC : San Diego/Pax River	5.450	0.054	Dec 2014	0.054	Dec 2015	0.000		-		0.000	Continuing	Continuing	Continuing
Technical Data	WR	SSC PAC : San Diego	2.070	0.021	Dec 2014	0.021	Dec 2015	0.000		-		0.000	Continuing	Continuing	Continuing

Exhibit R-3, RDT&E Project Cost Analysis: PB 2017 Navy			Date: February 2016
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Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2015 Cost	FY 2015 Award Date	FY 2016 Cost	FY 2016 Award Date	FY 2017 Base Cost	FY 2017 Base Award Date	FY 2017 OCO Cost	FY 2017 OCO Award Date	FY 2017 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Technical Data	WR	NAWC : Pax River	0.862	0.378	Dec 2014	0.380	Dec 2015	0.000		-		0.000	Continuing	Continuing	Continuing
Support	Various	Various : Various	5.396	0.000		0.000		0.000		-		0.000	0.000	5.396	-
		Subtotal	46.823	6.007		6.414		13.463		-		13.463	-	-	-

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2015 Cost	FY 2015 Award Date	FY 2016 Cost	FY 2016 Award Date	FY 2017 Base Cost	FY 2017 Base Award Date	FY 2017 OCO Cost	FY 2017 OCO Award Date	FY 2017 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Test & Evaluation	WR	SSC PAC/NAWC PAX : San Diego/Pax River	32.507	1.526	Nov 2014	1.946	Nov 2015	1.633	Nov 2016	-		1.633	Continuing	Continuing	Continuing
Test & Evaluation	Various	Various : Various	48.855	0.000		0.000		0.000		-		0.000	0.000	48.855	-
		Subtotal	81.362	1.526		1.946		1.633		-		1.633	-	-	-

Management Services ($ in Millions)

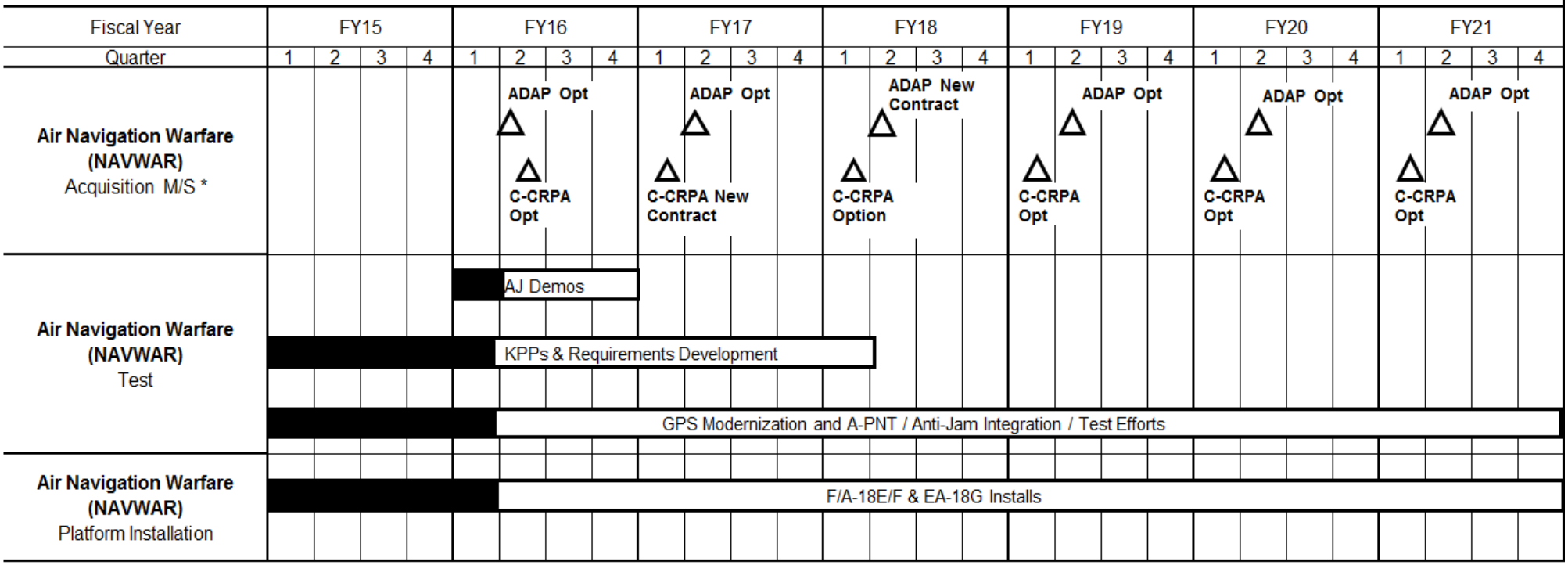
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2015 Cost	FY 2015 Award Date	FY 2016 Cost	FY 2016 Award Date	FY 2017 Base Cost	FY 2017 Base Award Date	FY 2017 OCO Cost	FY 2017 OCO Award Date	FY 2017 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management Support	C/CPAF	BAH : San Diego, Pax River, China Lake	4.667	1.402	Nov 2014	1.425	Nov 2015	2.695	Nov 2016	-		2.695	Continuing	Continuing	Continuing
Management Services	Various	Various : Various	31.334	0.000		0.000		0.000		-		0.000	0.000	31.334	-
		Subtotal	36.001	1.402		1.425		2.695		-		2.695	-	-	-

