Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy											Date: March 2019	
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 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
Total Program Element	589.152	74.984	126.026	40.755	-	40.755	48.907	48.451	43.371	43.251	Continuing	Continuing
0253: *Nav & Electro-Optical Supt*	50.734	7.250	35.963	36.532	-	36.532	37.339	37.724	38.892	38.681	Continuing	Continuing
0676: *Improve ID Development*	46.862	2.385	2.405	2.335	-	2.335	9.645	8.767	2.481	2.531	Continuing	Continuing
0921: *NAVSTAR GPS Equipment*	305.643	63.519	80.675	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	449.837
1253: *Combat Ident System*	185.913	1.830	1.983	1.888	-	1.888	1.923	1.960	1.998	2.039	Continuing	Continuing
9999: *Congressional Adds*	0.000	0.000	5.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	5.000

Note

Funding for the following project has been realigned out of PE 0604777N into PE 0604280N as part of Program Element Consolidation starting in FY 2020: Project 0921 (NAVSTAR GPS Equipment).

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) encompasses the Navy's efforts to pace the growing threat to GPS Navigation through the fielding of new GPS receivers, Anti-Jam (AJ) Antennas, and Assured Position Navigation and Timing (A-PNT) technologies across all Navy platform types. NAVSTAR GPS is a group of A-PNT systems that provides authorized users with secure, worldwide, all weather, three dimensional position, velocity, and precise time data. NAVSTAR GPS provides 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: Sea Navigation Warfare (NAVWAR), GPS-based Position, Navigation, and Timing (PNT) Service (GPNTS), Air Navigation Warfare (NAVWAR) and GPS Modernization. Sea NAVWAR provides AJ antennas and GPNTS provides GPS receivers and A-PNT technology to surface platforms, and Air NAVWAR provides AJ antennas and GPS Modernization provides GPS receivers to air platforms. 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.

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
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*

B. Program Change Summary ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	92.546	121.026	138.648	-	138.648
Current President's Budget	74.984	126.026	40.755	-	40.755
Total Adjustments	-17.562	5.000	-97.893	-	-97.893
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	5.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-1.542	0.000			
• SBIR/STTR Transfer	-1.570	0.000			
• Program Adjustments	0.000	0.000	-97.783	-	-97.783
• Rate/Misc Adjustments	0.000	0.000	-0.110	-	-0.110
• Congressional Directed Reductions Adjustments	-14.450	-	-	-	-

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

	FY 2018	FY 2019
Project: 9999: *Congressional Adds*		
Congressional Add: *Micro-IFF Component*	0.000	5.000
Congressional Add Subtotals for Project: 9999	0.000	5.000
Congressional Add Totals for all Projects	0.000	5.000

Change Summary Explanation

Beginning in FY 2020, Project 0921 was realigned from Program Element (PE) 0604777N into PE 0604280N due to budget line item consolidation.

Program:

Proj: 0921 Navigation Satellite Timing & Ranging (NAVSTAR) Global Positioning System (GPS) Equipment: As a result of hardware contract delays for the EGI-M GPS receivers and subsequent Prime Vendor Integration (PVI) contract delays, GPS Modernization withstood FY 2018 and FY 2019 budget reductions with minimal impact. F/A-18E/F, MV-22B, and CMV-22B air platforms equipped with MAGR2K-M GPS receivers will move forward with PVI efforts. F/A-18E/F, EA-18G, E-2D, CH-53K, and KC-130J air platforms with EGI-M GPS Receivers will move forward with critical risk reduction efforts to ensure Navy specific requirements are met in support of hardware development and PVI efforts.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
0253: *Nav & Electro-Optical Supt*	50.734	7.250	35.963	36.532	-	36.532	37.339	37.724	38.892	38.681	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The FY20 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 with an updated CDD approved on 15 Mar 2018. 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 $0.569M FY20 inflation increase continues the FY19 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. In FY20 these funds will continue the multi-year development of the Type 20 (previously named TOTIM) mast which will provide a modular mast with vastly increased capability, reduced maintenance costs and increased development flexibility with new reconfigurable mast sensors. Furthermore, this funding will improve the software algorithms and inboard hardware for the Type 20 mast and support non-recurring inboard hardware engineering activities which develop the Technical Insertion kits installed in all submarine classes that were previously funded with procurement (BLI 0840) funds which develop the Technical Insertion kits installed in all submarine classes. Finally, this inflation increase funds the TI-18/APB-17 688 Development Testing that verifies software improvements funded in previous fiscal years.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: ISIS and Photonics common software and hardware capabilities development and obsolescence.	5.567	7.436	22.589	0.000	22.589
Articles:	-	-	-	-	-
FY 2019 Plans: Design and develop additional complex and sophisticated imaging algorithms, upgrade software and hardware to process the significant increase in imaging data provided by Type 20 mast video and enable system to operate the mast. The increased data rates from the Type 20 provide enhanced situational awareness and effectiveness.					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Continue Advanced Processor Build (APB) productionization efforts, to add additional functionality including Image Contact Follower Improvements, Small Craft Detection, and Automatic Target Recognition. ***FY 2020 Base Plans:*** The $15.153M increase is (a) $0.149M inflationary increase in the annual investment advanced development of sensitive software imaging algorithms to maintain imaging system superiority, and (b) a $15.004M transfer of non-recurring engineering (NRE) that has been funded in prior years under OPN BLI 0840. This NRE provides the necessary engineering, technical program, project and configuration management of the Technical Insertion (TI) kit (software and hardware) baseline for each class of submarine. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** The $15.153M increase is to fund recurring development ($0.149M) of improved inboard hardware and software systems and to realign ($15.004M) to RDT&E a portion of longstanding NRE efforts funded in OPN BLI 0840.					
Title: Type 20 Mast (previously titled Task-Oriented Technology Insertion Mast (TOTIM))	1.002	27.832	13.234	0.000	13.234
Articles:	-	1	-	-	-
FY 2019 Plans: Design, develop, fabricate, and verify testing of the new Type 20 mast. Development will utilize open architecture and a modular design to reduce life cycle costs and enable flexibility for future capability upgrades. Specific efforts include: -Start development of the Type 20 technical data package -Execute design reviews -Start developing of the test plans -Start designing counter detection vulnerability reduction -Start procuring and fabricating the Type 20 test article for delivery in FY20 -Execute test events and environmental qualification testing of the Type 20 mast ***FY 2020 Base Plans:*** The $14.598M decrease in funding completes the Type 20 mast development, fabrication and verification. Specific efforts include: - Continue the test plans and commencement of test activities - Continue the counter detection vulnerability reduction - Complete fabrication of the Type 20 test article					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
- Develop enhancements to be incorporated into Type 20 mast ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** The $14.598M decrease is a result of reduced funding required for the completion of the development of a new mast. Type 20 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. Type 20 development will utilize open architecture and a modular design to reduce life cycle costs and enable flexibility for future capability upgrades. As a modular mast, the Type 20 mast will have additional enhancements added in future years.					
Title: Imaging Systems Test Efforts.	0.681	0.695	0.709	0.000	0.709
Articles:	-	-	-	-	-
FY 2019 Plans: 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 2020 Base Plans:*** The $0.014M increase is for TI-18/APB-17 688 Development Testing (DT) to validate sensitive algorithms incorporated into APB-17. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** The $0.014M increase is an inflation adjustment which will fund the design, management, and evaluation results of the Development Test for TI-18 / APB-17 for modernizing 688 boats.					
Accomplishments/Planned Programs Subtotals	7.250	35.963	36.532	0.000	36.532

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• SCN/2013: *Photonics Mast*	39.648	40.442	41.251	-	41.251	42.076	42.918	43.776	44.652	Continuing	Continuing

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• RDT&E/0604558N: *VIRGINIA Class Design Development*	0.000	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
• RDT&E/0603562N: *Advanced Submarine Support Equipment (ASSEP)*	4.120	4.307	4.672	-	4.672	4.777	4.866	4.977	5.077	Continuing	Continuing
• OPN/0840: *Sub Periscope, Imaging Equip. and Supt Equip Program*	172.740	178.421	169.969	-	169.969	211.640	281.297	290.510	291.727	Continuing	Continuing
• RDT&E/0603595N: *COLUMBIA Class Design Development*	1.024	1.118	1.115	-	1.115	0.898	0.936	0.954	0.974	Continuing	Continuing

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 Type 20 Mast 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 2020 Navy			Date: March 2019
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 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Software Development	C/CPIF	Lockheed Martin : Manassas, VA	16.765	2.075	Dec 2017	2.377	Dec 2018	9.444	Dec 2019	-		9.444	Continuing	Continuing	Continuing
Systems Engineering	WR	NUWC : Newport, RI	16.724	0.810	Oct 2017	2.323	Dec 2018	2.354	Nov 2019	-		2.354	Continuing	Continuing	Continuing
Hardware Development	C/CPIF	Lockheed Martin : Manassas, VA	7.688	2.636	Jun 2018	2.689	Dec 2018	10.743	Dec 2019	-		10.743	Continuing	Continuing	Continuing
Hardware Development - Type 20	C/CPIF	Lockheed Martin : Manassas, VA	0.000	1.002	Jul 2018	27.832	Dec 2018	13.234	Dec 2019	-		13.234	0.000	42.068	-
		Subtotal	41.177	6.523		35.221		35.775		-		35.775	Continuing	Continuing	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Development Test & Evaluation	WR	NUWC : Newport, RI	7.818	0.426	Oct 2017	0.435	Oct 2018	0.444	Oct 2019	-		0.444	Continuing	Continuing	Continuing
Development Test & Evaluation	WR	COMOPTEVFOR : Norfolk, VA	1.160	0.255	Oct 2017	0.260	Oct 2018	0.265	Oct 2019	-		0.265	Continuing	Continuing	Continuing
		Subtotal	8.978	0.681		0.695		0.709		-		0.709	Continuing	Continuing	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Travel	WR	NAVSEA : Washington, DC	0.579	0.046	Oct 2017	0.047	Oct 2018	0.048	Oct 2019	-		0.048	Continuing	Continuing	Continuing
		Subtotal	0.579	0.046		0.047		0.048		-		0.048	Continuing	Continuing	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	50.734	7.250		35.963		36.532		-		36.532	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604777N / *Navigation/Id System*	**Project (Number/Name)** 0253 / *Nav & Electro-Optical Supt*

