Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force											Date: February 2020	
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force* / BA 7: *Operational Systems Development*					R-1 Program Element (Number/Name) PE 1206423SF / *Global Positioning System III - Operational Control Segment*							
COST ($ in Millions)	**Prior Years**	**FY 2019**	**FY 2020**	**FY 2021 Base**	**FY 2021 OCO**	**FY 2021 Total**	**FY 2022**	**FY 2023**	**FY 2024**	**FY 2025**	**Cost To Complete**	**Total Cost**
Total Program Element	0.000	0.000	0.000	481.999	0.000	481.999	406.136	290.873	124.617	0.000	0.000	1,303.625
67A021: *OCX*	0.000	0.000	0.000	421.664	0.000	421.664	341.216	290.873	124.617	0.000	0.000	1,178.370
67A025: *GPS Enterprise Integrator*	0.000	0.000	0.000	60.335	0.000	60.335	64.920	0.000	0.000	0.000	0.000	125.255
Program MDAP/MAIS Code: 456												

Note

This program, BA 07, PE 1206423SF, project 67A021, OCX Block 3F, is a new start.

A. Mission Description and Budget Item Justification

In FY 2021, PE 1206423F, Global Positioning System III - Operational Control Segment efforts were transferred to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE 1206423SF, Global Positioning System III - Operational Control Segment from Appropriation 3600, Budget Activity 07 due to the creation of a new Appropriation for Space Force.

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) 1206423SF funds Research, Development, Test and Evaluation (RDT&E) for the GPS Next Generation Operational Control System (OCX), the upgrade to OCX called OCX Block 3F to incorporate Regional Military Protection (RMP), command and control functionality for GPS III Follow-on (GPS IIIF) satellites, and the GPS Enterprise Integrator (EI). 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. OCX Block 3F will upgrade OCX with new capabilities to synchronizes with GPS IIIF Space Segment 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

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force	Date: February 2020
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 1206423SF *I Global Positioning System III - Operational Control Segment*

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.

OCX Block 3F will upgrade OCX with new capabilities to synchronize with GPS IIIF Space Segment and Military GPS User Equipment (MGUE) Increment 2 capabilities. This includes advanced concept development such as 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 Block 3F will maintain backward compatibility to support the legacy constellation develop solutions necessary to command, control and monitor GPS IIIF, to include advance collection and integration of RMP high power regional M-code signals, rapid warfighter effects and support to GPS auxiliary payloads.

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.

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.

The FY 2021 funding request was reduced by $6.448 million to account for the availability of prior year execution balances.

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force	Date: February 2020
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 1206423SF *I Global Positioning System III - Operational Control Segment*

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 1206392SF and 1206398SF.

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.

B. Program Change Summary ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	0.000	0.000	0.000	0.000	0.000
Current President's Budget	0.000	0.000	481.999	0.000	481.999
Total Adjustments	0.000	0.000	481.999	0.000	481.999
• Congressional General Reductions	0.000	0.000			
• 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	0.000	0.000			
• Other Adjustments	0.000	0.000	481.999	0.000	481.999

Change Summary Explanation

FY 2021: +$481.999M; funds starting in FY 2021 were transferred from RDT&E, Air Force to RDT&E, Space Force.

Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force			Date: February 2020
Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1206423SF / *Global Positioning System III - Operational Control Segment*	Project (Number/Name) 67A021 / *OCX*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
67A021: *OCX*	0.000	0.000	0.000	421.664	0.000	421.664	341.216	290.873	124.617	0.000	0.000	1,178.370
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

This program, BA 07, PE 1206423SF, project 67A021, OCX Block 3F, is a new start.

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.

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.