	Prior Years	FY 2015		FY 2016		FY 2017 Base		FY 2017 OCO		FY 2017 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	1,016.101	17.703		17.156		26.965		-		26.965	-	-	-

Remarks

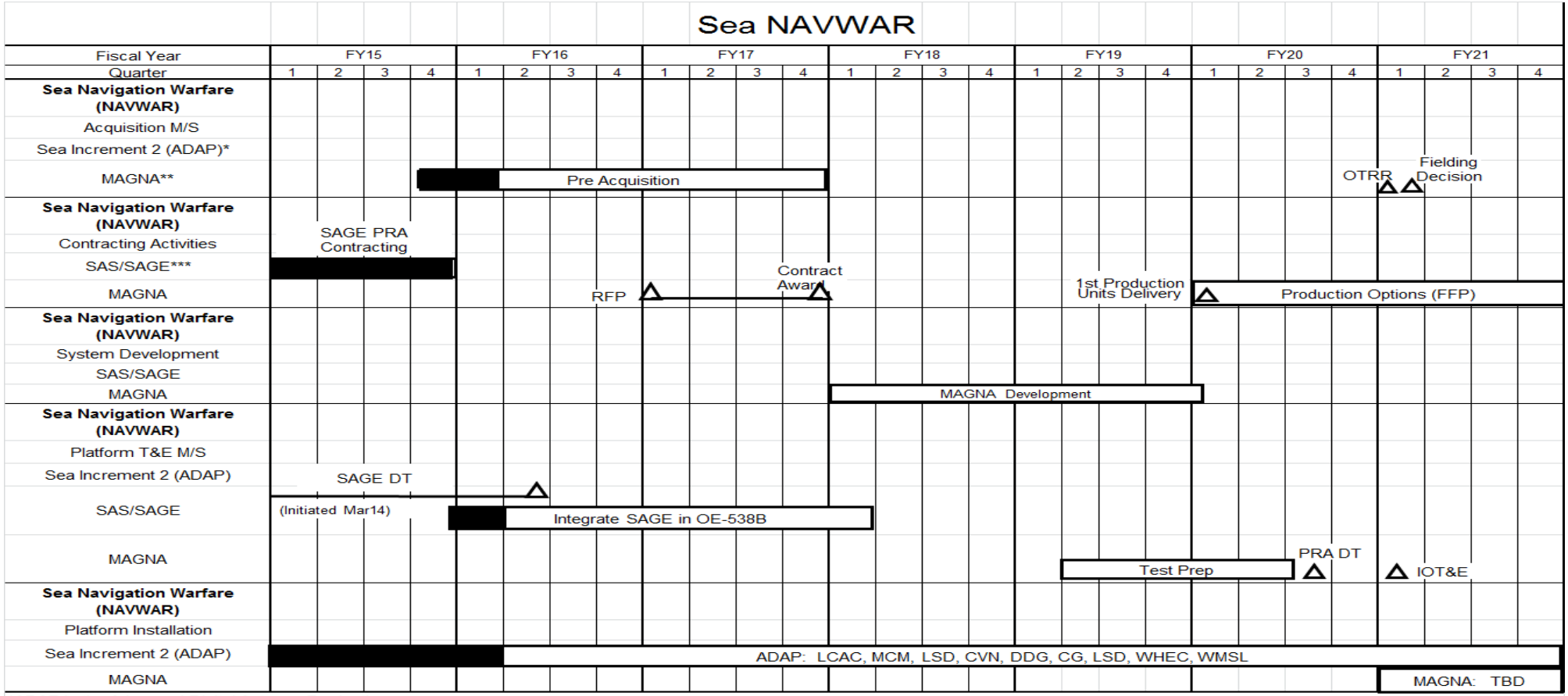
Exhibit R-4, RDT&E Schedule Profile: PB 2017 Navy		Date: February 2016
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604777N / *Navigation/Id System*	**Project (Number/Name)** 0921 / *NAVSTAR GPS Equipment*

Air NAVWAR



* ADAP (Advanced Digital Antenna Production), C-CRPA (Conformal Controlled Reception Pattern Antenna).