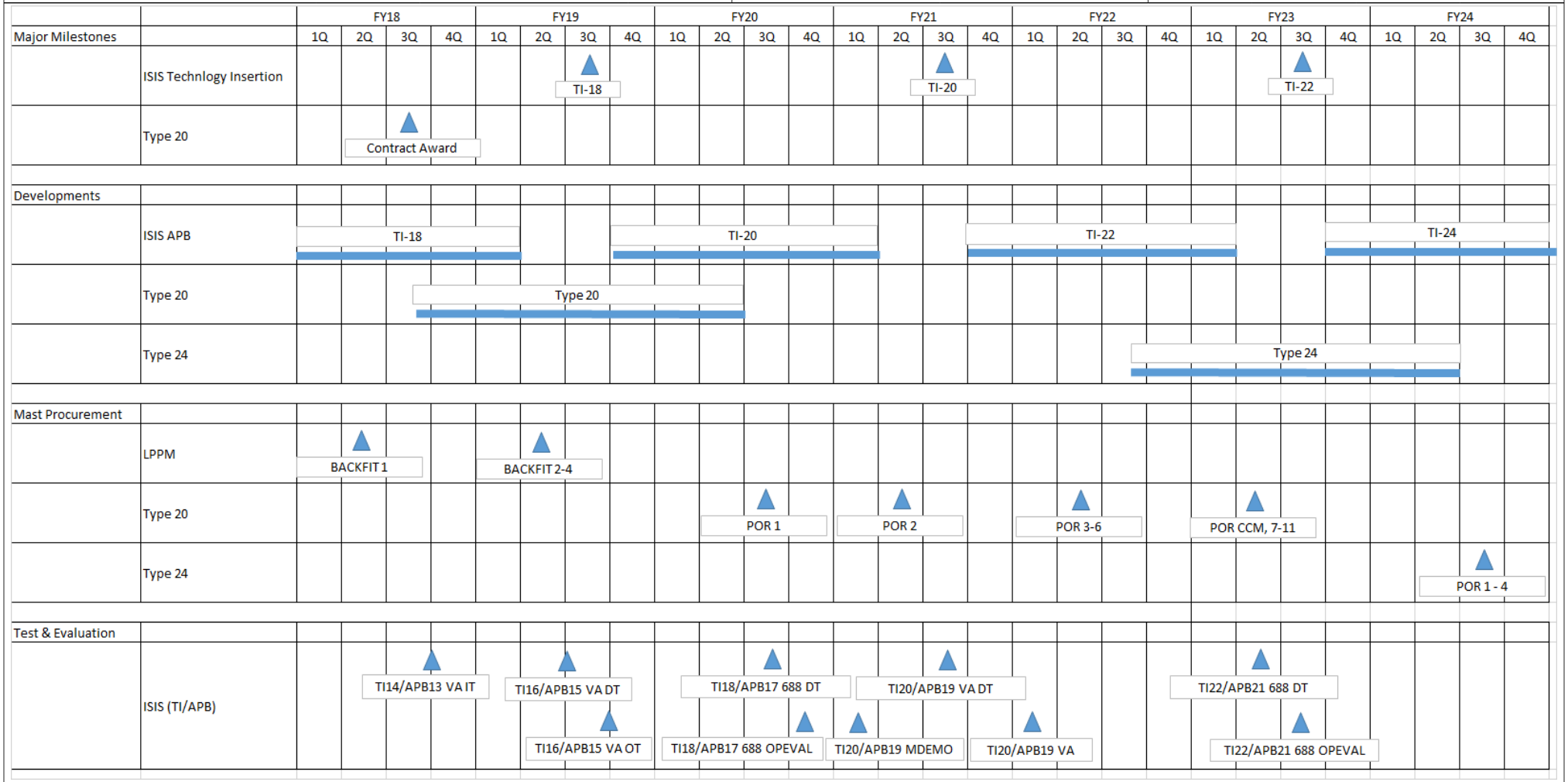

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604777N / *Navigation/Id System*	**Project (Number/Name)** 0253 / *Nav & Electro-Optical Supt*

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-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: Type 20: Contract Award	3	2018	3	2018
Developments: ISIS APB: ISIS TI-18	1	2018	1	2019
Developments: ISIS APB: ISIS TI-20	4	2019	1	2021
Developments: ISIS APB: ISIS TI-22	4	2021	1	2023
Developments: ISIS APB: ISIS TI-24	4	2023	4	2024
Developments: Type 20 Development: Type 20	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: Type 20 (Buy): POR 1	3	2020	3	2020
Mast Procurement: Type 20 (Buy): POR 2	2	2021	2	2021
Mast Procurement: Type 20 (Buy): POR 3-6	2	2022	2	2022
Mast Procurement: Type 20 (Buy): POR CCM, 7-11	2	2023	2	2023
Mast Procurement: Type 24 Development: Type 24	3	2022	2	2024
Mast Procurement: Type 24 (Buy): POR 1-4	3	2024	3	2024
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	3	2019	3	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 2020 Navy		Date: March 2019
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-18/APB 17 688 OPEVAL	4	2020	4	2020
Test & Evaluation: ISIS (TI/APB): Test & Evaluation - ISIS TI-20/APB 19 MDEMO	1	2021	1	2021
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 21 688 DT	2	2023	2	2023
Test & Evaluation: ISIS (TI/APB): Test & Evaluation - ISIS TI-22/APB 21 688 OPEVAL	3	2023	3	2023

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
0676: *Improve ID Development*	46.862	2.385	2.405	2.335	-	2.335	9.645	8.767	2.481	2.531	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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: AN/UPX-29 (V) - OE-120()/UPX Antenna Tech Refresh	1.720	1.611	1.544	0.000	1.544
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 2019 Plans: Establish tech-refresh configuration at In-Service Engineering Activity lab and land-based test sites.					
FY 2020 Base Plans: Conduct platform integration testing at In-Service Engineering Activity lab and land-based test sites.					
FY 2020 OCO Plans: N/A					
FY 2019 to FY 2020 Increase/Decrease Statement: Decrease from FY 2019 to FY 2020 is due to OE-120()/UPX transitioning to production cut-in.					
Title: Mark XIIA Mode 5 and Mode S Improvement for AN/UPX-29(V)	0.334	0.371	0.378	0.000	0.378

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 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 2019 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 2020 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 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increase from FY 2019 to FY 2020 is due to inflation.					
Title: AN/UPX-29(V) Management Support	0.331	0.423	0.413	0.000	0.413
Articles:	-	-	-	-	-
Description: Engineering and Program Management of the AN/UPX 29 (V). Perform system integration efforts. ***FY 2019 Plans:***					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
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 2020 Base Plans:*** Support logistics and technical data management for the AN/UPX 29 (V) Mode 5/Mode S integration. Develop and submit ship change documents for OE-120 retro-fit. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Decrease from FY 2019 to FY 2020 is due to phasing changes for management support.					
Accomplishments/Planned Programs Subtotals	2.385	2.405	2.335	0.000	2.335

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• OPN/2851: *ID Systems*	21.239	22.777	26.059	-	26.059	25.232	49.464	57.259	58.402	297.625	851.160

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 2020 Navy			Date: March 2019
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Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Primary Hardware Development	WR	NAWCAD : St Inigoes, MD	9.313	0.000		1.139	Nov 2018	1.062	Nov 2019	-		1.062	Continuing	Continuing	Continuing
Ship Integration	WR	NAWCAD : St Inigoes, MD	2.462	0.000		0.115	Nov 2018	0.117	Nov 2019	-		0.117	0.000	2.694	-
Systems Engineering	WR	NAWCAD : St Inigoes, MD	6.229	0.000		0.357	Nov 2018	0.365	Nov 2019	-		0.365	0.000	6.951	-
OE-120 Tech Refresh	SS/FFP	BAE : Nashua, NH	13.763	1.720	Nov 2017	0.000		0.000		-		0.000	0.000	15.483	15.483
		Subtotal	31.767	1.720		1.611		1.544		-		1.544	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 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 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	-
ILS	WR	NAWCAD : St Inigoes, MD	2.547	0.239	Nov 2017	0.075	Nov 2018	0.076	Nov 2019	-		0.076	0.000	2.937	-
Software Development	WR	NAWCAD : St Inigoes, MD	5.535	0.000		0.197	Nov 2018	0.201	Nov 2019	-		0.201	0.000	5.933	-
Technical Data	WR	NAWCAD : St Inigoes, MD	1.874	0.095	Nov 2017	0.099	Nov 2018	0.101	Nov 2019	-		0.101	0.000	2.169	-
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	0.334		0.371		0.378		-		0.378	0.000	11.652	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
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Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 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 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Prior Year T&E costs no longer funded in FYDP	WR	NAWCAD : St Inigoes, MD	2.559	0.000		0.000		0.000		-		0.000	0.000	2.559	-
		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 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management Support	C/CPFF	American Electronics : California, MD	1.967	0.331	Nov 2017	0.423	Nov 2018	0.413	Nov 2019	-		0.413	0.000	3.134	2.813
		Subtotal	1.967	0.331		0.423		0.413		-		0.413	0.000	3.134	N/A

	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	46.862	2.385		2.405		2.335		-		2.335	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604777N / *Navigation/Id System*	**Project (Number/Name)** 0676 / *Improve ID Development*

