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

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 5: System Development & Demonstration (SDD)</i>	R-1 Program Element (Number/Name) PE 1203269SF / <i>GPS III Follow-On (GPS IIIIF)</i>
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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	263.496	0.000	263.496	267.542	294.706	286.279	177.074	1,182.166	2,471.263
653170: <i>GPS IIIIF</i>	0.000	0.000	0.000	263.496	0.000	263.496	267.542	294.706	286.279	177.074	1,182.166	2,471.263
Quantity of RDT&E Articles	-	2	-	-	-	-	-	-	-	-	-	-

Program MDAP/MAIS Code: 590

A. Mission Description and Budget Item Justification

In FY 2021, PE 1203269F, GPS III Follow-On (GPS IIIIF) efforts were transferred to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE 1203269SF, GPS III Follow-On (GPS IIIIF) from Appropriation 3600, Budget Activity 05 due to the creation of a new Appropriation for Space Force.

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 segments: User Equipment (funded under Program Element (PE) 1203164F), Space (funded under PE 1203265F, 1203165F, and 1203269F), and a Control Network (funded under PE 1206423F 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 (NUDET) Detection System (USNDS) mission and provides strategic and tactical support to the following Department of Defense (DoD) missions: Joint Operations by providing capabilities for Positioning, Navigation, and Timing (PNT); Command, Control, Communications, and Intelligence (C3I); Special Operations; Military Operations in Urban Terrain (MOUT); Defense-Wide Mission Support (DWMS); Air Mobility; and Space Launch Orbital Support.

GPS IIIIF delivers GPS III satellites beyond the first ten Space Vehicles (SVs) being delivered by the GPS III program (funded in PE 1203265F GPS III Space Segment). The GPS IIIIF satellites maintain the same capabilities as the GPS III satellites, but also delivers significant enhancements to include: potential on-ramping of advanced PNT technology from efforts such as NTS-3, backward compatibility, unified S-Band (USB) interface compliance, integration of hosted payloads including a redesigned USNDS payload, Laser Retro-reflector Arrays (LRAs), Search and Rescue/GPS (SAR/GPS), Energetic Charged Particles (ECP) sensor, and Regional Military Protection (RMP) capabilities that provide the ability to deliver high-power regional Military Code (M-Code) signals in specific areas of intended effect. Implementation of RMP into the GPS Enterprise requires integration with the ground and user segments, executed by the GPS Next Generation Operational Control System (OCX), along with the Military GPS User Equipment (MGUE) programs, respectively. The SAR/GPS payload provided by Canada fills a validated National Search and Rescue Committee requirement to provide enduring, space-based distress alerting capability to detect, locate, and relay distress alerts to fulfill its responsibilities under international

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agreements for Search and Rescue. LRA, built by the Naval Research Lab (NRL), is a passive reflector that improves accuracy and provides better ephemeris data. National Geospatial-Intelligence Agency (NGA) funds the integration costs of the LRA.

This PE funds the Research, Development, Test, and Evaluation (RDT&E) of GPS IIIIF SVs 11-12 (to include Non-Recurring Engineering (NRE) support efforts). This program includes risk-reducing simulators and systems engineering associated with delivering the new capabilities required of GPS IIIIF satellites.

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.

The FY 2021 funding request was reduced by \$15.835 million to account for the availability of prior year execution balances

This PE may include necessary civilian pay expenses required to manage, execute, and deliver GPS IIIIF Space Segment 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 5, System Development and Demonstration (SDD) because it has passed Milestone B approval and is conducting engineering and manufacturing development tasks aimed at meeting validated requirements prior to full rate production.

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	263.496	0.000	263.496
Total Adjustments	0.000	0.000	263.496	0.000	263.496
• 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	263.496	0.000	263.496

Change Summary Explanation

FY 2021: +\$263.496M; funds starting in FY 2021 were transferred from RDT&E, Air Force to RDT&E, Space Force.

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C. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
<p>Title: GPS III Follow-On (GPS IIIIF) Development</p> <p>Description: The program utilizes RDT&E funds to develop and deliver SVs 11-12, conduct the NRE of developing risk-reducing simulators, developing support test equipment, and conducting the systems engineering associated with delivering the new capabilities required of GPS IIIIF including backward compatibility, dual band Telemetry, Tracking, and Control (TT&C), integration of Government Furnished Equipment (GFE) hosted payloads, and RMP, which delivers high power regional M-Code signals in specific areas of intended effect.</p> <p>FY 2020 Plans: N/A</p> <p>FY 2021 Plans: Continue development and NRE efforts to simultaneously support three satellites (SV11, SV12, & GNST+) in preparation for the start of system integration and the final build and checkout of two software simulators (GSS). Efforts include hardware purchases of long lead items. 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.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: N/A</p>	0.000	0.000	263.496
Accomplishments/Planned Programs Subtotals	0.000	0.000	263.496