Exhibit R-4, RDT&E Schedule Profile: PB 2017 Navy		Date: February 2016
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604777N / *Navigation/Id System*	**Project (Number/Name)** 0921 / *NAVSTAR GPS Equipment*



*ADAP is the Advanced Digital Antenna Production program

**MAGNA is the Multi-Platform Anti-Jam GPS Navigation Antenna. It is the proposed engineering change to the ADAP variant for swap constrained platforms.

***SAS/SAGE is the Navy's development of a Small Antenna System (SAS)/Submarine Anti-jam GPS Enhancement (SAGE): Per MDA Merger Decision dated 24 July 2012 , the Sea NAVWAR Increment 3 SAGE transitioned to the OE-538 Increment 2 program. Per updated APB of 7 March 2013 Increment 3 cost, schedule, and performance requirements has been removed from the APB. Sea NAVWAR remains as the Technical Authority for SAGE and is responsible for prototype development.

Exhibit R-4, RDT&E Schedule Profile: PB 2017 Navy		Date: February 2016
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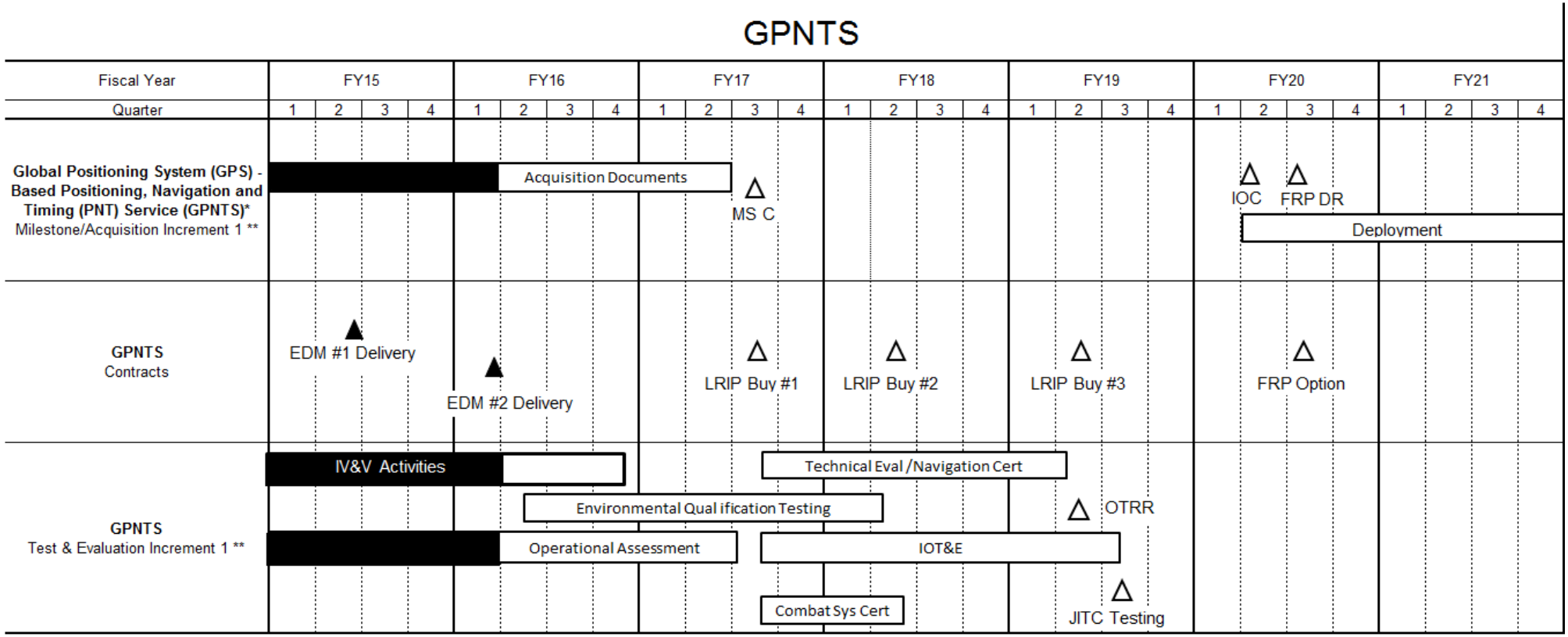

* Global Positioning System (GPS) Positioning, Navigation, Timing (PNT) Service (GPNTS) will be a single Program of Record (POR), which will receive, process, and distribute three dimensional position, velocity, acceleration, time, and frequency in the formats required by shipboard user systems. GPNTS will be scalable to accommodate back fit of current legacy PNT systems as well as forward fit of new platforms.