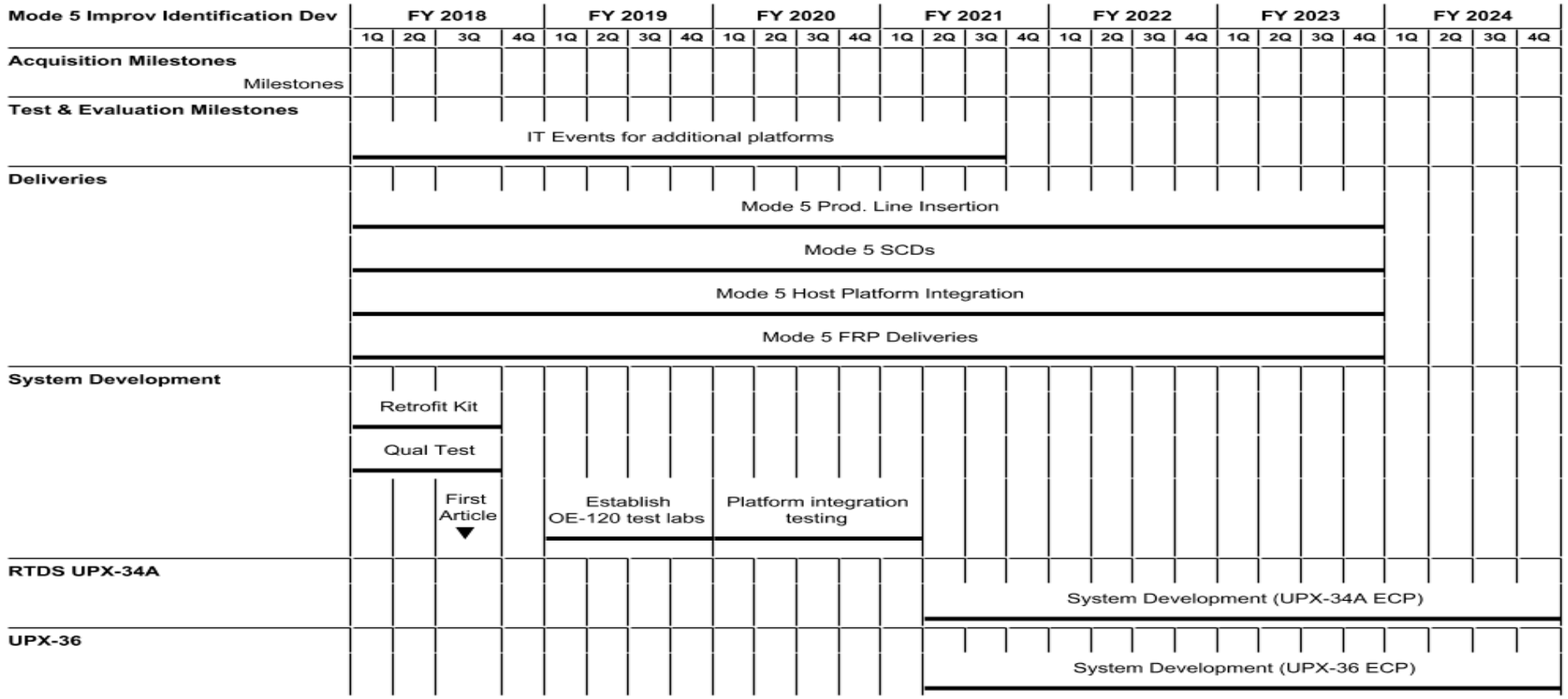

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
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Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Mode 5 Improv Identification Dev				
Test & Evaluation Milestones: IT Events for additional platforms	1	2018	3	2021
Deliveries: Mode 5 - Production Line Insertion	1	2018	4	2023
Deliveries: Mode 5 - Prepare and Evaluate ECPs/SCDs	1	2018	4	2023
Deliveries: Mode 5 - Host Platform Integrations	1	2018	4	2023
Deliveries: Mode 5 - FRP Deliveries	1	2018	4	2023
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
System Development: Platform integration testing	1	2020	1	2021
RTDS UPX-34A: System Development (UPX-34A ECP)	2	2021	4	2024
UPX-36: System Development (UPX-36 ECP)	2	2021	4	2024

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
0921: *NAVSTAR GPS Equipment*	305.643	63.519	80.675	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	449.837
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Note

Funding has been realigned out of PE 0604777N Project 0921 (NAVSTAR GPS Equipment), into PE 0604280N as part of RDTEN PE Consolidation starting in FY 2020.

A. Mission Description and Budget Item Justification

Navigation Satellite Timing & Ranging (NAVSTAR) Global Positioning System (GPS) project (0921) encompasses the Navy's efforts to pace the growing threat to GPS Navigation through the fielding of new GPS receivers, Anti-Jam (AJ) Antennas, and Assured Position Navigation and Timing (A-PNT) technologies across all Navy platform types. NAVSTAR GPS is a group of A-PNT systems that provides authorized users with secure, worldwide, all weather, three dimensional position, velocity, and precise time data. NAVSTAR GPS provides 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: Sea Navigation Warfare (NAVWAR), GPS-based PNT Service (GPNTS), Air NAVWAR and GPS Modernization. Sea NAVWAR provides AJ antennas and GPNTS provides GPS Receivers and A-PNT technology to surface platforms, and Air NAVWAR provides AJ antennas and GPS Modernization provides GPS receivers to air platforms. GPS continues to be integrated in all Department of Defense (DoD) platforms and the development of enhanced and protected GPS is a national security priority. 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 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 AJ antennas on air platforms while investigating smaller AJ antennas for space constrained platforms and aircraft with unique requirements. The Sea NAVWAR program integrates AJ antennas onto surface and subsurface platforms. The Sea NAVWAR program will continue to research the viability and development of smaller AJ 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 A-PNT system for the surface Navy to ensure reliable PNT capability and interoperability insertion into GPS receivers and associated C4ISR and Combat Systems in a denied environment. GPNTS pairs with AJ antennas and provides precise A-PNT data required for combat, weapons, command, control, communications, navigation, and other systems, as well as providing the time synchronization critical for network environments. GPNTS will back fit current PNT/GPS systems as well as serve as a forward fit for new platforms. GPNTS is an Open Architecture (OA) development, enabling rapid software and hardware based capability improvements to be inserted without a requirement for single-source contracting. GPNTS will host the Air Force 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

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
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(CCE) and provide a path for the integration of advanced navigation systems and sensors. GPNTS provides A-PNT capability to C4ISR and Combat Systems in standalone and networked architectures throughout maritime domains.

GPS Modernization executes the Navy's integration of MGUE being developed by the Air Force GPS Directorate on Navy air platforms. This effort provides Navy platforms improved access to GPS signals in challenged and jammed environments. Because of the number and diversity of all of the Navy's air and weapons platforms, this project will consist of multiple parallel efforts that integrate different M-code GPS receivers into different type model series aircraft across many program offices with central coordination and management of funding and priorities by GPS Modernization. Each platform will require unique prime vendor integration and testing that includes software updates to avionics and mission computers as well as modifications to the airframe based on Size, Weight and Power and Cost (SWaP-C) requirements. Modernized Global Positioning System (GPS) receivers will utilize the new M-Code GPS Signal in Space, incorporate enhanced cryptology, deliver greater position and time accuracy, and provide improved protection against signal spoofing as compared to legacy receivers. Additionally, GPS Modernization delivers increased GPS Anti-Jam (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-Military Code (M-Code) GPS user equipment after FY 2017.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Sea Navigation Warfare (NAVWAR)	6.109	3.370	0.000	0.000	0.000
Articles:	-	-	-	-	-
Description: Sea 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 AJ antennas. The program is continuing the Submarine Anti-Jam GPS Enhancement (SAGE) antenna development, which integrates AJ capability into the submarine Multi-Function Mast (OE-538B). Sea NAVWAR will continue to research the viability and development of smaller AJ antennas for platforms with Size, Weight and Power and Cost (SWaP-C) restrictions and will ensure compatibility with the Military Code (M-Code) signal.					
FY 2019 Plans: Complete electromagnetic compatibility and shock improvement for Submarine Anti-Jam Global Positioning System (GPS) Enhancement (SAGE) integration into the submarine Multi-Function Mast (OE-538B) antenna system. Complete Engineering Change (EC) process for implementation of the OE-538B antenna system on all submarine classes. Continue government oversight, system engineering, logistics, contracts, and programmatic management efforts for the SAGE and integration into the OE-538B antenna system development.					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Conduct OE-538B production representative article (PRA) factory acceptance testing and Functional Configuration Audit (FCA), and Physical Configuration Audit (PCA). Accept delivery of OE-538B PRA and conduct Government Acceptance Test. Commence testing of Radio Frequencies Distribution and Control System (RFDACS) with OE-538B PRA in the Land Based Submarine Radio Room (LBSRR). Commence the following First Article Qualification Testing (FAQT) of SAGE and OE-538B antenna system: - GPS Anti-Jamming - Electromagnetic Interference (EMI) - Vibration - Electromagnetic Pulse (EMP)/High Altitude Electromagnetic Pulse (HEMP) - Underwater Explosion (UNDEX) Commence preparation for OE-538B Developmental Testing/Operational Testing (DT/OT) on operational submarine classes. Begin requirements analysis and preparations for Environmental Qualification Testing (EQT) of a smaller Military Code (M-code) capable Anti-Jam (AJ) antennas, currently being used by U.S. Army Special Operations community, for Navy maritime requirements on Size, Weight and Power and Cost (SWaP-C) constrained surface platforms. ***FY 2020 Base Plans:*** FY 2020 funding has been realigned to PE 0604280N Project 0921 (NAVSTAR GPS Equipment) as part of PE Consolidation. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Program decrease is due to realigning funds as part of PE Consolidation. FY 2020 justification and change explanation is provided under PE 0604280N Project 0921 (NAVSTAR GPS Equipment).					
Title: Global Positioning System (GPS) - Based Positioning, Navigation and Timing (PNT) Service (GPNTS)	17.689	20.055	0.000	0.000	0.000
Articles:	1	-	-	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Description: GPNTS is the Navy's next generation Assured Position Navigation and Timing (A-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. GPNTS will back fit current PNT/GPS systems as well as serve as a forward fit for new platforms. The system contains Selective Availability Anti-spoofing Security Module (SAASM) GPS security architecture with a planned migration to GPS M-Code. ***FY 2019 Plans:*** Continue software defects on the GPNTS software prior to commencing Initial Operational Test and Evaluation (IOT&E). 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 Guided-Missile Destroyer (DDG) IOT&E platform and prior to fielding on platforms with Aegis capability (DDGs and Cruisers (CGs)). Conduct GPNTS Ship's Self Defense System (SSDS) Combat Systems Certification activities at Wallops Island, VA, to ensure compatibility with specific SSDS Combat System baselines. SSDS certification is required prior to the installation of GPNTS on SSDS capable platforms; Aircraft Carriers (CVNs) and Amphibious Assault Ships (LHAs/LHDs) in FY 2020. 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. Continue integration of the ONR developed capability, NoGAPSS, into the GPNTS software baseline. The NoGAPSS capability provides additional resiliency for 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.					

