Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force											Date: February 2019	
Appropriation/Budget Activity 3600: *Research, Development, Test & Evaluation, Air Force* / BA 7: *Operational Systems Development*					R-1 Program Element (Number/Name) PE 1206423F / *Global Positioning System III - Operational Control Segment*							
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	3,520.831	492.986	509.258	445.302	0.000	445.302	487.440	406.336	291.066	125.857	0.000	6,279.076
67A021: *OCX*	3,116.549	435.930	445.365	380.342	0.000	380.342	420.635	341.416	291.066	125.857	0.000	5,557.160
67A025: *GPS Enterprise Integrator*	404.282	57.056	63.893	64.960	0.000	64.960	66.805	64.920	0.000	0.000	0.000	721.916
Program MDAP/MAIS Code: 456												

A. Mission Description and Budget Item Justification

The Global Positioning System (GPS) is a space based Positioning, Navigation and Timing (PNT) distribution system which operates through all weather. GPS supports both civil and military users in air, space, sea and land operations. GPS is a satellite-based radio navigation system that serves military and civil users worldwide. GPS users process satellite signals to determine accurate position, velocity and time. GPS must comply with Title 10 United States Code (USC) Sec 2281 which requires that the Secretary of Defense (SECDEF) ensures the continued sustainment and operation of GPS for military and civilian purposes, and 51 USC Sec 50112, which requires that GPS complies with certain standards and facilitates international cooperation.

Program Element (PE) 1206423F funds Research, Development, Test and Evaluation (RDT&E) for the GPS Next Generation Operational Control System (OCX) and the GPS Enterprise Integrator (EI). This includes advanced concept development such as support for Regional Military Protection (RMP), systems analysis, modernized control segment development, modernization/deployment of 17 monitoring stations, mission planning development, training simulators, integrated logistics support products, test resources, systems engineering required to meet the Government's obligations to the international, military and civil communities, and system requirements verification. OCX acquisition was established to 1) provide command and control of legacy and GPS III satellites, 2) incorporate situational awareness to support Navigation Warfare (NAVWAR) and signal monitoring, 3) enable mission capability upgrades to support a warfighter effects-based approach to operations, and 4) integrate Department of Defense (DoD) information assurance and cybersecurity controls and capabilities. GPS EI is responsible for architecture and system definition (the analysis and definition, management, maintenance, and evolution of the GPS Enterprise requirements and interface technical documents) as well as for the planning, execution, and fielding of the GPS Enterprise.

OCX funds support efforts such as engineering studies and analyses, architectural engineering studies, trade studies, technology needs forecasting, modernization initiatives, systems engineering, system development, resolving obsolescence issues, test and evaluation efforts, and mission operations. These activities support upgrades and product improvements for military and civil applications necessary to enable efforts to protect United States (U.S.) Military and Allies' use of GPS. Additionally, funds ensure OCX efforts meet current and future Joint Requirements Oversight Council (JROC) approved required capabilities.

The GPS Enterprise consists of Space, Ground Control, Nuclear Detonation (NUDET) Detection System (NDS) and User Equipment Segments. The Government is responsible for the integration of the GPS Segments such that they provide worldwide GPS capability to support the warfighter and over a billion national security, civil, Allied, and commercial GPS users.

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force	Date: February 2019
Appropriation/Budget Activity 3600: *Research, Development, Test & Evaluation, Air Force* / BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 1206423F / *Global Positioning System III - Operational Control Segment*

The GPS EI project includes the efforts associated with the Government's prime contract tasks necessary to accomplish critical integrating function with the three GPS enterprise material segments along with the logistics, operational and transition communities. The GPS EI maintains the GPS current architecture and system definition, controls and validates interfaces, ensures compatibility of Generation II and III systems, and develops/manages plans for execution and fielding of the GPS Enterprise. Further, GPS EI provides modeling, simulation, and technical analyses of impacts for Government directed enterprise level trades among the GPS segments leading to definition, management, maintenance, and evolution of the GPS Enterprise requirements and interface technical documents to build and ensure the integrity of the enterprise technical baseline, and perform system requirements verification.

In addition, the GPS EI project funds the technical evolution, risk reduction, enterprise-level testing and delivery of all GPS Enterprise capabilities. Examples for Generation II include electronic protection; for Generation III, additional anti-jamming protection and additional civil signals. To accomplish this, GPS EI delivers Test and Verification capabilities, Requirements and Interface Management, and Systems Integration support across the Space, Control, and User Segments. In this capacity, GPS EI is responsible for managing this cross-program work to provide these and other capabilities.

