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 1203265SF / *GPS III Space 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	10.777	0.000	10.777	7.296	1.598	3.382	7.722	0.000	30.775
67A019: *GPS III*	0.000	0.000	0.000	10.777	0.000	10.777	7.296	1.598	3.382	7.722	0.000	30.775
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		
Program MDAP/MAIS Code: 292												

A. Mission Description and Budget Item Justification

GPS III is the next-generation SV supporting the GPS constellation and is funded in PE 1203265SF. GPS III SVs will deliver significant enhancements, including a new international civil (L1C) Galileo-compatible signal, and enhanced anti-jam power. GPS III SVs 03-10 are in the Production and Deployment Phase.

PE 1203265SF funds GPS III and supports RDT&E of GPS III SVs 01-02 and risk-reducing simulators through a systems engineering approach that matures and delivers SVs for launch. This program includes SVs 01-02 engineering studies and analyses, trade studies, system development, test and evaluation efforts, integrated logistics support products, on-orbit support, and mission operations support for civil and military applications that protect U.S. military and allied use of GPS. The program also includes Contingency Operations (COps) as a bridge capability to fly GPS III SVs until the delivery of the GPS OCX program.

Mission Readiness Campaign (MRC) activities include launch preparation, planning, mission readiness testing to validate space-ground-user interfaces, mission crew exercises and rehearsals, launch vehicle integration, and On-Orbit Checkout activities to validate performance prior to launch and post launch. Newly certified launch vehicles must be incorporated into the GPS III launch baseline. Integration requires the development of plans and procedures and procurement of special support equipment.

GPS supports the early deployment of Global M-Code to meet a congressional mandate limiting user equipment purchase to M-Code capable receivers starting in FY 2017. The funds will cover the M-Code Early Use (MCEU) program and support development costs associated with the GPS control segment software to provide core M-Code capabilities to the warfighter, as well as the ability to command and control, process, and monitor the M-Code signal. MCEU mitigates delays with GPS OCX, supports MGUE testing, and allows for early M-Code operations. M-Code provides greater security to protect navigation and timing in electronically contested environments.

Impacts of the M-Code deployment include:
-Compliance with The US Space Command Commander's mandate to provide global monitoring necessary for early M-code operational use and verification of NAVWAR effects.
-Direction to improve the resiliency of the GPS capability.
-Confirmation that Enterprise modernization efforts are integrated and properly deployed.
-Testing and Verification of M-Code capability on MGUE/GPS III solution and early M-Code use tied to MGUE fielding.

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The feasibility studies and preliminary engineering analyses that are funded by this budget item will determine whether an initiative to host GPS M-Code augmentation payloads on other satellite systems is practical and beneficial. The primary goal is to provide additional mission assurance through redundant systems not directly connected with the current U.S. GPS satellite constellation.

This PE encompasses the GPS III (SVs 01-10) and MCEU.

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	10.777	0.000	10.777
Total Adjustments	0.000	0.000	10.777	0.000	10.777
• 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	10.777	0.000	10.777

Change Summary Explanation

FY 2021: +$10.777M; funds starting in FY 2021 were transferred from RDT&E, Air Force to RDT&E, Space Force

C. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: GPS III SVs 01-02	0.000	0.000	7.145
Description: Development, test, and evaluation of GPS III SVs 01-02 and associated simulators, engineering studies and analyses, trade studies, system development, test and evaluation efforts, and integrated logistics support products. ***FY 2020 Plans:*** N/A ***FY 2021 Plans:*** Continue on-going on-orbit activities and engineering support for GPS III SV 01 and SV 02 to validate performance through life testing, technical support, system engineering, and mission operations. 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, continued program office support, studies, technical analysis, experimentation, prototyping, etc. ***FY 2020 to FY 2021 Increase/Decrease Statement:***			

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 1203265SF *I GPS III Space Segment*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
N/A			
Title: Architecture Evolution Plan (AEP) M-Code Monitoring	0.000	0.000	3.632
Description: The M-Code Early Use (MCEU) program initiative will cover the development costs associated with updating the legacy control segment software, AEP, with additional capabilities needed to provide M-Code operations. MCEU will provide the Combined Space Operations Center (CSpOC) with command and control (C2), processing, and integrity monitoring for the M-Code signal. The development will also include the integration of modernized Monitor Station Technology Improvement Capability (MSTIC) receivers, which are being procured separately using Operations and Maintenance (O&M) funding as a Form-Fit- Functional replacement for the legacy Monitor Station Receiver Element (MSRE) Y-Code receivers. MCEU will add a software upgrade to MSTIC receivers to allow it to process M-Code signals. Prime contract was awarded to start software development and test activities; includes insertion of Legacy Hot Start, Demilitarized Zone, and Receiver Protection Profile requirements into the MCEU baseline. ***FY 2020 Plans:*** N/A ***FY 2021 Plans:*** Complete Operational Test and Evaluation (OT&E), performance assessment and contract closeout 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			
Accomplishments/Planned Programs Subtotals	0.000	0.000	10.777

D. 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 III: *GPS III*	69.386	31.466	-	-	-	-	-	-	-	0.000	100.852
• SPSF 01 Line Item GPS III: *GPS III*	-	-	20.122	-	20.122	21.302	19.312	7.868	1.883	15.314	85.801
• 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	0.000	181.620

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force	Date: February 2020
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D. 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

Remarks

E. Acquisition Strategy

The GPS III next generation space segment (SV 01-10) rapidly and affordably responds to warfighter capability requirements. The acquisition approach utilizes a disciplined systems engineering approach which focuses on mitigating cost and schedule risk through a lower-risk incremental delivery of mature technologies. This approach focuses on mission success and on-time delivery. The GPS III SVs will have GPS IIF capabilities plus up to a 3x-8x increase in anti-jam signal power, 3x improved accuracy, 3+ year increased design life, a new international civil (L1C) signal compatible with the European Galileo system, and a satellite bus capable of supporting future SV capability additions.