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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Obtain an Authority to Operate (ATO) from the Navy Authorization Office (NAO) in order to install and operate a GPNTS system onboard a Navy ship. Continue the design of a Global Positioning System (GPS) - Based Positioning, Navigation and Timing (PNT) Service (GPNTS) small Size, Weight and Power and Cost (SWaP-C) solution for smaller surface combatant platforms to include Dock Landing Ship, United States Coast Guard, patrol crafts, Mine Countermeasure, and Military Sealift Command platforms. Conduct GPNTS Technical Evaluation prior to Initial Operational Test and Evaluation (IOT&E). Conduct GPNTS IOT&E for two rack solution. Support Navigation Certification following IOT&E on program selected platforms. Begin updates to all Regulatory and Statutory Acquisition documents in support of GPNTS Full Rate Production Decision (FRP). ***FY 2020 Base Plans:*** FY 2020 funding has been realigned to PE 0604280N Project 0921 (NAVSTAR GPS Equipment) as part of PE Consolidation. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Program decrease is due to realigning funds as part of PE Consolidation. FY 2020 justification and change explanation is provided under PE 0604280N Project 0921 (NAVSTAR GPS Equipment).					
Title: Air Navigation Warfare (NAVWAR)	13.237	10.265	0.000	0.000	0.000
Articles:	31	-	-	-	-
Description: Air 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 AJ capability and technologies such as development of miniaturized very small antenna systems to allow for the					

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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
capability on small variant aircraft. Efforts will also include development to ensure antennas can accept the new Military Code (M-Code) signal. ***FY 2019 Plans:*** Continue to fund the development and integration of miniaturized AJ antennas to be used for various Size, Weight, and Power Constrained air platforms. Efforts include maturation of antenna solutions, chamber and flight testing, moving toward integration on specific platforms. Efforts will continue to determine air platform specific requirements and solutions. Continue effort to upgrade main operation software including development, integration and laboratory testing to incorporate Y-Code Only signal mode functionality for MV-22, E-2D, and MQ-8B/C Fire Scout platforms. 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. Complete Non-Recurring Engineering (NRE) for platform interface modifications; integration testing; test plan development and updates; test support integration and flight testing for the anti-jam capability on the E-6B air platform. Continue efforts to assist with coordination of E-2D platforms with Anti-Jam (AJ) capable antennas in conjunction with a refueling probe upgrade. Continue development efforts for a High-Integrity GPS (Global Positioning System) Aided Inertial Navigation System (HI-GAINS) for Unmanned Aerial Systems (UAS) to include fabrication, assembly and testing of the HI-GAINS system. Continue developmental test effort to identify a 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. Continue to provide subject matter expertise to the MQ-4C platform as it continues the Non-Recurring Engineering (NRE) for platform interface modifications; integration testing; test plan development and updates; test support integration and flight testing for the anti-jam capability on the MQ-4C air platform.					

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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Conduct GPS Demonstrations and laboratory testing of GPS receivers with associated antennas at Facilities for Antenna and Radar Cross Section (RCS) Measurements (FARM), to include material procurement, testing, and demonstrations. Specific testing and demonstrations of the AN/APY-10 radar system will correct identified deficiencies in the antenna and provide an interim solution for platforms operating in a GPS-denied environment. Additional technology will be tested and demonstrated to compare performance between traditional nulling systems and new beam-steering antenna electronics, collecting data to be used by platforms as they consider future upgrades to antenna systems. 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 Office of the Chief of Naval Operations (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 Naval Air Systems Command (NAVAIR) platforms for SAASM integration and monitor future GPS Directorate SAASM upgrades. ***FY 2020 Base Plans:*** FY 2020 funding has been realigned to PE 0604280N Project 0921 (NAVSTAR GPS Equipment) as part of PE Consolidation. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Program decrease is due to realigning funds as part of PE Consolidation. FY 2020 justification and change explanation is provided under PE 0604280N Project 0921 (NAVSTAR GPS Equipment).					
Title: Global Positioning System (GPS) Modernization	26.484	46.985	0.000	0.000	0.000
Articles:	-	23	-	-	-
Description: GPS Modernization delivers increased GPS Anti-Jam (AJ) protection through modernized GPS receivers that will utilize the new Military Code (M-Code) GPS Signal in Space, incorporate enhanced cryptology, enable blue force GPS electronic attack, deliver greater position and time accuracy, and provide improved protection against signal spoofing as compared to legacy receivers. This project funds the Navy's integration of M-Code capable GPS receivers being developed by the United States Air Force (USAF) GPS Directorate into					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
various receivers on Navy air platforms. 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. To meet the Navy's mandate, system engineering and requirement development efforts must begin before actual delivery of Military GPS User Equipment (MGUE). The integration timeline of modernized GPS receivers is 5+ years from planning to test and is dependent on platform type. Each platform uses a unique GPS receiver, and has a unique GPS system configuration, which requires separate parallel efforts to include software updates to avionics and mission computers as well as modifications to the airframe based on Size, Weight and Power and Cost (SWaP-C) requirements; coordination with each Program Management Air (PMA) organization; management, oversight and support of the effort; and contracting and working with the identified Prime Vendor Integrator for the platform. Project currently consists of seven (7) parallel efforts that integrate four (4) different M-Code GPS receivers into seven (7) different type model series aircraft. ***FY 2019 Plans:*** Continue to fund the Prime Vendor Integration and testing of MAGR2K-M GPS Receivers on three (3) air platforms; F/A-18E/F, MV-22B, and CMV-22B. MAGR2K-M GPS Receivers required minimal enhanced functionality and kept the same aviation form factor as the legacy MAGR2K-S receivers. Due to the developmental complexity of EGI-M GPS Receivers, Prime Vendor Integration and testing of Embedded GPS Inertial - M-Code (EGI-M) GPS Receivers will be delayed in order to incorporate enhanced capabilities as required by the EGI-M System Requirements Document (SRD). Project will support critical risk reduction efforts of EGI-M GPS Receivers for five (5) air platforms: F/A-18E/F, EA-18G, E-2D, CH-53K, and KC-130J. Continue GPS Modernization efforts on three (3) air platforms, F/A-18E/F, MV-22B and CMV-22B, which require MAGR2K-M receivers: - Award Prime Vendor Integration (PVI) contracts for MV-22B and CMV-22B air platforms. - 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). - Completed hardware and software M-Code integration risk reduction studies of MAGR2K-M receiver for F/A-18E/F. - Perform Non-recurring Engineering (NRE) efforts and software updates required for the design and testing of Military Code (M-Code) Global Positioning System (GPS) receivers in support of developmental and operational test events.					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
- 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 five (5) air platforms, F/A-18E/F, EA-18G, E-2D, CH-53K, and KC-130J, which require Embedded GPS/Inertial Navigation System (INS) (EGI) type of GPS receivers (ANAV, LN-351, H-764): - Procure test article receivers to provide production representative M-Code receivers for laboratory and flight testing. - Conduct hardware and software M-Code integration risk reduction studies to include Systems Requirement Review (SRR), structural analysis, electrical power load analysis, human engineering, product support analysis, and product support review of Engineering & Manufacturing Development (EMD) Contract Data Requirements List (CDRL) deliverables. - Development of requirements and systems engineering efforts for integrating M-Code 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. - 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. OCO: N/A. ***FY 2020 Base Plans:*** FY 2020 funding has been realigned to PE 0604280N Project 0921 (NAVSTAR GPS Equipment) as part of PE Consolidation. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Program decrease is due to realigning funds as part of PE Consolidation. FY 2020 justification and change explanation is provided under PE 0604280N Project 0921 (NAVSTAR GPS Equipment).					
Accomplishments/Planned Programs Subtotals	63.519	80.675	0.000	0.000	0.000

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604777N / *Navigation/Id System*	**Project (Number/Name)** 0921 / *NAVSTAR GPS Equipment*

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• OPN/2657: *NAVSTAR GPS Receivers (Space)*	15.923	10.703	32.674	-	32.674	33.721	29.977	22.938	23.394	Continuing	Continuing
• APN/0577: *Common Avionics Changes*	12.431	7.543	8.118	-	8.118	7.991	19.193	41.139	45.712	245.777	778.432

Remarks

D. Acquisition Strategy

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

Global Positioning System (GPS)-based Positioning, Navigation, and Timing (PNT) Service (GPNTS) program will develop, acquire, and field 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) and the Office of Naval Research (ONR) developed Non-GPS Aided Positioning for Surface Ships (NoGAPSS) capabilities. A firm fixed price contract was awarded March 2018 to procure Low Rate Initial Production (LRIP) and Full Rate Production (FRP) systems.

GPS Modernization manages the non-recurring engineering required to conduct systems engineering, integration and test of modernized GPS receivers and utilize United States Air Force (USAF) hardware contracts, and Navy air platform integration contracts.

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 J/S identified in the Sea NAVWAR Increment 2 Capabilities Production Document (CPD) (12/2008). 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 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 2020 Navy			Date: March 2019
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 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Air NAVWAR Development Support	WR	NAWC : Pax River, MD	0.000	2.215	Nov 2017	2.000	Dec 2018	0.000		-		0.000	0.000	4.215	-
Air NAVWAR Govt Eng Support	WR	NAWC : Pax River, MD	0.000	2.566	Dec 2017	2.250	Dec 2018	0.000		-		0.000	0.000	4.816	-
Sea NAVWAR Development	C/CPIF	Lockheed : Marion, MA	9.631	2.530	Oct 2017	0.400	Jan 2019	0.000		-		0.000	0.000	12.561	-
Sea NAVWAR Development Support	WR	SSC PAC, NUWC : San Diego, Newport	0.000	1.484	Dec 2017	0.800	Dec 2018	0.000		-		0.000	0.000	2.284	-
Sea NAVWAR Govt Eng Support	WR	SSC PAC, NUWC : San Diego, Newport	0.000	0.345	Dec 2017	0.283	Dec 2018	0.000		-		0.000	0.000	0.628	-
GPNTS HW / SW Development	C/CPIF	Raytheon : San Diego, CA	39.188	4.340	Nov 2017	6.000	Dec 2018	0.000		-		0.000	0.000	49.528	-
GPNTS HW Product Development	C/CPFF	Sechan Electronics : Lititz, PA	0.000	0.660	Jul 2018	0.000		0.000		-		0.000	0.000	0.660	-
GPNTS SW / NoGAPSS Development	C/CPFF	TBD : TBD	0.000	0.000		1.800	Jul 2019	0.000		-		0.000	0.000	1.800	-
GPNTS Development Support	WR	SSC PAC : San Diego, CA	0.000	2.658	Dec 2017	1.500	Dec 2018	0.000		-		0.000	0.000	4.158	-
GPNTS Govt Eng Support	WR	SSC PAC : San Diego, CA	0.000	4.750	Dec 2017	2.456	Dec 2018	0.000		-		0.000	0.000	7.206	-
GPS Mod Development F/ A-18E/F MAGR2K-M	C/CPIF	Boeing : St Louis, MO	0.000	1.780	Apr 2018	2.850	Apr 2019	0.000		-		0.000	0.000	4.630	-
GPS Mod Development F/ A-18E/F & EA-18G ANAV	C/CPIF	Boeing : St Louis, MO	0.000	0.502	Sep 2018	0.600	Feb 2019	0.000		-		0.000	0.000	1.102	-
GPS Mod Development E-2D	C/CPIF	Northup Gruman : Pax River, MD	0.000	0.500	Sep 2018	0.900	Feb 2019	0.000		-		0.000	0.000	1.400	-
GPS Mod Development MV-22B,CMV-22B	C/CPIF	Bell Boeing : Amarillo, TX	0.000	0.500	Sep 2018	2.700	Feb 2019	0.000		-		0.000	0.000	3.200	-
GPS Mod Hardware F/ A-18E/F MAGR2K-M	C/FFP	TBD : TBD	0.000	0.000		2.302	Feb 2019	0.000		-		0.000	0.000	2.302	-
GPS Mod Hardware E-2D	C/FFP	TBD : TBD	0.000	0.000		0.450	Feb 2019	0.000		-		0.000	0.000	0.450	-
GPS Mod Hardware CH-53K	C/FFP	TBD : TBD	0.000	0.000		0.450	Feb 2019	0.000		-		0.000	0.000	0.450	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
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 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
GPS Mod Development Support	WR	SSC PAC, NAWC : San Diego, Pax River	0.000	5.673	Nov 2017	2.500	Dec 2018	0.000		-		0.000	0.000	8.173	-
GPS Mod Govt Eng Support	WR	SSC PAC, NAWC : San Diego, Pax River	0.000	3.741	Nov 2017	3.800	Dec 2018	0.000		-		0.000	0.000	7.541	-
Product Development	WR	GPS Directorate : Los Angeles, CA	4.924	1.300	Dec 2017	1.700	Dec 2018	0.000		-		0.000	0.000	7.924	-
Systems Engineering	WR	Govt, Contractor : San Diego, Newport	28.476	0.700	Nov 2017	0.750	Nov 2018	0.000		-		0.000	0.000	29.926	-
Product Development	Various	Various : Various	97.148	8.458	Oct 2018	0.000		0.000		-		0.000	0.000	105.606	-
GPS Mod TBD	TBD	Various : Various	0.000	0.000		19.000	Feb 2019	0.000		-		0.000	0.000	19.000	-
		Subtotal	179.367	44.702		55.491		0.000		-		0.000	0.000	279.560	N/A