OCX Block 3F will modify OCX Blocks 1 and 2 to field new capabilities in support of the GPS III Follow-On (GPS IIIF) production program and incorporate Regional Military Protection (RMP) to handle future threats. OCX Block 3F will upgrade OCX with new capabilities to synchronizes with GPS IIIF Space Segment and Military GPS User Equipment (MGUE) Increment 2 capabilities. OCX Block 3F will maintain backward compatibility with the existing capabilities to support the legacy GPS constellation and integrate into Block 1 and 2 and future efforts to support GPS IIIF. The OCX Block 3F effort will develop solutions necessary to command, control, and

Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1206423SF / *Global Positioning System III - Operational Control Segment*	**Project (Number/Name)** 67A021 / *OCX*

monitor GPS IIIF spacecraft and include advance collection and integration of RMP high-power regional Military Code (M-Code) signals, rapid warfighter effects, and support to GPS IIIF auxiliary payloads (including Search and Rescue (SAR), Nuclear Detonation (NUDET) Detection System (NDS).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: OCX Development	0.000	0.000	308.403
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 2020 Plans:*** N/A ***FY 2021 Plans:*** Complete 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 Site Acceptance Testing (SAT). Complete system maturity demonstrations, known as TRROs, in support of transition from the legacy OCS to OCX. Continue software and hardware obsolescence remediation and replacement of obsolete IBM servers. Begin and complete system acceptance and DD250. Begin interim contractor support activities. 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 2020 to FY 2021 Increase/Decrease Statement:*** N/A			
Title: OCX Block 3F	0.000	0.000	72.600
Description: OCX Block 3F will upgrade OCX Block 1 & 2 with new capabilities in support of GPS IIIF and incorporate RMP to handle future threats. OCX Block 3F will maintain backward compatibility to support the legacy constellation develop solutions necessary to command, control and monitor GPS IIIF, to include advance collection and integration of RMP high power regional M-code signals, rapid warfighter effects and support to GPS auxiliary payloads. ***FY 2020 Plans:*** N/A ***FY 2021 Plans:*** Award OCX Block 3F contract. Conduct requirements analysis and necessary systems engineering to start the development and test planning leading to a sprint design review in mid 2021 in order to upgrade the system simulator and implement all changes required to the OCX baseline to support GPS IIIF SV. ***FY 2020 to FY 2021 Increase/Decrease Statement:***			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1206423SF / *Global Positioning System III - Operational Control Segment*	**Project (Number/Name)** 67A021 / *OCX*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
FY 2021 is a new start for OCX Block 3F.			
Title: Technical Support	0.000	0.000	40.661
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 (TMA), Modernization SE and Technical Support, and Test and Evaluation (T&E). ***FY 2020 Plans:*** N/A ***FY 2021 Plans:*** Complete work on the SST and development demonstration of capabilities. Continue data collection, and tuning of the monitoring stations equipment and OMSRE. Begin technical support of Transition Risk Reduction Operations (TRROs) and Integrated System Test. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** N/A			
Accomplishments/Planned Programs Subtotals	0.000	0.000	421.664

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• RDTE,AF 07 PE 1203265F: *GPS III Space Segment*	139.180	42.440	-	-	-	-	-	-	-	0.000	181.620
• RDTE,SF 07 PE 1203265SF: *GPS III Space Segment*	-	-	10.777	-	10.777	7.296	1.598	3.382	7.722	0.000	30.775
• RDTE,AF 05 PE 1203269F: *GPS III Follow-On*	412.202	462.875	-	-	-	-	-	-	-	0.000	875.077
• RDTE,SF 05 PE 1203269SF: *GPS III Follow-On*	-	-	263.496	-	263.496	267.542	294.706	286.279	177.074	1,167.479	2,456.576
• SPAF 01 Line Item GPSIII: *GPS III Space Segment*	69.386	31.466	-	-	-	-	-	-	-	0.000	100.852
• SPSF 01 Line Item GPSIII: *GPS III Space Segment*	-	-	20.122	-	20.122	21.302	19.312	7.868	1.883	92.808	163.295

Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1206423SF / *Global Positioning System III - Operational Control Segment*	**Project (Number/Name)** 67A021 / *OCX*

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• SPAF 01 Line Item GPS IIIF: *GPS III Follow-On*	-	414.625	-	-	-	-	-	-	-	0.000	414.625
• SPSF 01 Line Item GPS IIIF: *GPS III Follow-On*	-	-	627.796	-	627.796	634.821	640.782	920.657	750.853	3,230.317	6,805.226