GPS EI's analyses guides Government decisions to ensure efficient and effective synchronization and execution across all Generation II and III GPS programs. For Enterprise-wide integration to be successful, the GPS EI: works with the GPS and NDS prime contractor teams to develop plans for early risk reduction System Integration Demonstrations to ensure system interfaces and functionality meet user and system requirements; ensures all equipment and documentation is ready when needed; integrates and analyzes enterprise schedules; and conducts formal test and verification, including Requirement Verification Plans and System Test Plans and Procedures. GPS EI performs all these efforts across all GPS programs in all acquisition phases. The Government owns the GPS Enterprise system requirements and integration, and highly leverages the GPS EI team to eliminate the need to fund a development prime contractor to perform these functions. This enhances Government control, oversight and program accountability.

Space acquisition must respond with speed and agility to emerging adversary threats. Space & Missile Systems Center (SMC) is transforming the organization and implementation of space acquisition to an enterprise approach, maximizing innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/classified enterprise space architecture. Expanding the appropriate acquisition authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose capabilities.

This PE may include necessary civilian pay expenses required to manage, execute, and deliver OCX weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in PEs 1206392F and 1206398F.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is $14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This program is in Budget Activity 7, Operational System Development because this budget activity includes development efforts to upgrade systems that have been fielded or have received approval for full rate production and anticipate production funding in the current or subsequent fiscal year.

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force					Date: February 2019
Appropriation/Budget Activity 3600: *Research, Development, Test & Evaluation, Air Force* / BA 7: *Operational Systems Development*			R-1 Program Element (Number/Name) PE 1206423F / *Global Positioning System III - Operational Control Segment*		
B. Program Change Summary ($ in Millions)	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**
Previous President's Budget	510.938	513.235	402.102	0.000	402.102
Current President's Budget	492.986	509.258	445.302	0.000	445.302
Total Adjustments	-17.952	-3.977	43.200	0.000	43.200
• Congressional General Reductions	0.000	-3.977			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	-17.952	0.000			
• Other Adjustments	0.000	0.000	43.200	0.000	43.200

Change Summary Explanation

FY 2020: +$43.200M fund to the June 2018 Independent Cost Estimate (ICE).

Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force			Date: February 2019
Appropriation/Budget Activity 3600 / 7	R-1 Program Element (Number/Name) PE 1206423F / *Global Positioning System III - Operational Control Segment*	Project (Number/Name) 67A021 / *OCX*	

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
67A021: *OCX*	3,116.549	435.930	445.365	380.342	0.000	380.342	420.635	341.416	291.066	125.857	0.000	5,557.160
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

GPS is a space based PNT distribution system which operates through all weather. This project funds the research and development for OCX. This includes, but is not limited to, advanced concept development, systems engineering and analysis, modernized control segment and mission planning development, modernization/ deployment of 17 monitoring stations, training simulators, integrated logistics support products, and test resources.

OCX acquisition was established to: 1) provide command and control of legacy and GPS III satellites; 2) incorporate situational awareness to support NAVWAR and signal monitoring; 3) enable mission capability upgrades to support a warfighter effects-based approach to operations; and 4) integrate DoD information assurance and cybersecurity controls and capabilities. OCX funds will support efforts such as engineering studies and analyses, architectural engineering studies, trade studies, technology needs forecasting, technology development, systems engineering, system development, test and evaluation efforts and mission operations in support of upgrades and product improvements for military and civil applications necessary to support efforts to protect U.S. military and Allies' use of GPS. Additionally, funds will ensure efforts to meet current and future JROC approved required capabilities.

Funding will also support new capabilities being developed by the GPS III Follow-On (GPS IIIF) production program along with RMP. This effort will research potential impacts and develop solutions due to the GPS IIIF modifications, upgrade monitoring stations, and implement advances in collection and integration of RMP high-power regional Military Code (M-Code) signals.

OCX Block 0 (through Iteration 1.5) is the Launch and Control System (LCS) intended to conduct Launch and Early Orbit (LEO) operations and the on-orbit checkout of all GPS III satellites. OCX Block 0 is a subset of OCX Block 1.

OCX Block 1 (adds Iterations 1.6, 1.7 and 2.1 to Block 0) fields the operational capability to control all legacy satellites and civil signals (L1C/A), military signals (L1P(Y), L2P(Y)) as well as the GPS III satellites and the modernized civil signal (L2C) and the aviation safety-of-flight signal (L5). In addition, Block 1 will field the basic operational capability to control the modernized military signals (L1M and L2M M-Code), and the globally compatible signal (L1C). It also fully meets information assurance/cyber defense requirements.