** Increment 1 will develop, acquire, and field a baseline GPNTS integrating current Selective Availability Anti-Spoof Module (SAASM) GPS receiver. GPNTS will be based on

Exhibit R-4, RDT&E Schedule Profile: PB 2017 Navy		Date: February 2016
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GPS Modernization

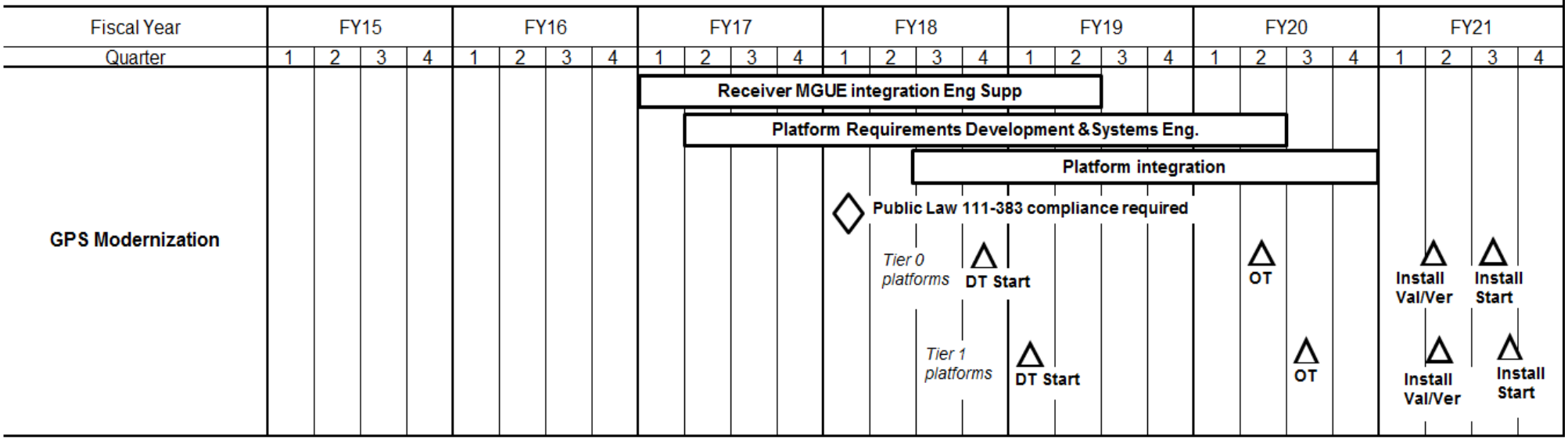

Exhibit R-4A, RDT&E Schedule Details: PB 2017 Navy		Date: February 2016
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Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 0921				
Air NAVWAR: Air Navigation AJ Demonstrations	1	2016	4	2016
Air NAVWAR: Air Navigation KPP & Requirements Development	1	2015	2	2018
Air NAVWAR: Air Navigation GPS Mod and A-PNT/AJ Integration/Test Efforts	1	2015	4	2021
Air NAVWAR: Air Navigation ADAP Option 2016	2	2016	2	2016
Air NAVWAR: Air Navigation C-CRPA Option 2016	2	2016	2	2016
Air NAVWAR: Air Navigation C-CRPA 2017 New Contract	1	2017	1	2017
Air NAVWAR: Air Navigation ADAP Option 2017	2	2017	2	2017
Air NAVWAR: Air Navigation C-CRPA Option 2018	1	2018	1	2018
Air NAVWAR: Air Navigation ADAP 2018 New Contract	2	2018	2	2018
Air NAVWAR: Air Navigation C-CRPA Option 2019	1	2019	1	2019
Air NAVWAR: Air Navigation ADAP Option 2019	2	2019	2	2019
Air NAVWAR: Air Navigation C-CRPA Option 2020	1	2020	1	2020
Air NAVWAR: Air Navigation ADAP Option 2020	2	2020	2	2020
Air NAVWAR: Air Navigation C-CRPA Option 2021	1	2021	1	2021
Air NAVWAR: Air Navigation ADAP Option 2021	2	2021	2	2021
Air NAVWAR: Air Navigation Installations	1	2015	4	2021
Sea NAVWAR: Sea Navigation MAGNA Pre-Acquisition	4	2015	4	2017
Sea NAVWAR: Sea Navigation MAGNA OTRR	1	2021	1	2021
Sea NAVWAR: Sea Navigation MAGNA Fielding Decision	1	2021	1	2021
Sea NAVWAR: Sea Navigation (SUB) SAGE PRA Contracting	1	2015	4	2015
Sea NAVWAR: Sea Navigation MAGNA RFP	1	2017	1	2017
Sea NAVWAR: Sea Navigation MAGNA Contract Award	4	2017	4	2017