Remarks

FY 2020 cost data is provided under PE 0604280N Project 0921 (NAVSTAR GPS Equipment).

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Contract Engineering Services	WR	BAH : San Diego, Pax River, China Lake	0.000	1.830	Nov 2017	2.700	Nov 2018	0.000		-		0.000	0.000	4.530	-
Enginering Services	WR	SSC PAC, NAWC : San Diego, Pax River	0.000	1.875	Nov 2017	4.310	Nov 2018	0.000		-		0.000	0.000	6.185	-
Integrated Logistics Support	WR	SSC PAC, NAWC : San Diego, Pax River	0.000	1.735	Dec 2017	2.750	Dec 2018	0.000		-		0.000	0.000	4.485	-
Technical Data	WR	Various : Various	0.401	0.000		0.000		0.000		-		0.000	0.000	0.401	-
Support	Various	Various : Various	56.370	0.000		0.000		0.000		-		0.000	0.000	56.370	-
		Subtotal	56.771	5.440		9.760		0.000		-		0.000	0.000	71.971	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
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 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract

Remarks

FY 2020 cost data is provided under PE 0604280N Project 0921 (NAVSTAR GPS Equipment).

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Air NAVWAR Test & Evaluation	WR	NAWC : Pax River	0.000	2.250	Nov 2017	3.946	Dec 2018	0.000		-		0.000	0.000	6.196	-
Sea NAVWAR Test & Evaluation	WR	SSC PAC, NUWC : San Diego, Newport	0.000	0.138	Nov 2017	1.372	Dec 2018	0.000		-		0.000	0.000	1.510	-
GPNTS Test & Evaluation	WR	SSC PAC : San Diego	0.000	3.187	Nov 2017	4.000	Dec 2018	0.000		-		0.000	0.000	7.187	-
GPS Mod Test & Evaluation	WR	SSC PAC, NAWC : San Diego, Pax River	0.000	0.250	Nov 2017	1.000	Dec 2018	0.000		-		0.000	0.000	1.250	-
Test & Evaluation	Various	Various : Various	49.282	0.000		0.000		0.000		-		0.000	0.000	49.282	-
		Subtotal	49.282	5.825		10.318		0.000		-		0.000	0.000	65.425	N/A

Remarks

FY 2020 cost data is provided under PE 0604280N Project 0921 (NAVSTAR GPS Equipment).

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management Support	C/CPAF	BAH : San Diego, Pax River, China Lake	0.000	7.552	Nov 2017	5.106	Nov 2018	0.000		-		0.000	0.000	12.658	-
Management Services	Various	Various : Various	20.223	0.000		0.000		0.000		-		0.000	0.000	20.223	-
		Subtotal	20.223	7.552		5.106		0.000		-		0.000	0.000	32.881	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
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Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Remarks															
FY 2020 cost data is provided under PE 0604280N Project 0921 (NAVSTAR GPS Equipment).															

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	305.643	63.519		80.675		0.000		-		0.000	0.000	449.837	N/A

Remarks

FY 2020 cost data is provided under PE 0604280N Project 0921 (NAVSTAR GPS Equipment).

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604777N / *Navigation/Id System*	**Project (Number/Name)** 0921 / *NAVSTAR GPS Equipment*

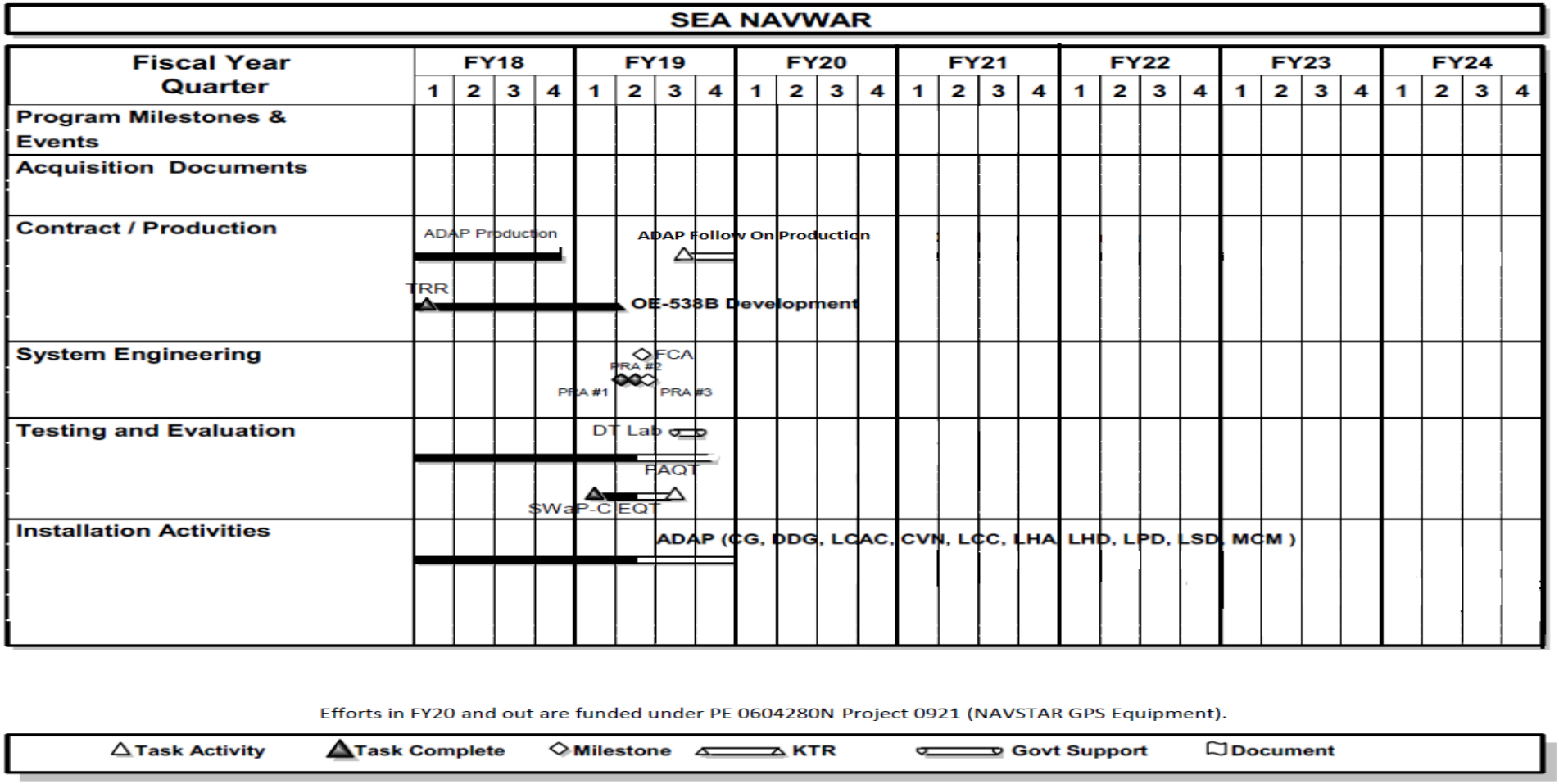


Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604777N / *Navigation/Id System*	**Project (Number/Name)** 0921 / *NAVSTAR GPS Equipment*