OCX Block 2 fields the advanced operational capability to control the advanced features of the modernized military signals (L1M and L2M M-Code). Blocks 1 & 2 are being delivered concurrently as a result of the Oct 2016 Nunn-McCurdy review.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Title: OCX Development	411.734	410.435	342.142

Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force		Date: February 2019
Appropriation/Budget Activity 3600 / 7	**R-1 Program Element (Number/Name)** PE 1206423F / *Global Positioning System III - Operational Control Segment*	**Project (Number/Name)** 67A021 / *OCX*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Description: Development of GPS OCX system to launch GPS III, operate a mixed GPS II and GPS III constellation, and provide for a robust Information Assurance system. ***FY 2019 Plans:*** Continue contractor support of Block 0. Complete Iteration 1.7 and 2.1 software coding and start integration and test activities. Complete 1.7 and 2.1 Security Test and Evaluation activities. Start installation and integration of the monitoring stations equipment and OCX Monitor Station Receiver Equipment (OMSRE). Begin OMSRE Positioning Signal Integrity Continuity Assurance (PSICA) data collecting and Network Interface Module (NIM) tuning. Continue security certification leading to Authorization to Operate (ATO). Continue program office support and other related support activities that may include, but are not limited to studies, technical analysis, prototyping, etc. ***FY 2020 Plans:*** Continue Iteration 1.7 and 2.1 integration and test activities Continue contractor support of the Block 0 baseline that is supporting GPS III satellite launch and checkout. Complete system level Factory Qualification Testing (FQT) and Site Acceptance Testing (SAT). Continue system maturity demonstrations, known as Transition Risk Reduction Operations (TRROs), in support of transition from the legacy Operational Control Segment (OCS) to OCX. Complete OMSRE PSICA data collecting and NIM tuning. Submit ATO packages for the Block 0 and Operational Block 1. Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, experimentation, prototyping, etc. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** FY 2020 decreased compared to FY 2019 by $68.293M. Justification for this decrease is described in plans above.			
Title: Technical Support ***Description:*** Development of the Standardized Space Trainer (SST) to provide GPS III operator training. Development of Enterprise Mission Planning Systems. Facilities upgrades for Control Stations and associated equipment and servers. Systems Engineering (SE) including Technical Mission Analysis, Modernization SE and Technical Support, and Test and Evaluation. ***FY 2019 Plans:*** Complete work on the SST and development demonstration of capabilities. Complete installation and integration. Continue data collection, and tuning of the monitoring stations equipment and OMSRE. Complete facility upgrades and testing to include the Master Control Station (MCS), Alternate Master Control Station (AMCS), and remote monitor station sites. ***FY 2020 Plans:***	24.196	34.930	38.200

Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force		Date: February 2019
Appropriation/Budget Activity 3600 / 7	**R-1 Program Element (Number/Name)** PE 1206423F / *Global Positioning System III - Operational Control Segment*	**Project (Number/Name)** 67A021 / *OCX*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Complete work on the SST and development demonstration of capabilities. Complete installation and integration. Continue data collection, and tuning of the monitoring stations equipment and OMSRE. Complete facility upgrades and testing to include the MCS, AMCS, and remote monitor station sites. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** FY 2020 increased compared to FY 2019 by $3.270M. Justification for this increase is described in plans above.			
Accomplishments/Planned Programs Subtotals	435.930	445.365	380.342

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
• RDTE 07 PE 1203265F: *GPS III Space Segment*	233.043	141.892	42.440	-	42.440	10.780	7.296	7.451	7.585	26.700	477.187
• RDTE 05 PE 1203269F: *GPS III Follow-On*	-	426.889	462.875	-	462.875	279.423	258.041	294.800	286.368	Continuing	Continuing
• SPAF 01 Line Item GPSIII: *GPS III Space Segment*	84.064	69.386	31.466	-	31.466	20.143	21.320	19.332	19.680	87.300	352.691
• DOT: *DOT (FAA) Civil Funding*	11.400	0.000	0.000	-	0.000	0.000	0.000	0.000	-	0.000	11.400

Remarks

D. Acquisition Strategy

The Air Force is pursuing a "Block" approach for OCX in order to respond to warfighter capability requirements. The strategy calls for capability (e.g., better signal maintainability, Unified S-Band (USB), Search and Rescue (SAR) GPS, and near-real time Command and Control (C2)), on-ramps for the follow-on contract for GPS III Space Vehicles (SVs) (starting no earlier than SV11) which will require updates to the OCX ground segment. Enterprise studies will ensure GPS Enterprise synchronization across space and ground segments.