Exhibit R-4A, RDT&E Schedule Details: PB 2017 Navy		Date: February 2016
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	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Sea NAVWAR: Sea Navigation MAGNA 1st Unit Delivery	1	2020	1	2020
Sea NAVWAR: Sea Navigation MAGNA Production Options (FFP)	1	2020	4	2021
Sea NAVWAR: Sea Navigation MAGNA Development	1	2018	1	2020
Sea NAVWAR: Sea Navigation (SUB) SAGE DT	1	2015	2	2016
Sea NAVWAR: Sea Navigation (SUB) Integrate SAGE to OE-538B	4	2015	1	2018
Sea NAVWAR: Sea Navigation MAGNA Test Preparation Efforts	2	2019	3	2020
Sea NAVWAR: Sea Navigation MAGNA PRA DT	3	2020	3	2020
Sea NAVWAR: Sea Navigation MAGNA IOT&E	1	2021	1	2021
Sea NAVWAR: Sea Navigation (SUB) SAGE/ADAP Installations	1	2015	4	2021
Sea NAVWAR: Sea Navigation MAGNA Installations	1	2021	4	2021
GPS-based PNT Service (GPNTS): GPNTS Acquisition Documents	1	2015	2	2017
GPS-based PNT Service (GPNTS): GPNTS MS C	3	2017	3	2017
GPS-based PNT Service (GPNTS): GPNTS IOC	2	2020	2	2020
GPS-based PNT Service (GPNTS): GPNTS FRP DR	3	2020	3	2020
GPS-based PNT Service (GPNTS): GPNTS Deployment	2	2020	4	2021
GPS-based PNT Service (GPNTS): GPNTS EDM Delivery #1	2	2015	2	2015
GPS-based PNT Service (GPNTS): GPNTS EDM Delivery #2	1	2016	1	2016
GPS-based PNT Service (GPNTS): GPNTS LRIP Option 1	3	2017	3	2017
GPS-based PNT Service (GPNTS): GPNTS LRIP Option 2	2	2018	2	2018
GPS-based PNT Service (GPNTS): GPNTS LRIP Option 3	2	2019	2	2019
GPS-based PNT Service (GPNTS): GPNTS FRP Option	3	2020	3	2020
GPS-based PNT Service (GPNTS): GPNTS IV&V Activities	1	2015	4	2016
GPS-based PNT Service (GPNTS): GPNTS Operational Assessment	1	2015	3	2017
GPS-based PNT Service (GPNTS): GPNTS Environmental Qualification Testing	2	2016	2	2018
GPS-based PNT Service (GPNTS): GPNTS Tech Eval / Nav Cert	3	2017	2	2019
GPS-based PNT Service (GPNTS): GPNTS IOT&E Activities	3	2017	3	2019

Exhibit R-4A, RDT&E Schedule Details: PB 2017 Navy		Date: February 2016
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 Combat Cert	3	2017	2	2018
GPS-based PNT Service (GPNTS): GPNTS OTRR	2	2019	2	2019
GPS-based PNT Service (GPNTS): GPNTS JITC Testing	3	2019	3	2019
GPS Modernization: GPS Modernization MGUE Integration Engineering Support	1	2017	2	2019
GPS Modernization: GPS Modernization Requirements Development & System Engineering	2	2017	2	2020
GPS Modernization: GPS Modernization Platform Integration	2	2018	4	2020
GPS Modernization: GPS Modernization Public Law 111-383 Compliance Required	1	2018	1	2018
GPS Modernization: GPS Modernization Tier 0 Development Testing Start	4	2018	4	2018
GPS Modernization: GPS Modernization Tier 0 Development Operational Testing	2	2020	2	2020
GPS Modernization: GPS Modernization Tier 0 Install Validation & Verification	2	2021	2	2021
GPS Modernization: GPS Modernization Tier 0 Installation Start	3	2021	3	2021
GPS Modernization: GPS Modernization Tier 1 Development Testing Start	1	2019	1	2019
GPS Modernization: GPS Modernization Tier 1 Development Operational Testing	3	2020	3	2020
GPS Modernization: GPS Modernization Tier 1 Install Validation & Verification	2	2021	2	2021
GPS Modernization: GPS Modernization Tier 1 Installation Start	3	2021	3	2021