RDT&E funding for SVs 11 and 12 is in PE 1203269F and PE 1203269SF, Project GPS IIIF. Procurement funding for SVs 13-32 is captured in PE 1203269F and PE 1203269SF, Project GPS IIIF.

The AF is using its research laboratories to mature an On-Orbit Reprogrammable Digital Waveform Generator (ORDWG) which provide signal flexibility to change the signal form while the satellite is on-orbit. This effort is funded with AFRL's S&T funding and PE 1203265F, to increase the number of alternate navigation payloads and inform future PNT architectures.

On 21 Jan 2017, PEO Space approved the Acquisition Strategy for the MCEU program. The MCEU acquisition strategy enables the GPS Enterprise to provide core M-Code capabilities to the warfighter prior to GPS OCX delivery. MCEU will also support the scheduled operational testing of MGUE. MCEU will update the GPS control segment software, AEP, to allow for command and control, processing, and integrity monitoring of the M-Code signal. MCEU acquires this capability by using the existing GPS III prime contract vehicle to modify the operational AEP software.

The Air Force approved reinstatement of a previously deferred Key Support Area (KSA) on 10 Feb 2016. The MSTIC receivers currently under development will get a software upgrade to process M-Code data. This $7.96M project to procure the M-MSTIC receivers was funded through both O&M and SPAF funds in FY 2016-FY 2018. Performance monitoring, integration, and test will be conducted by the MCEU program and sustained under the Global Positioning Operations Support and Sustainment Division contract with Lockheed Martin.

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 1203265SF / *GPS III Space Segment*	Project (Number/Name) 67A019 / *GPS III*	

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 III Engineering Support	C/CPIF	Lockheed Martin : Denver, CO	-	-		-		1.900	Dec 2020	-		1.900	17.251	19.151	-
GPS III SV01-02 On Orbit Incentive Fee	C/CPIF	Lockheed Martin : Denver, CO	-	-		-		1.500	Jan 2021	-		1.500	0.000	1.500	-
GPS III Development_MCEU	C/CPIF	Lockheed Martin : Denver, CO	-	-		-		2.520	Dec 2020	-		2.520	0.000	2.520	-
GPS III Technical Mission Analysis	MIPR	Various : Various	-	-		-		1.365	Dec 2020	-		1.365	1.095	2.460	-
GPS III Enterprise SE&I	C/CPAF	TASC : El Segundo, CA	-	-		-		0.214	Oct 2020	-		0.214	0.000	0.214	-
GPS III Launch Support	RO	45th : Cape Canaveral, FL	-	-		-		2.000	Mar 2021	-		2.000	0.000	2.000	-
		Subtotal	-	-		-		9.499		-		9.499	18.346	27.845	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 III FFRDC	MIPR	Various : El Segundo, CA	-	-		-		0.600	Apr 2021	-		0.600	0.512	1.112	-
GPS III A&AS	Various	Various : Various	-	-		-		0.573	Apr 2021	-		0.573	0.875	1.448	-
GPS III Other Support	Various	Various : Various	-	-		-		0.105	Oct 2020	-		0.105	0.265	0.370	-
		Subtotal	-	-		-		1.278		-		1.278	1.652	2.930	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		10.777		-		10.777	19.998	30.775	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 1203265SF / *GPS III Space Segment*	**Project (Number/Name)** 67A019 / *GPS III*

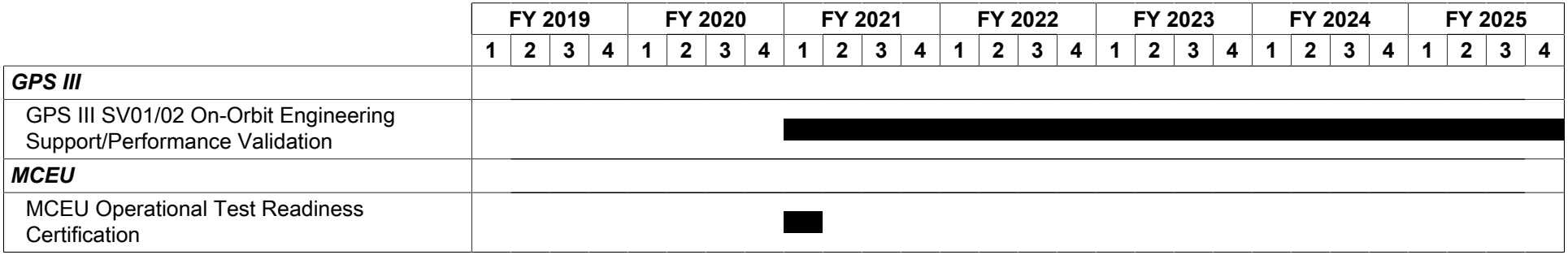

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1203265SF / *GPS III Space Segment*	**Project (Number/Name)** 67A019 / *GPS III*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
GPS III				
GPS III SV01/02 On-Orbit Engineering Support/Performance Validation	1	2021	4	2025
MCEU				
MCEU Operational Test Readiness Certification	1	2021	1	2021

Note

GPS III SV 02 was launched on 22 August 2019

GPS III SV01/SV02 will perform on-going on-orbit engineering support and performance validation through FY 2025

MCEU schedule milestones adjusted to match approved Acquisition Program Baseline threshold dates