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force			Date: February 2019
Appropriation/Budget Activity 3600 / 7	**R-1 Program Element (Number/Name)** PE 1206423F / *Global Positioning System III - Operational Control Segment*	**Project (Number/Name)** 67A021 / *OCX*	

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 OCX Phase B OCX Block 1 & 2 Development	C/CPAF	Raytheon : Aurora, CO	2,392.664	388.550	Dec 2017	377.976	Dec 2018	321.639	Dec 2019	-		321.639	1,041.585	4,522.414	4,522.414
GPS OCX Technical Mission Analysis	MIPR	Various : Various	31.614	14.467	Dec 2017	13.909	Dec 2018	15.124	Dec 2019	-		15.124	44.750	119.864	-
GPS OCX Enterprise SE&I	C/CPAF	TASC : El Segundo, CA	53.503	1.429	Dec 2017	6.841	Dec 2018	5.795	Dec 2019	-		5.795	9.087	76.655	76.655
GPS OCX Modernization/ SE & Technical Support	Various	Various : Various	62.921	2.114	Dec 2017	0.800	Dec 2018	2.650	Dec 2019	-		2.650	5.100	73.585	-
GPS OCX AMCS Facility Dev	Various	Various : Various	0.777	0.615	Mar 2018	1.000	Mar 2019	-		-		-	0.000	2.392	-
GPS OCX Standard Space Trainer (SST)	C/CPAF	Sonalyst, Inc : Waterford, CT	16.500	-		6.000	Dec 2018	5.000	Dec 2019	-		5.000	5.000	32.500	32.500
GPS OCX Enterprise Mission Planning	C/CPIF	Booz Allen Hamilton Eng Services : El Segundo, CA	16.300	5.800	Jan 2018	5.800	Jan 2019	5.800	Jan 2020	-		5.800	0.000	33.700	33.700
GPS OCX Phase A Development	Various	Various : Various	289.000	-		-		-		-		-	0.000	289.000	289.000
		Subtotal	2,863.279	412.975		412.326		356.008		-		356.008	1,105.522	5,150.110	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
GPS OCX T&E	C/Various	Various : Various	4.672	1.200	Mar 2018	7.421	Mar 2019	9.626	Mar 2020	-		9.626	0.000	22.919	-
		Subtotal	4.672	1.200		7.421		9.626		-		9.626	0.000	22.919	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
GPS OCX FFRDC	MIPR	Various : Various	133.502	9.913	Oct 2017	5.730	Oct 2018	4.949	Oct 2019	-		4.949	17.158	171.252	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force		Date: February 2019
Appropriation/Budget Activity 3600 / 7	**R-1 Program Element (Number/Name)** PE 1206423F / *Global Positioning System III - Operational Control Segment*	**Project (Number/Name)** 67A021 / *OCX*

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
GPS OCX A&AS	Various	Various : Various	112.419	11.156	Feb 2018	18.948	Feb 2019	7.919	Feb 2020	-		7.919	54.170	204.612	-
GPS OCX Other Support	Various	Various : Various	2.677	0.686	Oct 2017	0.940	Oct 2018	1.840	Oct 2019	-		1.840	2.125	8.268	-
		Subtotal	248.598	21.755		25.618		14.708		-		14.708	73.453	384.132	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	3,116.549	435.930		445.365		380.342		-		380.342	1,178.975	5,557.161	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force		Date: February 2019
Appropriation/Budget Activity 3600 / 7	**R-1 Program Element (Number/Name)** PE 1206423F / *Global Positioning System III - Operational Control Segment*	**Project (Number/Name)** 67A021 / *OCX*