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. Acquisition strategy for OCX Block 3F is currently in work however program office is targeting a tailored ACAT II program with a targeted award in FY 2021.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Air Force			Date: February 2020
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1206423SF / *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 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 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	-	-		-		280.853	Dec 2020	-		280.853	622.320	903.173	4,413.394
GPS OCX Block 3F Development	TBD	Not specified. : TBD	-	-		-		72.600	Mar 2021	-		72.600	0.000	72.600	-
GPS OCX Technical Mission Analysis	MIPR	Various : Various	-	-		-		15.394	Dec 2020	-		15.394	46.182	61.576	-
GPS OCX Enterprise SE&I	C/CPAF	TASC : El Segundo, CA	-	-		-		6.865	Dec 2020	-		6.865	20.595	27.460	88.187
GPS OCX Modernization/ SE & Technical Support	Various	Various : Various	-	-		-		3.313	Dec 2020	-		3.313	0.000	3.313	-
GPS OCX Standard Space Trainer (SST)	C/CPAF	Sonalyst, Inc : Waterford, CT	-	-		-		6.500	Dec 2020	-		6.500	0.000	6.500	34.000
GPS OCX Enterprise Mission Planning	C/CPIF	Booz Allen Hamilton Eng Services : El Segundo, CA	-	-		-		5.800	Jan 2021	-		5.800	0.000	5.800	33.700
		Subtotal	-	-		-		391.325		-		391.325	689.097	1,080.422	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
GPS OCX T&E	C/Various	Various : Various	-	-		-		9.654	Mar 2021	-		9.654	0.000	9.654	-
		Subtotal	-	-		-		9.654		-		9.654	0.000	9.654	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
GPS OCX FFRDC	MIPR	Various : Various	-	-		-		7.132	Oct 2020	-		7.132	21.396	28.528	-
GPS OCX A&AS	Various	Various : Various	-	-		-		12.613	Feb 2021	-		12.613	45.213	57.826	-
GPS OCX Other Support	Various	Various : Various	-	-		-		0.940	Oct 2020	-		0.940	1.000	1.940	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1206423SF / *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 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
		Subtotal	-	-		-		20.685		-		20.685	67.609	88.294	N/A

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		0.000		421.664		-		421.664	756.706	1,178.370	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1206423SF / *Global Positioning System III - Operational Control Segment*	**Project (Number/Name)** 67A021 / *OCX*