GPNTS

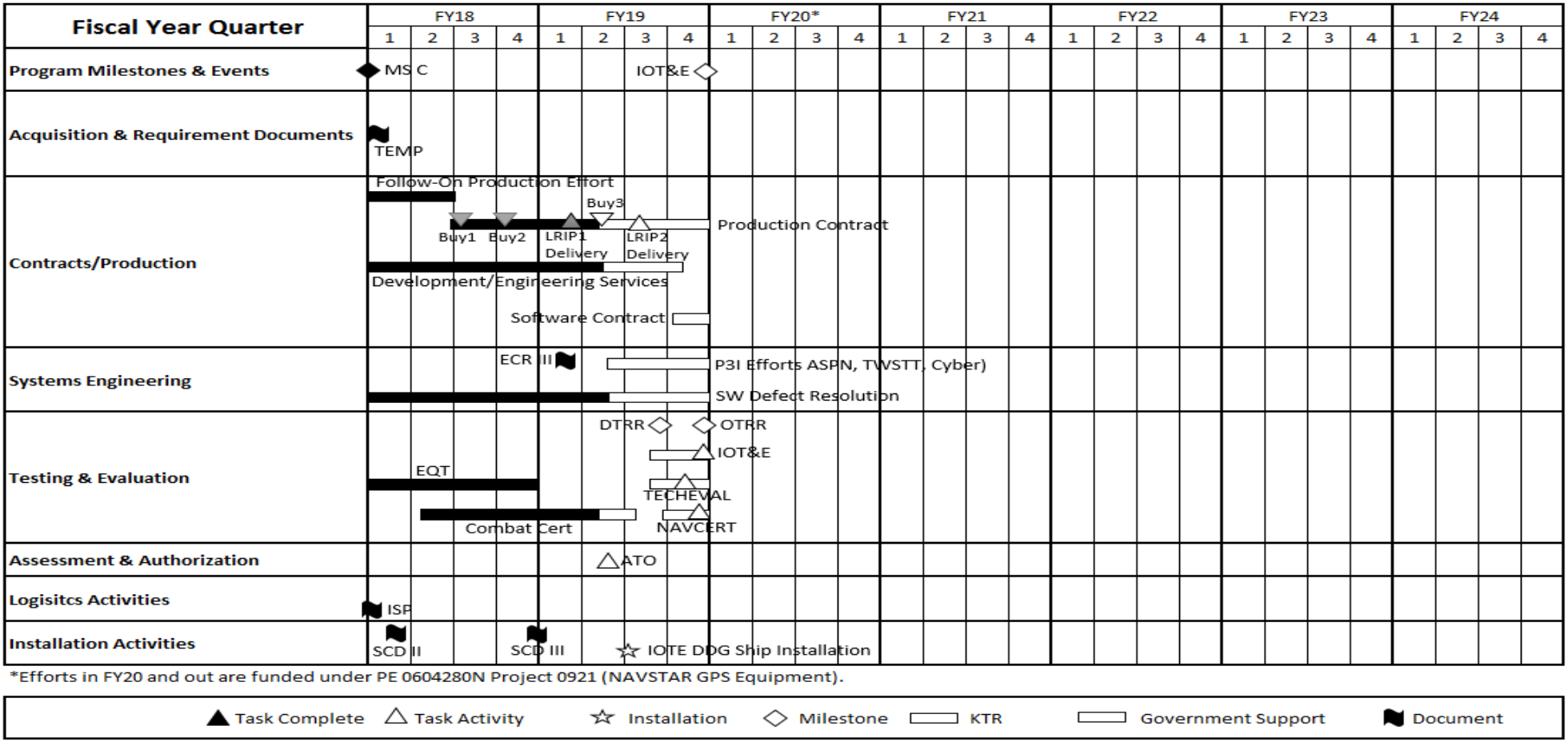
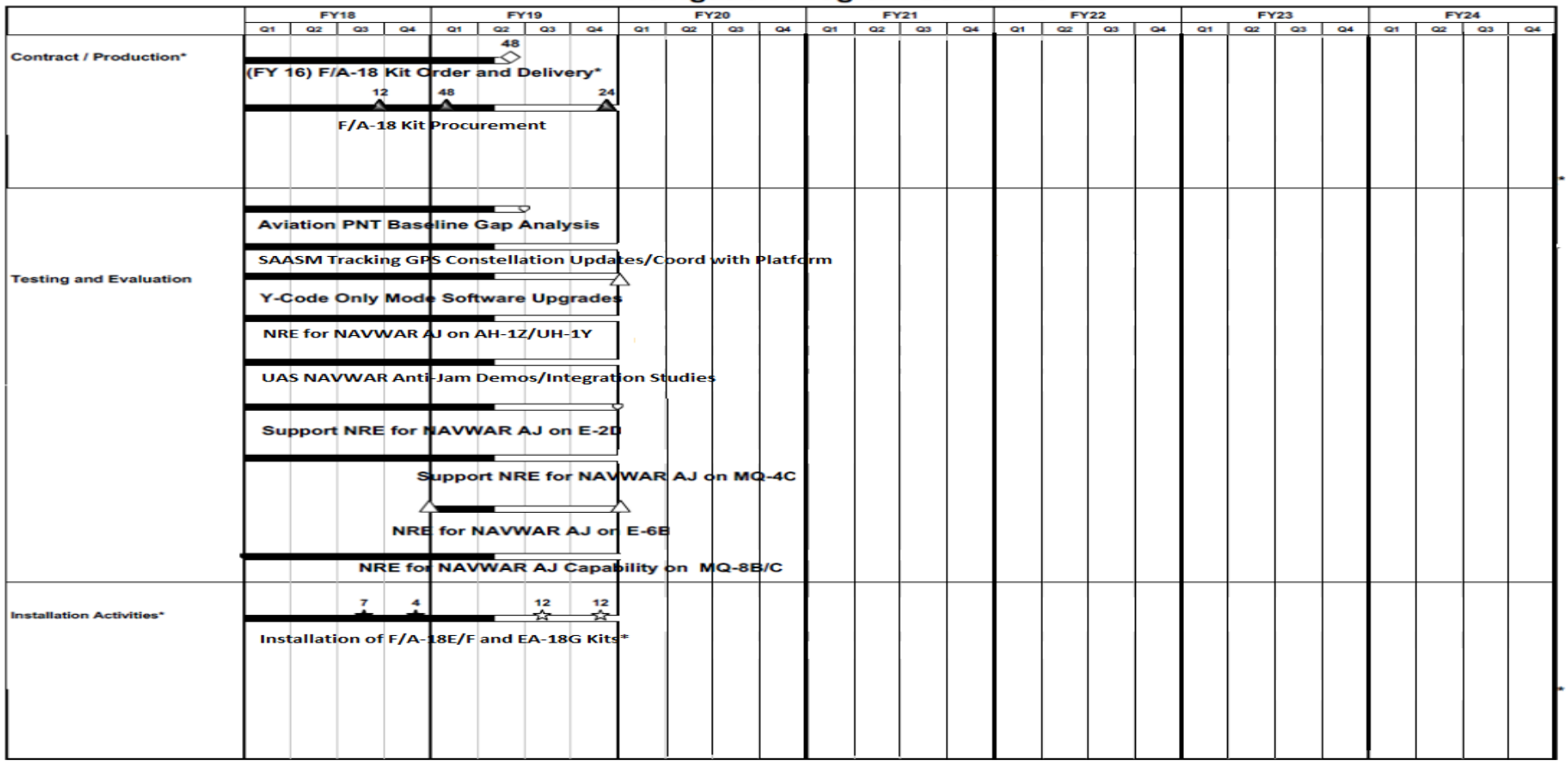


Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604777N / *Navigation/Id System*	**Project (Number/Name)** 0921 / *NAVSTAR GPS Equipment*

Air Navigation Program Schedule



* These Schedule activities are funded with APN

Efforts in FY20 and out are funded under PE 0604280N Project 0921 (NAVSTAR GPS Equipment).

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
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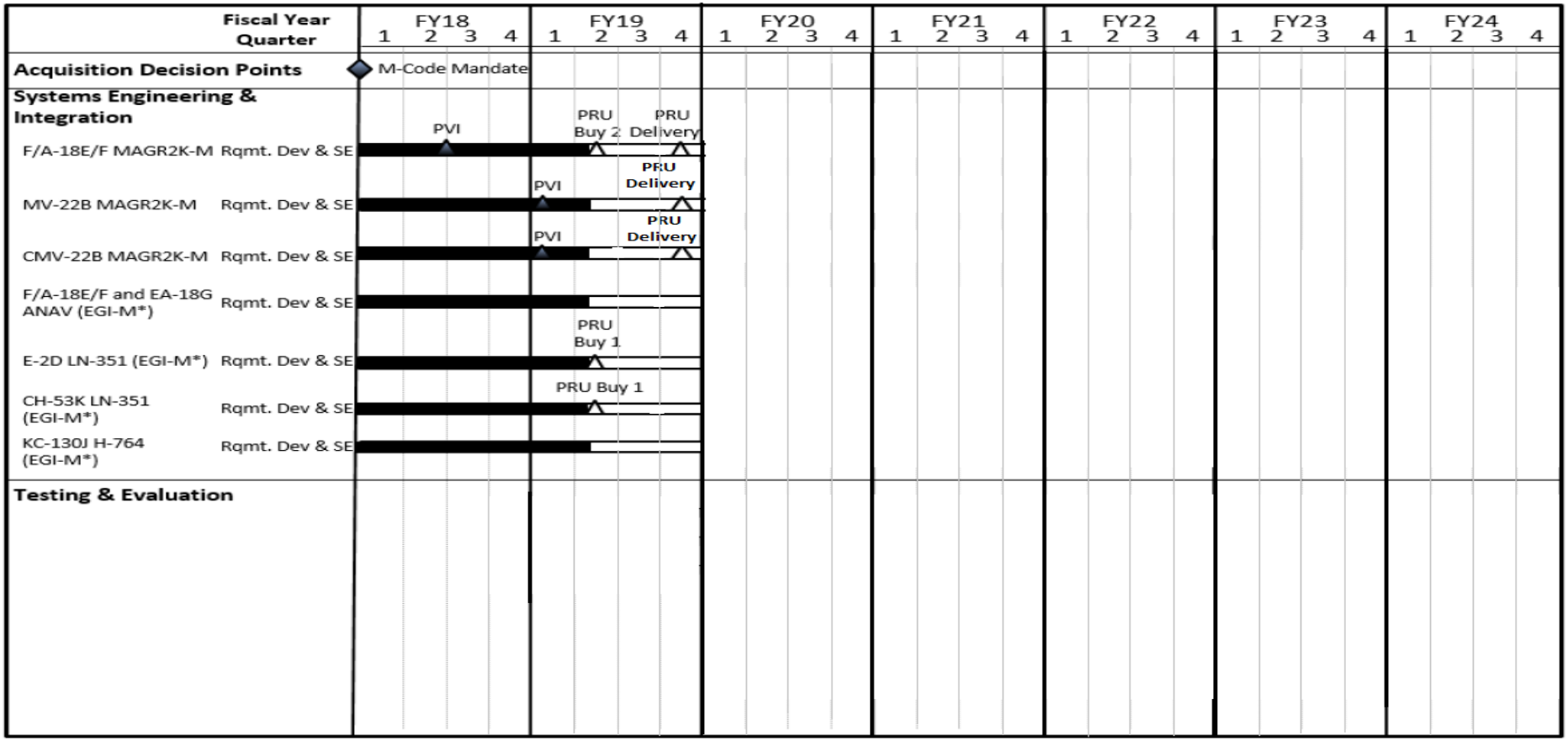
GPS Modernization



* EGI-M Platforms will conduct critical Risk Reduction Studies in FY19 and FY20
Efforts in FY20 and out are funded under PE 0604280N Project 0921 (NAVSTAR GPS Equipment).