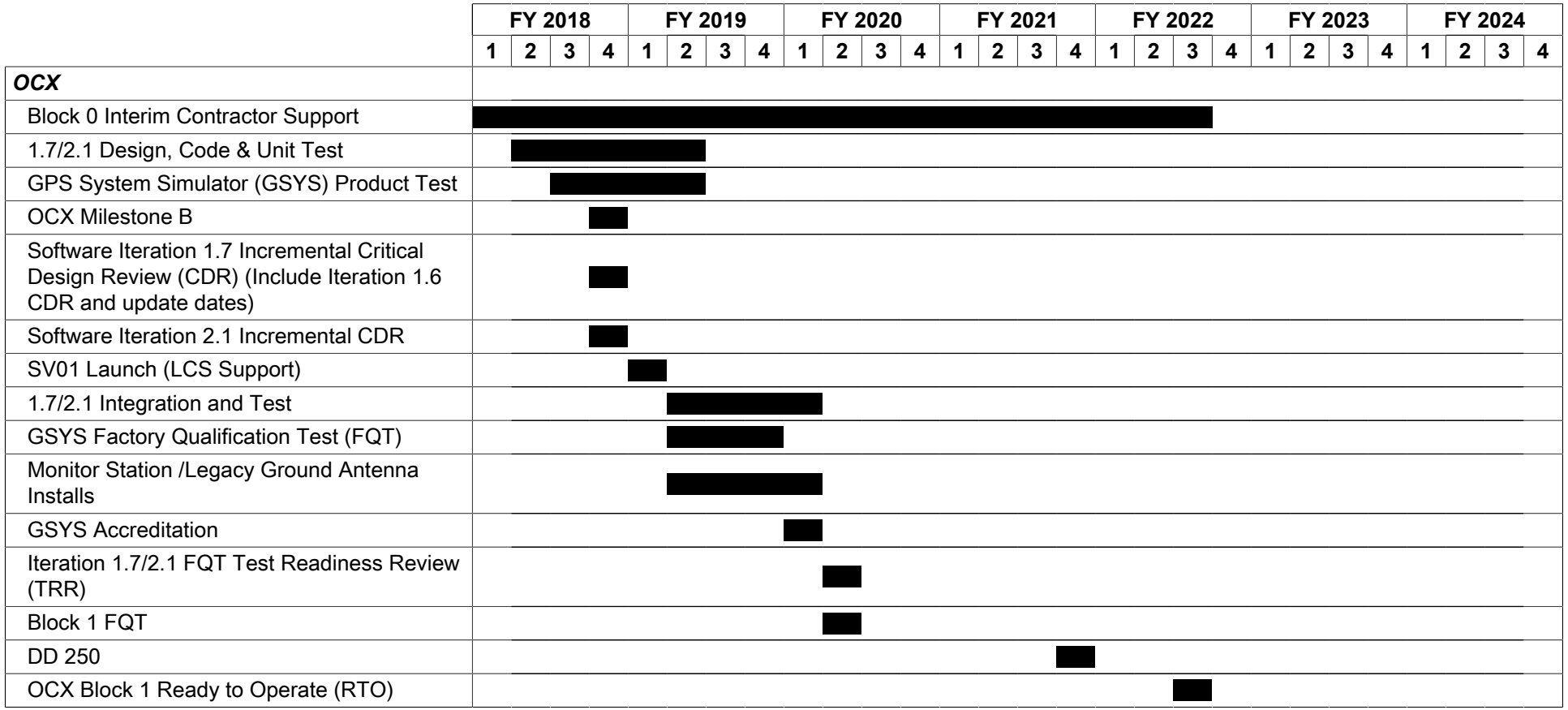

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force		Date: February 2019
Appropriation/Budget Activity 3600 / 7	**R-1 Program Element (Number/Name)** PE 1206423F / *Global Positioning System III - Operational Control Segment*	**Project (Number/Name)** 67A021 / *OCX*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
OCX				
Block 0 Interim Contractor Support	1	2018	3	2022
1.7/2.1 Design, Code & Unit Test	2	2018	2	2019
GPS System Simulator (GSYS) Product Test	3	2018	2	2019
OCX Milestone B	4	2018	4	2018
Software Iteration 1.7 Incremental Critical Design Review (CDR) (Include Iteration 1.6 CDR and update dates)	4	2018	4	2018
Software Iteration 2.1 Incremental CDR	4	2018	4	2018
SV01 Launch (LCS Support)	1	2019	1	2019
1.7/2.1 Integration and Test	2	2019	1	2020
GSYS Factory Qualification Test (FQT)	2	2019	4	2019
Monitor Station /Legacy Ground Antenna Installs	2	2019	1	2020
GSYS Accreditation	1	2020	1	2020
Iteration 1.7/2.1 FQT Test Readiness Review (TRR)	2	2020	2	2020
Block 1 FQT	2	2020	2	2020
DD 250	4	2021	4	2021
OCX Block 1 Ready to Operate (RTO)	3	2022	3	2022

Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force			Date: February 2019
Appropriation/Budget Activity 3600 / 7	R-1 Program Element (Number/Name) PE 1206423F / *Global Positioning System III - Operational Control Segment*	Project (Number/Name) 67A025 / *GPS Enterprise Integrator*	

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
67A025: *GPS Enterprise Integrator*	404.282	57.056	63.893	64.960	0.000	64.960	66.805	64.920	0.000	0.000	0.000	721.916
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

GPS EI is responsible for technical baseline management, integration, synchronizing, testing, and verifying GPS III, OCX, Military Global Positioning System User Equipment (MGUE), M-Code Early Use (MCEU) and Contingency Operations (COps) programs that constitute the GPS Enterprise. Moreover, GPS EI is responsible for delivering a reliable PNT signal capability to military operators, the civil user community, and international partners. Similarly, the Government Joint Program Office owns and approves the technical baseline and is responsible for the successful fielding of all the GPS Segments (space, control, and user). In order to successfully execute its responsibilities, the Government relies on GPS EI's specific expertise to create an enterprise architecture, integrate segment products, and verify the enterprise requirements are adequately met.