Exhibit R-2A, RDT&E Project Justification: PB 2017 Navy			Date: February 2016
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 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total	FY 2018	FY 2019	FY 2020	FY 2021	Cost To Complete	Total Cost
1253: *Combat Ident System*	177.905	3.200	2.645	3.852	-	3.852	2.556	2.056	1.953	1.996	Continuing	Continuing
Quantity of RDT&E Articles	81	1	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

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 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 Mark 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. Achieved Navy Mode 5 Initial Operational Capability (IOC) in 2012 in accordance with ORD. Fielded Mode 5 capable equipment 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. Expect 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-123, AN/APX-119, and AN/APX-111 equipment. RDT&E units are required for government and contractor labs to support aircraft and ship integrations, test sites and test aircraft.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
Title: Mode 5 prototype hardware, cryptographic module	0.397	0.890	2.272	0.000	2.272
Articles:	-	-	-	-	-
Description: Develop kits for installation into existing fleet assets including AN/APX-118/123 Common Digital Transponder, and AN/APX-111 Combined Interrogator Transponder or other interrogator/transponder equipment. Repair and correct deficiencies identified during integration and test. Procure IFF interrogators and transponders, including but not limited to: AN/APX-123, AN/APX-119, AN/APX-111, cryptographic modules and Mode 5 modification kits to support platform integration and testing. Perform platform integration efforts of Mode 5 equipment for various Type/ Model/Series aircraft.					
FY 2015 Accomplishments: Finalized integration of the Mode 5 AN/APX-111 CIT in the F/A-18E/F and EA-18G aircraft.					
FY 2016 Plans:					

Exhibit R-2A, RDT&E Project Justification: PB 2017 Navy		Date: February 2016
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 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
Begin platform integration design and development for incorporation of Mode 5 capability in CH-53K aircraft. ***FY 2017 Base Plans:*** Complete integration of Mode 5 capability in the CH-53K aircraft, including laboratory verification testing of the functionality prior to FY2018 T&E efforts. ***FY 2017 OCO Plans:*** N/A					
Title: Mode 5 Systems Engineering and Integrated Logistics Support (ILS) ***Articles:*** ***Description:*** Performed systems engineering and analysis in support of Mode 5 hardware/software development and engineering change proposals on Identification Friend or Foe interrogators and transponders, including but not limited to: AN/UPX-41C Interrogator, 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 2015 Accomplishments:*** Continue systems engineering and logistics efforts for various platforms (including KC-130J aircraft). ***FY 2016 Plans:*** Continue systems engineering integration design and development and logistics planning efforts for various platforms. Continue integration efforts of Mode 5 capability in CH-53K and KC-130J aircraft platforms. ***FY 2017 Base Plans:*** Continue systems engineering efforts for integration of Mode 5 capability in aircraft platforms, to include CH-53K and KC-130J. Perform logistics efforts to develop fleet pubs, training and retrofit Engineering Change Proposals for achieving Mode 5 capability in CH-53K and KC-130J. ***FY 2017 OCO Plans:*** N/A	1.122 -	0.366 -	0.412 -	0.000 -	0.412 -
Title: Mode 5 Upgrade Developmental Test & Operational Test ***Articles:*** ***Description:*** Perform Mode 5 integrated and operational test phases for AN/UPX-41C Interrogator, AN/APX-123 Common Transponder, AN/APX-119 Transponder, and AN/APX-111 Combined Interrogator Transponder.	1.681 1	1.389 -	1.168 -	0.000 -	1.168 -

Exhibit R-2A, RDT&E Project Justification: PB 2017 Navy		Date: February 2016
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 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
FY 2015 Accomplishments: Procure APX-119 and cryptographic module for the Navy's KC-130J test aircraft and planned for testing. Coordinate and planned for multiple platform integrated testing. Planned and conducted platform integrated testing for Mode 5 equipment upgrades on multiple platforms. Conducted operational testing on the F/A-18E/F and EA-18G of the Mode 5 AN/APX-111 equipment and platform H10 Mission Computer integration software. ***FY 2016 Plans:*** Continue testing of Mode 5 modified equipment including cryptological devices. Perform F/A-18E/F and EA-18G Mode 5 AN/APX-111 and H10 testing for verification and correction of deficiencies identified as a result of integrated and operational testing. ***FY 2017 Base Plans:*** Continue testing of Mode 5 modified equipment including cryptological devices. Perform test planning and execution in support of Mode 5 APX-119 integration on KC-130J aircraft and Mode 5 APX-123 integration on CH-53K platform. ***FY 2017 OCO Plans:*** N/A					
Accomplishments/Planned Programs Subtotals	3.200	2.645	3.852	0.000	3.852