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
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Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 0921				
Sea NAVWAR: Sea Navigation ADAP Production FY18	1	2018	4	2018
Sea NAVWAR: Sea Navigation ADAP Follow On Production FY19	3	2019	4	2019
Sea NAVWAR: Sea Navigation OE-538B Development	1	2018	2	2019
Sea NAVWAR: Sea Navigation Test Readiness Review (TRR)	1	2018	1	2018
Sea NAVWAR: Sea Navigation Functional Configuarion Audit (FCA)	2	2019	2	2019
Sea NAVWAR: Sea Navigation Production Representative Article (PRA) Delivery 1	2	2019	2	2019
Sea NAVWAR: Sea Navigation Production Representative Article (PRA) Delivery 2	2	2019	2	2019
Sea NAVWAR: Sea Navigation Production Representative Article (PRA) Delivery 3	2	2019	2	2019
Sea NAVWAR: Sea Navigation Development Test (DT) LAB	3	2019	4	2019
Sea NAVWAR: Sea Navigation First Article Qualification Testing (FAQT)	1	2018	4	2019
Sea NAVWAR: Sea Navigation SWaP-C Engineering Qualification Testing (EQT)	1	2019	3	2019
Sea NAVWAR: Sea Navigation ADAP Installations	1	2018	4	2019
GPS-based PNT Service (GPNTS): GPNTS Milestone C	1	2018	1	2018
GPS-based PNT Service (GPNTS): GPNTS Initial Operational Test & Evaluation (IOT&E)	4	2019	4	2019
GPS-based PNT Service (GPNTS): GPNTS Test and Evaluation Master Plan (TEMP)	1	2018	1	2018
GPS-based PNT Service (GPNTS): GPNTS Follow-On Production Effort	1	2018	2	2018
GPS-based PNT Service (GPNTS): GPNTS Production Contract	3	2018	4	2019
GPS-based PNT Service (GPNTS): GPNTS Buy 1	3	2018	3	2018
GPS-based PNT Service (GPNTS): GPNTS Buy 2	4	2018	4	2018
GPS-based PNT Service (GPNTS): GPNTS Buy 3	2	2019	2	2019
GPS-based PNT Service (GPNTS): GPNTS Development/ Engineering Services	1	2018	4	2019

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
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	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
GPS-based PNT Service (GPNTS): GPNTS Software Contract	4	2019	4	2019
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	4	2019
GPS-based PNT Service (GPNTS): GPNTS SW Defect Resolution	1	2018	4	2019
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)	4	2019	4	2019
GPS-based PNT Service (GPNTS): GPNTS Initial Operational Test and Evaluation (IOT&E)	3	2019	4	2019
GPS-based PNT Service (GPNTS): GPNTS Environmental Quality Testing (EQT)	1	2018	4	2018
GPS-based PNT Service (GPNTS): GPNTS Technical Evaluation	3	2019	4	2019
GPS-based PNT Service (GPNTS): GPNTS Combat Certification	2	2018	3	2019
GPS-based PNT Service (GPNTS): GPNTS NAVCERT	3	2019	4	2019
GPS-based PNT Service (GPNTS): GPNTS Authority to Operate (ATO)	2	2019	2	2019
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	3	2019	3	2019
Air NAVWAR: Air Navigation F/A-18 Kit Procurement 2016 Funds	1	2018	2	2019
Air NAVWAR: Air Navigation F/A-18 Kit Delivery 2016 Funds	2	2019	2	2019
Air NAVWAR: Air Navigation F/A-18 Kit Procurement 2018	3	2018	3	2018
Air NAVWAR: Air Navigation F/A-18 Kit First Procurement 2019	1	2019	1	2019
Air NAVWAR: Air Navigation F/A-18 Kit Second Procurement 2019	4	2019	4	2019
Air NAVWAR: Air Navigation Aviation PNT Baseline Gap Analysis	1	2018	3	2019
Air NAVWAR: Air Navigation SAASM Tracking GPS Constellation Updates	1	2018	4	2019

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
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**
Air NAVWAR: Air Navigation Y-Code Only Mode Software Upgrades	1	2018	4	2019
Air NAVWAR: Air Navigation NRE Integration for NAVWAR AJ on AH-1 Z/UH-1Y	1	2018	4	2019
Air NAVWAR: Air Navigation UAS NAVWAR Anti-Jam Demos/Integration Studies	1	2018	4	2019
Air NAVWAR: Air Navigation Support NRE for NAVWAR AJ on E-2D	1	2018	4	2019
Air NAVWAR: Air Navigation Support NRE for NAVWAR AJ on MQ-4C	1	2018	4	2019
Air NAVWAR: Air Navigation Support NRE for NAVWAR AJ on E-6B	1	2019	4	2019
Air NAVWAR: Air Navigation Support NRE for NAVWAR AJ on MQ-8B/8C	1	2018	4	2019
Air NAVWAR: Air Navigation Installation of F/A-18E/F & EA-18G Kits	1	2018	4	2019
GPS Modernization: GPS Modernization M-Code Mandate	1	2018	1	2018
GPS Modernization: GPS Modernization F/A-18E/F MAGR2K-M Rqmt. Dev & SE	1	2018	4	2019
GPS Modernization: GPS Modernization F/A-18E/F MAGR2K-M Prime Vendor Integration	2	2018	2	2018
GPS Modernization: GPS Modernization F/A18-E/F MAGR2K-M PRU Buy 2	2	2019	2	2019
GPS Modernization: GPS Modernization F/A-18E/F MAGR2K-M PRU Delivery 1	4	2019	4	2019
GPS Modernization: GPS Modernization MV-22B MAGR2K-M Rqmt. Dev & SE	1	2018	4	2019
GPS Modernization: GPS Modernization MV-22B MAGR2K-M Prime Vendor Integration	1	2019	1	2019
GPS Modernization: GPS Modernization MV-22B MAGR2K-M PRU Delivery	4	2019	4	2019
GPS Modernization: GPS Modernization CMV-22B MAGR2K-M Rqmt. Dev & SE	1	2018	4	2019
GPS Modernization: GPS Modernization CMV-22B MAGR2K-M Prime Vendor Integration	1	2019	1	2019
GPS Modernization: GPS Modernization CMV-22B MAGR2K-M PRU Delivery	4	2019	4	2019
GPS Modernization: GPS Modernization F/A18-E/F & EA-18G ANAV Rqmt. Dev & SE	1	2018	4	2019
GPS Modernization: GPS Modernization E-2D LN-351 Rqmt. Dev & SE	1	2018	4	2019
GPS Modernization: GPS Modernization E-2D LN-351 PRU Buy 1	2	2019	2	2019
GPS Modernization: GPS Modernization CH-53K LN-351 Rqmt. Dev & SE	1	2018	4	2019
GPS Modernization: GPS Modernization CH-53K LN-351 PRU Buy 1	2	2019	2	2019

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
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 KC-130J H-764 Rqmt. Dev & SE	1	2018	4	2019

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
1253: *Combat Ident System*	185.913	1.830	1.983	1.888	-	1.888	1.923	1.960	1.998	2.039	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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Mode 5 prototype hardware, cryptographic module	0.981	0.164	0.096	0.000	0.096
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 2019 Plans: Begin T&E system integration testing of the Mode 5 capability in the CH-53K aircraft.					
FY 2020 Base Plans:					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Complete T&E efforts testing the functionality of the Mode 5 capability in the CH-53K aircraft. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Decrease from FY 2019 to FY 2020 is due to CH-53K transitioning to production.					
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 2019 Plans:*** Development of small form factor IFF for unmanned aircraft systems. Support developmental test of Mode 5 capability in CH-53K aircraft. ***FY 2020 Base Plans:*** Continue development of small form factor IFF for unmanned aircraft systems. Complete developmental test of Mode 5 capability in CH-53K aircraft. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Decrease from FY 2019 to FY 2020 is due to completion of CH-53K development.	0.300 -	0.799 -	0.757 -	0.000 -	0.757 -
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, small form factor IFF for unmanned aircraft systems, and AN/APX-111 Combined Interrogator Transponder. ***FY 2019 Plans:***	0.549 -	1.020 -	1.035 -	0.000 -	1.035 -

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Perform CH-53K flight testing and certification. ***FY 2020 Base Plans:*** Complete CH-53K flight testing and certification. Begin small form factor testing. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increase from FY 2019 to FY 2020 is due to platform integration testing beginning for small form factor.					
Accomplishments/Planned Programs Subtotals	1.830	1.983	1.888	0.000	1.888

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• OPN/2851: *ID Systems*	21.239	22.777	26.059	-	26.059	25.232	49.464	57.259	58.402	297.625	851.160
• APN/0582: *ID Sys*	49.443	39.196	41.437	-	41.437	35.653	13.347	9.605	9.797	0.000	511.395

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 2020 Navy			Date: March 2019
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 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Systems Engineering	WR	NAWCAD : PAX River, MD	15.625	0.204	Nov 2017	0.092	Nov 2018	0.056	Nov 2019	-		0.056	Continuing	Continuing	Continuing
Systems Engineering	WR	NAWCAD : St Inigoes, MD	14.802	0.051	Nov 2017	0.655	Nov 2018	0.628	Nov 2019	-		0.628	Continuing	Continuing	Continuing
Primary Hardware Development	Various	Sikorsky : Stratford, CT	2.795	0.981	Jan 2018	0.164	Jan 2019	0.096	Jan 2020	-		0.096	0.164	4.200	4.200
Prior Year Prod Dev Services costs no longer funded in FYDP	Various	Various : Various	90.857	0.000		0.000		0.000		-		0.000	0.000	90.857	43.213
		Subtotal	124.079	1.236		0.911		0.780		-		0.780	Continuing	Continuing	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
ILS	Various	Various : Various	5.040	0.083	Nov 2017	0.052	Nov 2018	0.073	Nov 2019	-		0.073	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	7.801	0.083		0.052		0.073		-		0.073	Continuing	Continuing	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Developmental T & E	WR	NAWCAD : PAX River, MD	29.267	0.511	Nov 2017	1.020	Nov 2018	1.035	Nov 2019	-		1.035	7.705	39.538	-
Prior Year T&E costs no longer funded in FYDP	Various	Various : Various	20.370	0.000		0.000		0.000		-		0.000	0.000	20.370	3.456
		Subtotal	49.637	0.511		1.020		1.035		-		1.035	7.705	59.908	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604777N / *Navigation/Id System*	Project (Number/Name) 1253 / *Combat Ident System*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 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 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	185.913	1.830		1.983		1.888		-		1.888	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604777N / *Navigation/Id System*	**Project (Number/Name)** 1253 / *Combat Ident System*