The GPS EI is also responsible for developing and managing the Enterprise technical baseline, which reflects multiple stakeholders' requirements. Such stakeholders include the Department of Defense (DoD), foreign governments, industry, and the general public (through four public interface specifications). Furthermore, GPS EI ensures GPS capabilities meet the warfighter's, civil agencies', commercial entities', international treaties', and over four billion global GPS users' needs. The GPS EI also manages the process through which the JROC validated requirements are matured and flowed down to the system segments, while remaining consistent with various interfaces. This enables the GPS system to meet Title 10 of the USC, Sec 2281, mandated GPS capabilities, and various other obligations to the international community that provide inter-operable PNT signals. GPS EI is also responsible for all aspects of schedule and technical alignment across the segments. Additionally, GPS EI is responsible for creating and managing plans that provide early exercise of the products under development, compatibility analysis, and inter-segment testing. The inter-segment tests are required to prove OCX interoperability with GPS III satellites and modernized user equipment. More importantly, it ensures backwards compatibility with GPS Block II satellites and legacy user equipment.

GPS EI activity supports the Government Joint Program Office's GPS spectrum protection at international forums such as the International Telecommunications Union. Such support consists of advocating on behalf of the United States Government when negotiating with foreign partners. In addition, GPS EI provides technical expertise to maintain relationships with other U.S. government agencies that include the Federal Aviation Administration (FAA), National Geospatial-Intelligence Agency (NGA), National Aeronautics and Space Administration (NASA), Departments of State (DOS), Transportation (DoT), Homeland Security (DHS), and Commerce (DOC).

Spectrum expertise also ensures GPS priority for eight essential spectrum signals, including those required for civil air navigation and safety of life. Spectrum Protection prevents encroachment from commercial or foreign entities, which results in the preservation of warfighter's reliable signal. As a result, military operations and the integrity of the global economic infrastructure are protected. GPS EI also provides the GPS enterprise expertise in System Safety, Enterprise level System Security Engineering covering Acquisition Systems Program Security (i.e., personnel, industrial, operations, information, sensitive compartmented information, communication, and physical), Program Protection, Foreign Disclosure, Public Release reviews, Mission System Certification and Accreditation, and Enterprise Cybersecurity. GPS EI is accountable for the development, execution, and analysis of OCX, cybersecurity, and associated test cases necessary to deliver a secure operational system.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force		Date: February 2019
Appropriation/Budget Activity 3600 / 7	**R-1 Program Element (Number/Name)** PE 1206423F / *Global Positioning System III - Operational Control Segment*	**Project (Number/Name)** 67A025 / *GPS Enterprise Integrator*

GPS EI supports the Government development and implementation of various Systems Engineering documents, defines the methods of verification, conducts the analyses or tests, and assists the Government in conducting Integrated System Tests. In addition, GPS EI validates the system performance in various mission threat scenarios during its development. GPS EI provides in-depth technical expertise to enhance government control, oversight and program accountability.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Title: GPS Enterprise Integrator	57.056	63.893	64.960
Description: The integration and technical baseline control of all elements of the GPS system (space/control/user) in support of both military and civil users. Test and verification of integrated system performance in preparation for operational test and evaluation.			
FY 2019 Plans: Continue execution of MGUE Developmental Testing (DT) (Integrated System Test 3-3 Phases 2-4). Execute MGUE lead platform tests. Support MGUE Operational Test and Evaluation (OT&E) test planning. Conduct integrated cyber test of the GPS MCS Architecture Evolution Program (AEP) in preparation for fielding of GPS III satellite. Conduct integrated system test of GPS III satellite with the GPS III COps upgrade to AEP (Integrated System Test 2-5) in preparation for OT&E and operational acceptance of GPS III. Conduct M-Code LiveSky tests in preparation for Core M-Code fielding. Support contractor cybersecurity test of OCX Block 1. Continue cybersecurity tests across all GPS segments (space/ control/user). Conduct test planning for Integrated System Test (IST) 2-6 (Core M-Code), IST 3-1 (OCX Block 1 and GPS III) and IST 3-2 (OCX Block 1, satellite constellation, and MGUE). Support launch and on-orbit checkout testing of GPS III SVs 01 and 02. Support planning and execution of test events for SVs 02 and 03. Execute testing for Selective Availability Anti-Spoofing Module (SAASM) Mission Planning System (SMPS) 5.B.3. Test and integrate M-Code monitoring for Early Use integration and Command and Control of M-Code on the existing OCS AEP. Conduct tests and analyses to protect GPS users from interference sources that threaten performance of GPS receivers. Participate in international Global Navigation Satellite System (GNSS) forums to advocate for GPS regulatory and technical interests. Continue program office support and other related support activities that may include, but are not limited to studies, technical analysis, prototyping, etc.			
FY 2020 Plans: Conduct integrated system test of Core M-Code capability (Integrated System Test 2-6) in preparation for OT&E and operational acceptance of M-Code Early Use (MCEU). Conduct government security test of OCX Block 1. Continue test planning for IST 3-1 (OCX Block 1 and GPS III) and IST 3-2 (OCX Block 1, satellite constellation, and MGUE). Continue to support MGUE operational test planning. Continue execution of MGUE DT (IST 3-3 Phases 2-4). Continue execution of MGUE lead platform tests in preparation for MGUE OT&E. Conduct M-Code LiveSky tests in support of MGUE field testing. Support launch and on-orbit checkout testing of SVs 03-05. Support planning and execution of test events for SVs 04-05. Execute testing for SMPS 5.C. Support AEP ground antennas and Commercial Off-The-Shelf (COTS) upgrades. Test and integrate M-Code monitoring stations upgrades. Continue cybersecurity tests across all GPS segments (space/control/user). Continue to conduct tests and analyses			

Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force		Date: February 2019
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
to protect GPS users from interference sources that threaten performance of GPS receivers. Participate in international GNSS forums to advocate for GPS regulatory and technical interests. Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, experimentation, prototyping, etc.			
FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 increased compared to FY 2019 by $1.067M. Justification for this increase is described in plans above.			
Accomplishments/Planned Programs Subtotals	57.056	63.893	64.960

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
• RDTE 04 PE 1203164F: *NAVSTAR Global Positioning System (User Equipment) (Space)*	321.186	252.834	329.948	-	329.948	160.139	47.178	71.686	116.771	107.755	1,407.497
• RDTE 07 PE 1203265F: *GPS III Space Segment*	233.043	141.892	42.440	-	42.440	10.780	7.296	7.451	7.585	5.900	456.387
• RDTE 05 PE 1203269F: *GPS III Follow-On*	-	426.889	462.875	-	462.875	279.423	258.041	294.800	286.368	Continuing	Continuing
• RDTE 07 PE 1203913F: *NUDET Detection System*	31.304	19.778	49.300	-	49.300	14.162	14.456	14.719	0.000	Continuing	Continuing
• SPAF 01 Line Item GPSIII: *GPS III Space Segment*	63.664	69.386	31.466	-	31.466	20.143	21.320	19.332	19.680	26.400	271.391
• SPAF 01 GPS IIIF SPAF: *GPS IIIF SPAF*	-	-	414.625	-	414.625	628.445	890.355	897.544	962.300	Continuing	Continuing

Remarks

D. Acquisition Strategy

In accordance with a "back to basics" acquisition approach and the exercise of strong oversight of development contractors, the Air Force is required to exercise complete ownership of the architecture, system definition, technical baseline, and integration of the GPS space, ground, and user segments. While this complex inter-segment integration is traditionally performed by a prime contractor under a systems development contract, for GPS, this approach requires the government to be the integrator. To execute this responsibility, the government leverages systems engineering and integration expertise from both Federally Funded Research and Development Center (FFRDC) contractors and a Systems Engineering & Integration (SE&I) contractor. The GPS EI function of the SE&I contractor is currently funded

Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force		Date: February 2019
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within this PE. The SE&I effort was originally procured in 2007 through a full and open competition, as was the new follow-on SE&I contract awarded in 2015. The SE&I follow-on strategy builds in year over year cost reductions as requirements stabilize. In FY 2023, the GPS EI budget will transition from PE 1206423F to PE 1203269F.