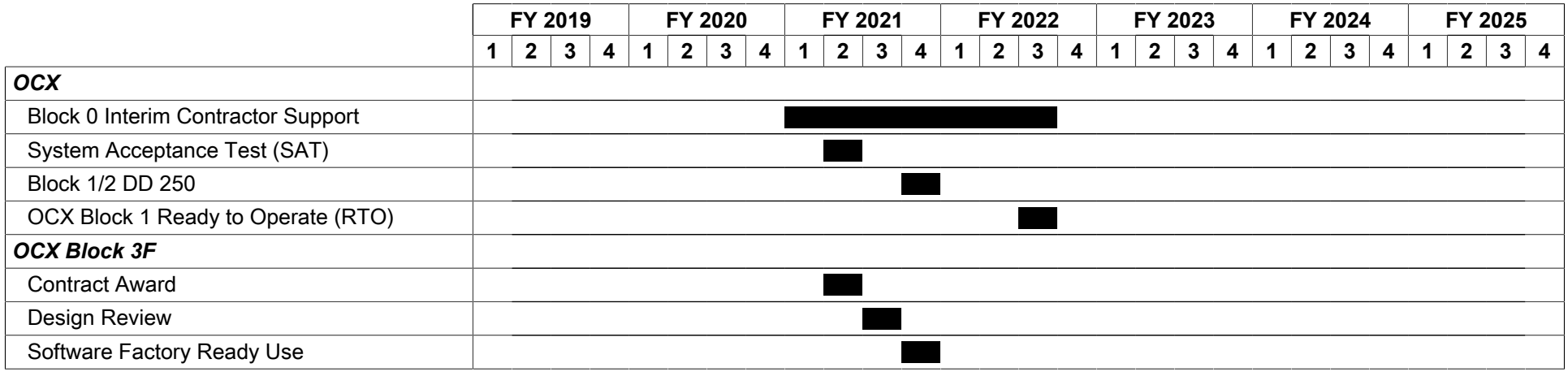

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1206423SF / *Global Positioning System III - Operational Control Segment*	**Project (Number/Name)** 67A021 / *OCX*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
OCX				
Block 0 Interim Contractor Support	1	2021	3	2022
System Acceptance Test (SAT)	2	2021	2	2021
Block 1/2 DD 250	4	2021	4	2021
OCX Block 1 Ready to Operate (RTO)	3	2022	3	2022
OCX Block 3F				
Contract Award	2	2021	2	2021
Design Review	3	2021	3	2021
Software Factory Ready Use	4	2021	4	2021

Note

Acquisition strategy for OCX Block 3F is currently in work. However, program office is targeting a tailored ACAT II program with a targeted contract award 2QFY21, design review 3QFY21, 4QFY21 OCX3F Software Factory Ready for Use.

Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force			Date: February 2020
Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1206423SF / *Global Positioning System III - Operational Control Segment*	Project (Number/Name) 67A025 / *GPS Enterprise Integrator*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
67A025: *GPS Enterprise Integrator*	0.000	0.000	0.000	60.335	0.000	60.335	64.920	0.000	0.000	0.000	0.000	125.255
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The GPS Joint Program Office established and maintains the technical baseline and is responsible for the successful fielding of all the GPS Segments (space, control, and user). In order to successfully execute these responsibilities, GPS Enterprise Integrator (EI) creates an enterprise architecture, integrates segment products, verifies the enterprise requirements are adequately met, develops and implements various Systems Engineering documents, defines methods of verification, conducts integrated system test and test analysis, develops and manages the Enterprise technical baseline which reflect multiple stakeholder requirements; 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. Moreover, GPS EI is responsible for delivering a reliable PNT signal capability to military operators, the civil user community, and international partners. In addition, GPS EI validates the system performance in various mission threat scenarios during its development as well as, provides in-depth technical expertise to enhance government control, oversight and program accountability. GPS EI is also responsible for all aspects of schedule and technical alignment across the GPS segments (space, control, and user).

More specifically, 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). 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. 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 also 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 (U.S.) 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). GPS EI Spectrum 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.

Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1206423SF / *Global Positioning System III - Operational Control Segment*	**Project (Number/Name)** 67A025 / *GPS Enterprise Integrator*

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.

The FY 2021 funding request was reduced by $6.448 million to account for the availability of prior year execution balances.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: GPS Enterprise Integrator	0.000	0.000	60.335
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 2020 Plans:*** N/A ***FY 2021 Plans:*** Conduct government security test of OCX block 1 and test planning using simulators to verify test procedures and determine readiness for testing with live assets of OCX Block 1, and GPS III, (IST 3-1) in preparation for an integrated test for OCX that includes OCX Block 1, the full GPS satellite constellation with GPS III, and MGUE available on all four service lead platforms (IST 3-2). In addition, perform OCX adversarial cyber tests, M-code live sky and support OCX operational test. Support MGUE increment one Operational Testing (IST 3-3) on all four service lead platforms. Support delivery and testing for SMPS 5C update that allows full tasking for M-Code and OCX compatibility. Initiate planning for IST 3-4 to verify functionality of MGUE increment 2 and M-Code handheld receivers. Transition MCEU (IST 2-6) from Operational Test activities into operations. Align enterprise to seamlessly transition control of the GPS constellation from OCS to OCX. Support launch and on- orbit checkout testing of SVs 06-07. Support planning and execution of test events for SVs 08. Conduct modeling and simulation to verify capability of GPS IIIF to operate in a contested environment. Continue cybersecurity tests across all GPS segments (space/control/user). Develop technical specifications for operation of Regional Military Protection (RMP). Continue to conduct tests and analyses 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 2020 to FY 2021 Increase/Decrease Statement:*** N/A			
Accomplishments/Planned Programs Subtotals	0.000	0.000	60.335

Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force		Date: February 2020
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C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• RDTE,SF 04 PE 1203164SF: *NAVSTAR Global Positioning System (User Equipment) (Space)*	-	-	390.704	-	390.704	340.178	283.663	212.735	54.066	0.000	1,196.616
• RDTE,SF 07 PE 1203265SF: *GPS III Space Segment*	-	-	10.777	-	10.777	7.296	1.598	3.382	7.722	61.861	92.636
• RDTE,SF 05 PE 1203269SF: *GPS III Follow-On*	-	-	263.496	-	263.496	267.542	294.706	286.279	177.074	1,167.479	2,456.576
• RDTE,SF 07 PE 1203913SF: *NUDET Detection System*	-	-	29.157	-	29.157	25.456	26.714	11.000	0.000	0.000	135.654
• SPSF 01 Line Item GPSIII: *GPS III Space Segment*	-	-	20.122	-	20.122	21.302	19.312	7.868	1.883	92.679	163.309
• SPSF 01 GPS IIIF: *GPS III Follow-On*	-	-	627.796	-	627.796	634.821	640.782	920.657	750.853	3,230.317	6,805.226
• RDTE,AF 07 1203164F: *NAVSTAR Global Positioning System (User Equipment) (Space)*	236.789	187.355	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	557.384
• RDTE,AF 07 1203913F: *NUDET Detection System*	21.578	49.300	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	70.878
• RDTE,AF 07 1203265F: *GPS III Space Segment*	139.180	42.440	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	181.620
• RDTE,AF 05 1203269F: *GPS III Follow-On*	412.202	447.875	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	860.077

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 2021 Air Force		Date: February 2020
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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 effort will transition from PE 1206423SF to PE 1203269SF.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Air Force		Date: February 2020
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Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
GPS EI Enterprise SE&I	C/CPAF	TASC : El Segundo, CA	-	-		-		22.000	Oct 2020	-		22.000	24.246	46.246	-
GPS EI Technical Mission Analysis 1	MIPR	Aerospace : El Segundo, CA	-	-		-		10.476	Oct 2020	-		10.476	7.560	18.036	-
GPS EI Technical Mission Analysis 2	RO	MITRE : Various	-	-		-		9.762	Oct 2020	-		9.762	13.870	23.632	-
GPS EI MRTA/MSTA	C/CPIF	Draper Labs : Cambridge, MA	-	-		-		3.502	Dec 2020	-		3.502	3.607	7.109	-
GPS EI Cybersecurity	Various	Various : El Segundo, CA	-	-		-		7.220	Dec 2020	-		7.220	7.835	15.055	-
GPS EI Additonal Product Development	Various	Various : Various	-	-		-		2.193	Oct 2020	-		2.193	2.260	4.453	-
		Subtotal	-	-		-		55.153		-		55.153	59.378	114.531	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
GPS EI FFRDC	Various	Various : El Segundo, CA	-	-		-		0.165	Oct 2020	-		0.165	0.175	0.340	-
GPS EI A&AS	Various	Various : El Segundo, CA	-	-		-		4.487	Oct 2020	-		4.487	4.943	9.430	-
GPS EI Other Support	Various	Various : Various	-	-		-		0.530	Oct 2020	-		0.530	0.424	0.954	-
		Subtotal	-	-		-		5.182		-		5.182	5.542	10.724	N/A

