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Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Air Force **Date:** April 2022

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 7: Operational Systems Development</i>	R-1 Program Element (Number/Name) PE 1203265SF / <i>GPS III Space Segment</i>
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COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
Total Program Element	0.000	10.398	7.207	1.626	0.000	1.626	0.000	0.000	0.000	0.000	0.000	19.231
67A019: <i>GPS III</i>	0.000	10.398	7.207	1.626	0.000	1.626	0.000	0.000	0.000	0.000	0.000	19.231
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Program MDAP/MAIS Code: 292

A. Mission Description and Budget Item Justification

The Global Positioning System (GPS) is a space-based navigation system that fills validated Joint Service requirements for worldwide, accurate, common grid three dimensional positioning/navigation for military aircraft, ships, and ground personnel. The consistent accuracy, unaffected by location or weather and available in real time, significantly improves effectiveness of reconnaissance, weapons delivery, mine countermeasures and rapid deployment for all services. GPS must comply with Title 10 United States Code (USC) Sec. 2281, which requires that the Secretary of Defense 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.

The system is composed of three programs: User Equipment (funded under Program Element (PE) 1203164F, 1203164SF), Space (funded under PE 1203165F, 1203265F, 1203265SF, 1203269F, and 1203269SF), and a Control Network (funded under PE 1206423F, 1206423SF and 1203165F). The satellites broadcast high accuracy data using precisely synchronized signals that are received and processed by user equipment installed in military platforms. The user equipment computes the platform position and velocity and provides steering vectors to target locations or navigation waypoints. The control segment provides daily updates to the navigation messages broadcast from the satellites to maintain system precision in three dimensions to 16 meters (spherical error probable) worldwide. Additionally, GPS supports the United States Nuclear Detonation Detection System mission and provides strategic and tactical support to the following Department of Defense missions: Joint Operations by providing capabilities for Positioning, Navigation, and Timing (PNT); Command, Control, Communications, and Intelligence; Special Operations; Military Operations in Urban Terrain; Defense-Wide Mission Support; Air Mobility; and Space Launch Orbital Support.

GPS III is the next generation Space Vehicles (SV) supporting the GPS constellation and is funded in PE 1203265SF. GPS III SVs deliver significant enhancements over legacy satellites, including a new international civil (L1C) Galileo-compatible signal, and enhanced anti-jam power. GPS III SVs 06-10 are in the Production and Deployment Phase.

The GPS III program funds 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 as a bridge capability to fly GPS III SVs until the delivery of the Next Generation Operational Control System (OCX) program.

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<p>Mission Readiness Campaign 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.</p> <p>GPS supports the early deployment of Global Military-Code (M-Code) to meet a Congressional mandate limiting user equipment purchases 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 Military GPS User Equipment (MGUE) testing, and allows for early M-Code operations. M-Code provides greater security to protect navigation and timing in electronically contested environments.</p> <p>Impacts of the M-Code deployment include:</p> <ul style="list-style-type: none">-Compliance with U.S. Space Command Commander's mandate to provide global monitoring necessary for early M-Code operational use and verification of navigation warfare effects.-Improved resiliency of the GPS capability.-Confirmation that PNT 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. <p>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.</p> <p>This program encompasses GPS III (SVs 01-10) and MCEU.</p> <p>Space acquisition must respond with speed and agility to emerging adversary threats. Space Systems Command (SSC) has transformed 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, SSC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose capabilities.</p> <p>This program may include necessary civilian pay expenses required to manage, execute, and deliver GPS III weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 1206392SF and 1206398SF.</p> <p>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.</p>		

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B. Program Change Summary (\$ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Previous President's Budget	10.777	7.207	0.000	0.000	0.000
Current President's Budget	10.398	7.207	1.626	0.000	1.626
Total Adjustments	-0.379	0.000	1.626	0.000	1.626
• 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	-0.379	0.000			
• Other Adjustments	0.000	0.000	1.626	0.000	1.626

Change Summary Explanation

The FY 2022 President's Budget submittal did not reflect FY 2023 through FY 2026 funding. Therefore, an explanation of the change between the two budget positions for FY 2023 cannot be made in a relevant manner.