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force		Date: February 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
GPS EI Enterprise SE&I	C/CPAF	TASC : El Segundo, CA	194.598	18.605	Oct 2017	23.198	Oct 2018	24.248	Oct 2019	-		24.248	48.777	309.426	309.426
GPS EI Technical Mission Analysis 1	MIPR	Aerospace : El Segundo, CA	83.555	10.865	Oct 2017	11.592	Oct 2018	11.100	Oct 2019	-		11.100	19.797	136.909	-
GPS EI Technical Mission Analysis 2	RO	MITRE : Various	80.219	11.703	Oct 2017	12.075	Oct 2018	11.827	Oct 2019	-		11.827	22.942	138.766	-
GPS EI MRTA/MSTA	C/CPIF	Draper Labs : Cambridge, MA	7.446	3.436	Dec 2017	4.250	Dec 2018	3.400	Dec 2019	-		3.400	6.800	25.332	25.332
GPS EI Enterprise Mission Planning	C/CPIF	Various : El Segundo, CA	1.320	-		-		-		-		-	0.000	1.320	1.320
GPS EI Cybersecurity	Various	Various : El Segundo, CA	16.158	4.745	Oct 2017	4.982	Oct 2018	6.985	Oct 2019	-		6.985	15.929	48.799	-
GPS EI Additonal Product Development	Various	Various : Various	4.082	1.236	Oct 2017	1.511	Oct 2018	2.200	Oct 2019	-		2.200	6.974	16.003	-
		Subtotal	387.378	50.590		57.608		59.760		-		59.760	121.219	676.555	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
EI Integrated Systems Test	Various	Various : El Segundo, CA	0.294	-		-		-		-		-	0.000	0.294	-
		Subtotal	0.294	-		-		-		-		-	0.000	0.294	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
GPS EI FFRDC	Various	Various : El Segundo, CA	0.583	1.000	Oct 2017	0.165	Oct 2018	0.165	Oct 2019	-		0.165	0.250	2.163	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force		Date: February 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
GPS EI A&AS	Various	Various : El Segundo, CA	14.922	5.100	Oct 2017	5.720	Oct 2018	4.635	Oct 2019	-		4.635	9.456	39.833	-
GPS EI Other Support	Various	Various : Various	1.105	0.366	Oct 2017	0.400	Oct 2018	0.400	Oct 2019	-		0.400	0.800	3.071	-
		Subtotal	16.610	6.466		6.285		5.200		-		5.200	10.506	45.067	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	404.282	57.056		63.893		64.960		-		64.960	131.725	721.916	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force		Date: February 2019
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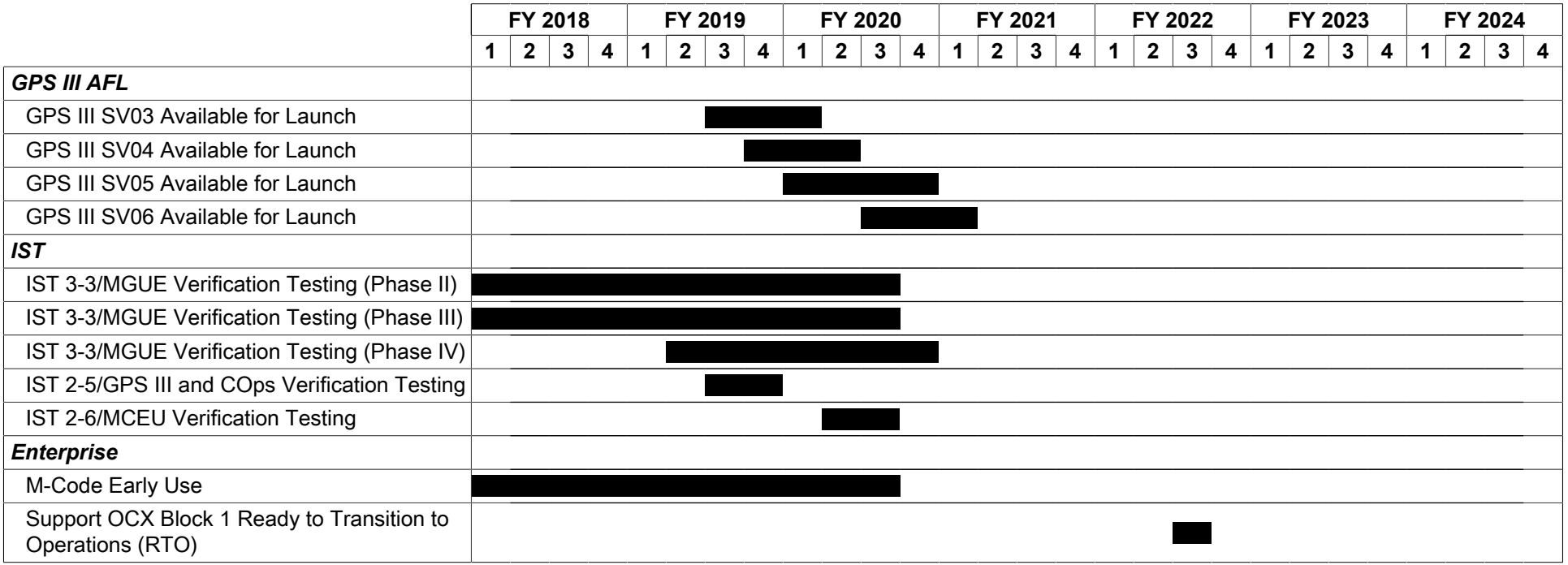

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force		Date: February 2019
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Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
GPS III AFL				
GPS III SV03 Available for Launch	3	2019	1	2020
GPS III SV04 Available for Launch	4	2019	2	2020
GPS III SV05 Available for Launch	1	2020	4	2020
GPS III SV06 Available for Launch	3	2020	1	2021
IST				
IST 3-3/MGUE Verification Testing (Phase II)	1	2018	3	2020
IST 3-3/MGUE Verification Testing (Phase III)	1	2018	3	2020
IST 3-3/MGUE Verification Testing (Phase IV)	2	2019	4	2020
IST 2-5/GPS III and COps Verification Testing	3	2019	4	2019
IST 2-6/MCEU Verification Testing	2	2020	3	2020
Enterprise				
M-Code Early Use	1	2018	3	2020
Support OCX Block 1 Ready to Transition to Operations (RTO)	3	2022	3	2022