	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		0.000		60.335		-		60.335	64.920	125.255	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Air Force		Date: February 2020
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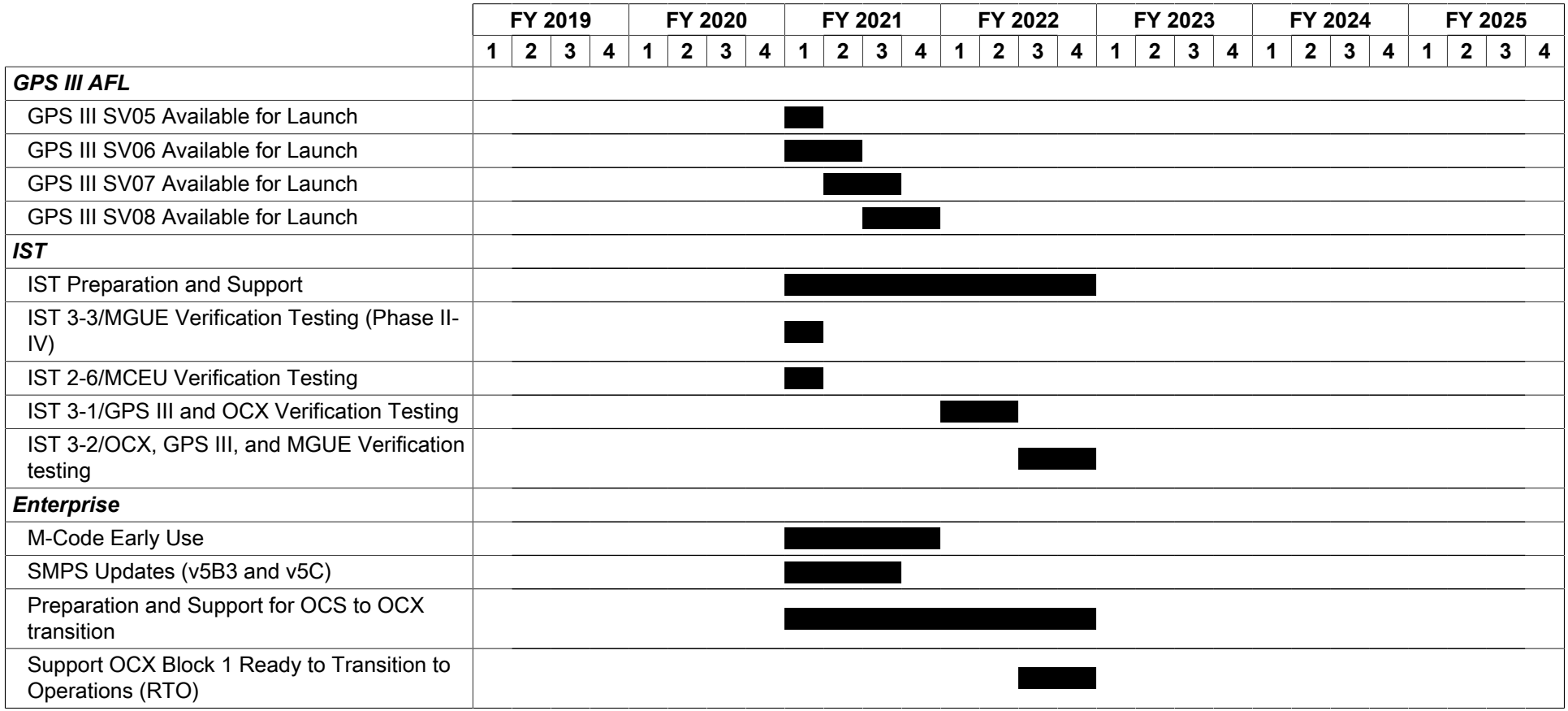

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Air Force		Date: February 2020
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Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
GPS III AFL				
GPS III SV05 Available for Launch	1	2021	1	2021
GPS III SV06 Available for Launch	1	2021	2	2021
GPS III SV07 Available for Launch	2	2021	3	2021
GPS III SV08 Available for Launch	3	2021	4	2021
IST				
IST Preparation and Support	1	2021	4	2022
IST 3-3/MGUE Verification Testing (Phase II-IV)	1	2021	1	2021
IST 2-6/MCEU Verification Testing	1	2021	1	2021
IST 3-1/GPS III and OCX Verification Testing	1	2022	2	2022
IST 3-2/OCX, GPS III, and MGUE Verification testing	3	2022	4	2022
Enterprise				
M-Code Early Use	1	2021	4	2021
SMPS Updates (v5B3 and v5C)	1	2021	3	2021
Preparation and Support for OCS to OCX transition	1	2021	4	2022
Support OCX Block 1 Ready to Transition to Operations (RTO)	3	2022	4	2022