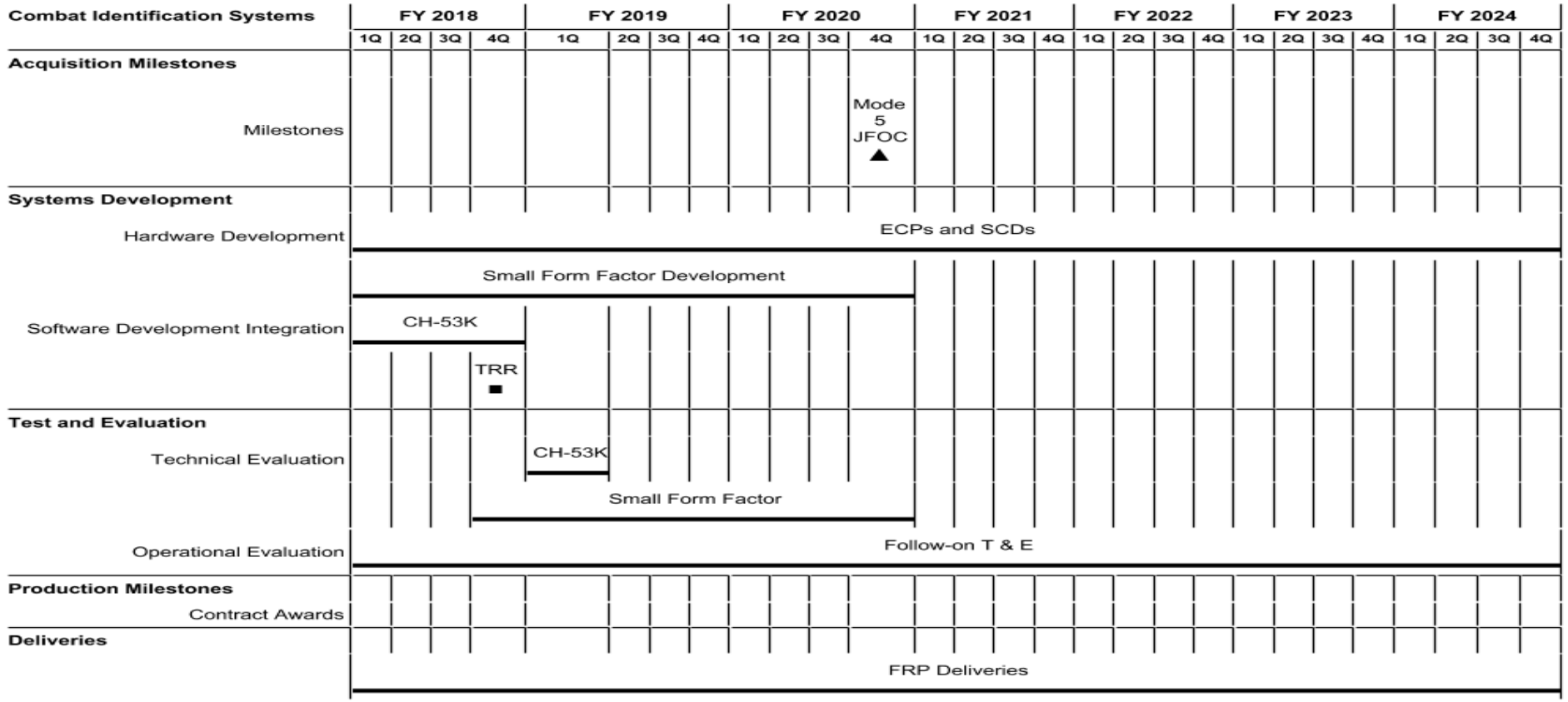

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604777N / *Navigation/Id System*	**Project (Number/Name)** 1253 / *Combat Ident System*

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	2018	4	2024
Systems Development: Hardware Development: Small Form Factor	1	2018	4	2020
Systems Development: Software Development Integration: CH-53K	1	2018	4	2018
Systems Development: Software Development Integration: Test Readiness Review	4	2018	4	2018
Test and Evaluation: Technical Evaluation: CH-53K	1	2019	1	2019
Test and Evaluation: Technical Evaluation: Small Form Factor	4	2018	4	2020
Test and Evaluation: Operational Evaluation: Follow-on Test and Evaluation	1	2018	4	2024
Deliveries: FRP Deliveries	1	2018	4	2024

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
9999: *Congressional Adds*	0.000	0.000	5.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	5.000
Quantity of RDT&E Articles		-	4	-	-	-	-	-	-	-		

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. Research, development, and acquisition to support a micro IFF transponder with Mode 5 in order to meet the space, weight, and power (SWaP) requirements for Group 2 and 3 Unmanned Aerial Vehicles (UAVs), and other unmanned systems.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019
Congressional Add: Micro-IFF Component	0.000	5.000
FY 2018 Accomplishments: N/A		
FY 2019 Plans: Development of prototype, testing and certification of Mode 5 Micro IFF transponder.		
Congressional Adds Subtotals	0.000	5.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

The Acquisition Strategy is to develop a micro IFF transponder solution through Small Business Innovation Research (SBIR) and other government development organizations.

E. Performance Metrics

Achieve NSA Certification.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
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 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Product Development - SBIR	Various	R-Cubed Engineering LLC : Palmetto, FL	0.000	0.000		1.994	Mar 2019	0.000		-		0.000	0.000	1.994	1.994
Product Development - SBIR	Various	Intelligent Automation : Rockville, MD	0.000	0.000		1.994	Apr 2019	0.000		-		0.000	0.000	1.994	1.994
Product Development - Organic	WR	NAWCAD : Patuxent River, MD	0.000	0.000		0.700	Feb 2019	0.000		-		0.000	0.000	0.700	-
Certification	TBD	Various : Various	0.000	0.000		0.312	Feb 2019	0.000		-		0.000	0.000	0.312	-
		Subtotal	0.000	0.000		5.000		0.000		-		0.000	0.000	5.000	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	0.000		5.000		0.000		-		0.000	0.000	5.000	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604777N / *Navigation/Id System*	**Project (Number/Name)** 9999 / *Congressional Adds*

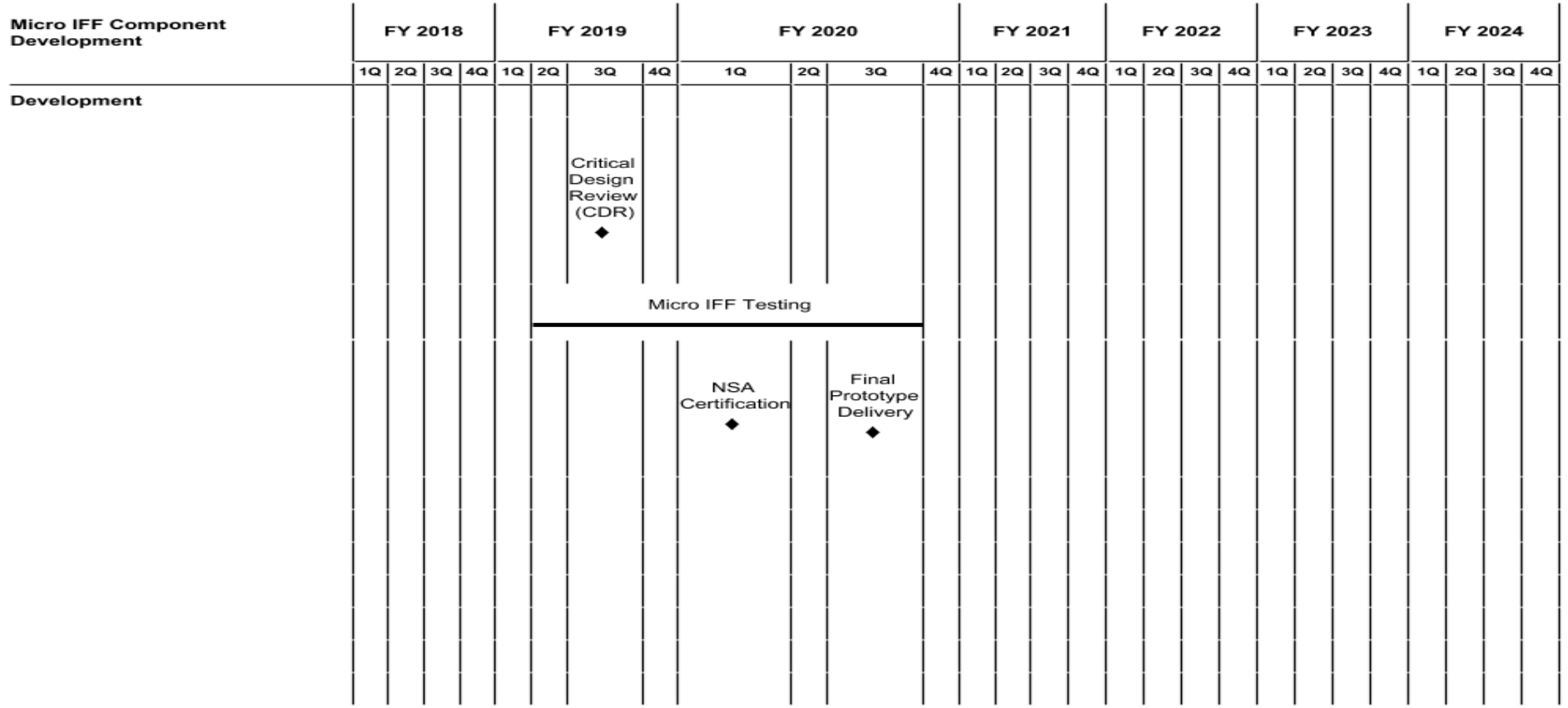

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604777N / *Navigation/Id System*	**Project (Number/Name)** 9999 / *Congressional Adds*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Micro IFF Component Development				
Development: NSA Certification Critical Design Review (CDR)	3	2019	3	2019
Development: Micro IFF Testing	2	2019	3	2020
Development: Final Prototype Delivery	3	2020	3	2020
Development: NSA Certification	1	2020	1	2020