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
Title: GPS III SVs 01-02	7.093	7.207	1.626
Description: Development, test, and evaluation of GPS III SVs 01-02 and associated simulators, on-orbit engineering, engineering studies and analyses, trade studies, system development, test and evaluation efforts, and integrated logistics support products.			
FY 2022 Plans: Continue support activities that include product development through life testing, technical mission analysis, information assurance, technical support, system engineering, mission operations, support of test assets, maintenance of network equipment and mission planning tools, and contract closeout activities. Continue program office and other related support activities that may include, but are not limited to studies, technical analysis, prototyping, etc.			
FY 2023 Plans: Finish SV01/02 On-Orbit Engineering and Performance Validation. Complete final development, test and contract closeout activities. Additionally, FY 2023 funding will allow the program to 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 2022 to FY 2023 Increase/Decrease Statement:			

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C. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
FY 2023 decreased due to the ramping down of activities associated with final development, test, and initiation of contract close out.			
Title: Architecture Evolution Plan (AEP) M-Code Monitoring	3.305	0.000	0.000
Description: The MCEU program initiative covers the development costs associated with updating the legacy control segment software, AEP, with additional capabilities needed to provide M-Code operations. MCEU provides the Combined Space Operations Center with command and control, processing, and integrity monitoring for the M-Code signal. The development also includes 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 Y-Code receivers. MCEU adds 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 2022 Plans: N/A			
FY 2023 Plans: N/A			
FY 2022 to FY 2023 Increase/Decrease Statement: N/A			
Accomplishments/Planned Programs Subtotals	10.398	7.207	1.626

D. Other Program Funding Summary (\$ in Millions)											
<u>Line Item</u>	<u>FY 2021</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2023</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>FY 2025</u>	<u>FY 2026</u>	<u>FY 2027</u>	<u>Cost To</u>	<u>Total Cost</u>
			<u>Base</u>	<u>OCO</u>	<u>Total</u>					<u>Complete</u>	
• SPSF 01 GPSIII: <i>GPS III Space Segment</i>	24.146	84.452	103.340	-	103.340	122.753	76.037	50.443	2.831	0.000	464.002

Remarks

E. Acquisition Strategy
The GPS III next generation space segment (SVs 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

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<p>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.</p> <p>On January 21, 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 supports the scheduled operational testing of MGUE. MCEU updated 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 February 10, 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-Code 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.</p>		

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2023 Air Force **Date:** April 2022

Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1203265SF / GPS III Space Segment	Project (Number/Name) 67A019 / GPS III
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Product Development (\$ in Millions)				FY 2021		FY 2022		FY 2023 Base		FY 2023 OCO		FY 2023 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
GPS III Development	C/CPIF	Lockheed Martin : Denver, CO	0.000	1.245	Dec 2020	0.504	Apr 2022	0.832	Dec 2022	-		0.832	0.000	2.581	-
GPS III SV01-02 On Orbit Incentive Fee	C/CPIF	Lockheed Martin : Denver, CO	0.000	0.547	Apr 2021	-		-		-		-	0.000	0.547	-
GPS III Technical Mission Analysis	Various	Various : Various	0.000	0.756	Mar 2021	0.898	Apr 2022	0.518		-		0.518	0.000	2.172	-
GPS III Enterprise SE&I	C/CPAF	TASC : El Segundo, CA	0.000	0.927	May 2021	0.444	Mar 2023	0.182	Oct 2022	-		0.182	0.000	1.553	-
GPS III Launch Support	RO	45th : Cape Canaveral, FL	0.000	1.475	May 2021	3.765	Apr 2022	-		-		-	0.000	5.240	-
MCEU Development	C/CPIF	Lockheed Martin : Denver, CO	0.000	3.305	Jun 2021	-		-		-		-	0.000	3.305	-
Subtotal			0.000	8.255		5.611		1.532		-		1.532	0.000	15.398	N/A

Management Services (\$ in Millions)				FY 2021		FY 2022		FY 2023 Base		FY 2023 OCO		FY 2023 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
GPS III FFRDC	RO	Aerospace : El Segundo, CA	0.000	1.044	Mar 2021	0.735	Apr 2022	-		-		-	0.000	1.779	-
GPS III A&AS	Various	Various : Various	0.000	1.099	Aug 2021	0.861	Jan 2022	0.094	Dec 2022	-		0.094	0.000	2.054	-
GPS III Other Support	Various	Various : Various	0.000	0.000	Oct 2020	0.000	Oct 2021	-		-		-	0.000	0.000	-
Subtotal			0.000	2.143		1.596		0.094		-		0.094	0.000	3.833	N/A

	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	Cost To Complete	Total Cost	Target Value of Contract	
Project Cost Totals		0.000	10.398	7.207	1.626	-	1.626	0.000	19.231	N/A

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2023 Air Force **Date:** April 2022

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	FY 2021				FY 2022				FY 2023				FY 2024				FY 2025				FY 2026				FY 2027			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4

GPS III	
GPS III SV01/02 On-Orbit Engineering Support/Performance Validation	
MCEU	
MCEU Operational Test Readiness Certification	

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Exhibit R-4A, RDT&E Schedule Details: PB 2023 Air Force **Date:** April 2022

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Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>GPS III</i>				
GPS III SV01/02 On-Orbit Engineering Support/Performance Validation	1	2021	4	2023
<i>MCEU</i>				
MCEU Operational Test Readiness Certification	1	2021	1	2021