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total	FY 2018	FY 2019	FY 2020	FY 2021	Cost To Complete	Total Cost
• OPN/2851: *ID Systems*	28.085	29.676	22.177	-	22.177	26.711	28.650	29.272	29.888	Continuing	Continuing
• APN/0582: *ID Sys*	38.880	41.063	45.768	-	45.768	49.374	46.199	47.146	48.112	Continuing	Continuing

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 other existing equipment. 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. Preform studies and analysis for future road mapping of IFF capability.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2017 Navy		Date: February 2016
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Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2015 Cost	FY 2015 Award Date	FY 2016 Cost	FY 2016 Award Date	FY 2017 Base Cost	FY 2017 Base Award Date	FY 2017 OCO Cost	FY 2017 OCO Award Date	FY 2017 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
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
Primary Hardware Development	WR	NAWCWD : China Lake, CA	16.821	0.397	Jan 2015	0.000		0.000		-		0.000	0.294	17.512	17.512
Primary Hardware Development	Various	Boeing : St Louis, MO	30.426	0.000		0.000		0.000		-		0.000	4.551	34.977	34.977
Systems Engineering	WR	NAWCAD : PAX River, MD	14.514	0.643	Nov 2014	0.216	Nov 2015	0.248	Nov 2016	-		0.248	Continuing	Continuing	Continuing
Systems Engineering	WR	NAWCAD : St Inigoes, MD	14.312	0.394	Nov 2014	0.045	Nov 2015	0.051	Nov 2016	-		0.051	Continuing	Continuing	Continuing
Primary Hardware Development	Various	L-3 : Waco, TX	0.000	0.000		0.000		0.032	Jan 2017	-		0.032	0.224	0.256	0.256
Primary Hardware Development	Various	Sikorsky : Stratford, CT	0.000	0.000		0.890	Jan 2016	2.240	Jan 2017	-		2.240	4.386	7.516	7.516
		Subtotal	119.286	1.434		1.151		2.571		-		2.571	-	-	-

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2015 Cost	FY 2015 Award Date	FY 2016 Cost	FY 2016 Award Date	FY 2017 Base Cost	FY 2017 Base Award Date	FY 2017 OCO Cost	FY 2017 OCO Award Date	FY 2017 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
ILS	Various	Various : Various	4.737	0.085	Nov 2014	0.105	Nov 2015	0.113	Nov 2016	-		0.113	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	7.498	0.085		0.105		0.113		-		0.113	-	-	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2017 Navy			Date: February 2016
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 2015 Cost	FY 2015 Award Date	FY 2016 Cost	FY 2016 Award Date	FY 2017 Base Cost	FY 2017 Base Award Date	FY 2017 OCO Cost	FY 2017 OCO Award Date	FY 2017 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Developmental T & E	WR	NAWCAD : PAX River, MD	26.415	1.621	Nov 2014	1.389	Nov 2015	1.168	Nov 2016	-		1.168	7.705	38.298	38.298
Develop/Operational T & E	WR	COMOPTEVFOR : Norfolk, VA	0.291	0.000		0.000		0.000		-		0.000	0.000	0.291	0.291
Operational T & E	WR	NAWCAD : PAX River, MD	16.623	0.000		0.000		0.000		-		0.000	0.000	16.623	16.623
Test Assets	Various	Various : Various	3.396	0.060	Mar 2015	0.000		0.000		-		0.000	0.000	3.456	3.456
		Subtotal	46.725	1.681		1.389		1.168		-		1.168	7.705	58.668	58.668

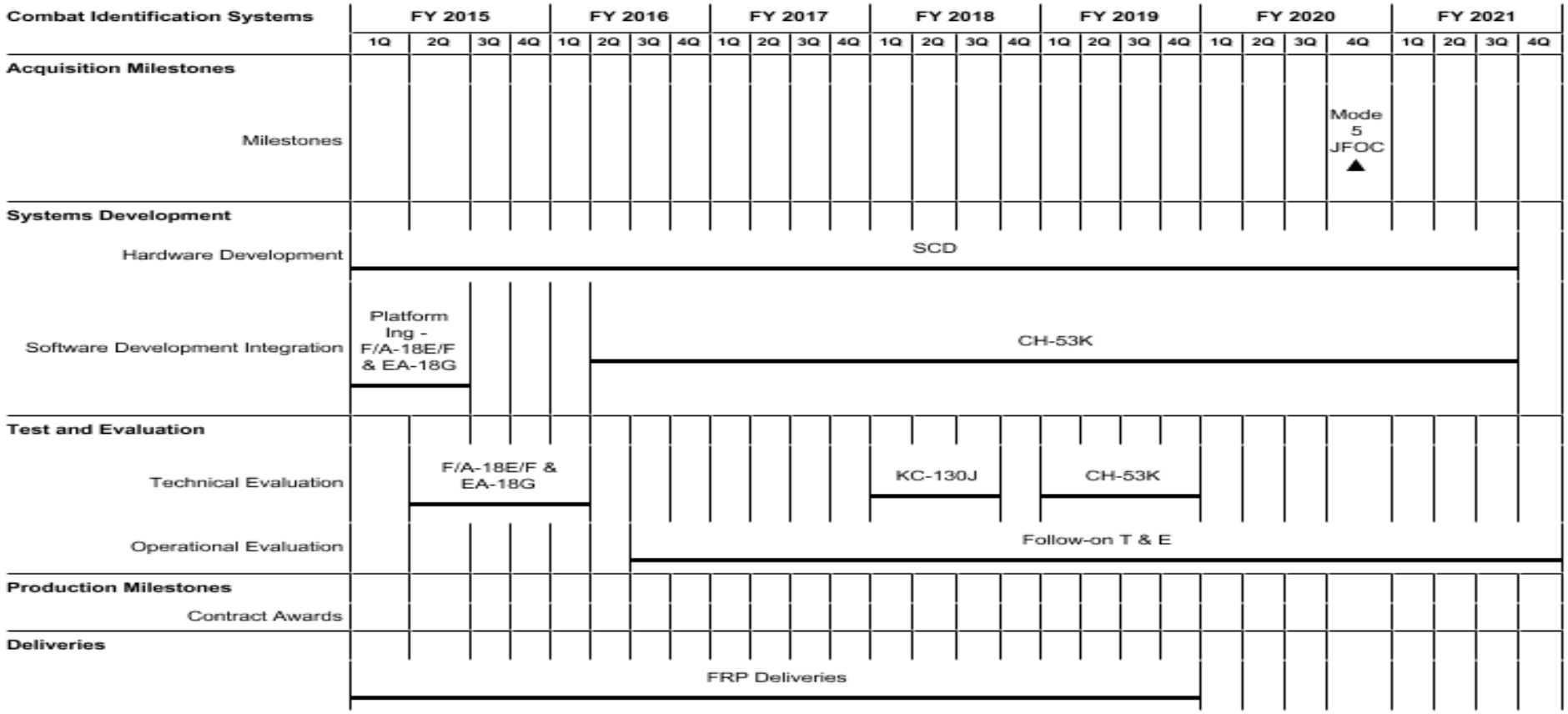
Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2015 Cost	FY 2015 Award Date	FY 2016 Cost	FY 2016 Award Date	FY 2017 Base Cost	FY 2017 Base Award Date	FY 2017 OCO Cost	FY 2017 OCO Award Date	FY 2017 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	4.396

	Prior Years	FY 2015		FY 2016		FY 2017 Base		FY 2017 OCO		FY 2017 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	177.905	3.200		2.645		3.852		-		3.852	-	-	-

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2017 Navy		Date: February 2016
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604777N / *Navigation/Id System*	**Project (Number/Name)** 1253 / *Combat Ident System*



2017DON - 0604777N - 1253

Exhibit R-4A, RDT&E Schedule Details: PB 2017 Navy		Date: February 2016
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	2015	3	2021
Systems Development: Software Development Integration: Platform Intg	1	2015	2	2015
Systems Development: Software Development Integration: KC-130J	1	2016	4	2017
Systems Development: Software Development Integration: CH-53K	2	2016	1	2018
Test and Evaluation: Technical Evaluation: F/A-18E/F & EA-18G	2	2015	1	2016
Test and Evaluation: Technical Evaluation: CH-53K	1	2019	4	2019
Test and Evaluation: Technical Evaluation: KC-130J	1	2018	3	2018
Test and Evaluation: Technical Evaluation: F/A-18E/F Verification	3	2016	1	2017
Test and Evaluation: Operational Evaluation: Follow-on Test and Evaluation	3	2016	4	2021
Deliveries: FRP Deliveries	1	2015	4	2019

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