D. Other Program Funding Summary (\$ in Millions)	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 GPS03C: <i>GPSIII Follow On</i>	-	394.625	-	-	-	-	-	-	-	0.000	394.625
• SPSF 01 GPS03C: <i>GPSIII Follow On</i>	-	-	627.796	-	627.796	634.821	640.782	920.657	750.853	3,230.317	6,805.226
• RDTE 07 1203265F: <i>GPS III Space Segment</i>	72.096	42.440	-	-	-	-	-	-	-	0.000	114.536
• RDTE 07 1203265SF: <i>GPS III Space Segment</i>	-	-	10.777	-	10.777	7.296	1.598	3.382	7.722	0.000	65.493
• SPAF 01 GPSIII: <i>GPS III Space Segment</i>	69.386	31.466	-	-	-	-	-	-	-	0.000	100.852

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D. Other Program Funding Summary (\$ in Millions)

<u>Line Item</u>	<u>FY 2019</u>	<u>FY 2020</u>	<u>FY 2021</u> <u>Base</u>	<u>FY 2021</u> <u>OCO</u>	<u>FY 2021</u> <u>Total</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>FY 2025</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
• SPSF 01 GPSIII: <i>GPS III Space Segment</i>	-	-	20.122	-	20.122	21.302	19.312	7.868	1.883	15.196	85.683

Remarks

E. Acquisition Strategy

In December 2017, Principal Deputy Office of the Assistant Secretary of the Air Force (Acquisition & Logistics) declared the GPS IIIIF program a new start beginning in FY 2019 and, consistent with the Fiscal Year 2016 National Defense Authorization Act (NDAA), the program was categorized as an Acquisition Category (ACAT) (1B) Major Defense Acquisition Program (MDAP) with the Service Acquisition Executive (SAE) serving as the Milestone Decision Authority (MDA). During this time, the MDA approved the second phase of the two-phased GPS III Follow-On acquisition strategy. Executed using funds in PE 1203265F, GPS III Space Segment, the Phase 1 Production Readiness Feasibility Assessments conducted during FY 2016-2017 provided data and insight into contractors' GPS satellite production designs with emphasis on a mature navigation payload and production-ready designs. Phase 1 results affirmed the viability of a competitive approach for Phase 2. The Phase 2 strategy directed the Air Force to conduct a full-and-open competition for GPS IIIIF space vehicles and specified the use of RDT&E funds to deliver SVs 11-12 and conduct associated NRE. In addition to SVs 11-12, the RDT&E effort will be comprised of developing risk-reducing simulators, support test equipment, and conducting the systems engineering associated with delivering the new capabilities required of GPS IIIIF. The Air Force awarded the contract to Lockheed Martin in September 2018 and began the 1-year CDR campaign in March 2019. Completion of CDR is scheduled for March 2020 followed by Milestone C in Q3FY20. Upon Milestone C approval, the Space Force will procure SV 13+ via annual contract options exercised Space Procurement, Air Force (SPAF) and Space Procurement, Space Force (SPSF) funds consistent with full-funding policy under an annual buy approach.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Air Force												Date: February 2020				
Appropriation/Budget Activity				R-1 Program Element (Number/Name)				Project (Number/Name)								
3620F / 5				PE 1203269SF / GPS III Follow-On (GPS IIIIF)				653170 / GPS IIIIF								
Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total				
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract	
GPS IIIIF Development	C/FPIF	Lockheed Martin : Littleton, CO	-	-		-		222.799	Dec 2020	-		222.799	1,533.756	1,756.555	-	
GPS IIIIF Technical Mission Analysis	MIPR	Various : Various	-	-		-		12.071	Dec 2020	-		12.071	136.679	148.750	-	
GPS IIIIF Enterprise SE&I	C/CPAF	SAIC : El Segundo, CA	-	-		-		8.882	Dec 2020	-		8.882	157.248	166.130	-	
Subtotal			-	-		-		243.752		-		243.752	1,827.683	2,071.435	N/A	
Test and Evaluation (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total				
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract	
GPS IIIIF Test and Evaluation	Various	Various : Various	0.000	-		-		2.235	Mar 2021	-		2.235	22.932	25.167	-	
Subtotal			0.000	-		-		2.235		-		2.235	22.932	25.167	N/A	
Management Services (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total				
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract	
GPS IIIIF FFRDC	MIPR	Aerospace Corp : El Segundo, CA	-	-		-		4.024	Dec 2020	-		4.024	65.272	69.296	-	
GPS IIIIF A&AS	Various	Various : El Segundo, CA	-	-		-		13.085	Dec 2020	-		13.085	286.680	299.765	-	
GPS IIIIF Other Support	Various	Various : El Segundo, CA	-	-		-		0.400	Oct 2020	-		0.400	5.200	5.600	-	
Subtotal			-	-		-		17.509		-		17.509	357.152	374.661	N/A	
Project Cost Totals			0.000	-		0.000		263.496		-		263.496	2,207.767	2,471.263	N/A	

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F / 5	R-1 Program Element (Number/Name) PE 1203269SF / GPS III Follow-On (GPS IIIIF)	Project (Number/Name) 653170 / GPS IIIIF
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	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
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Remarks
 FINANCIAL PERFORMANCE: GPS IIIIF is evaluated against traditional Research and Development (R&D) program expenditure benchmarks. However, unlike many traditional R&D programs, the GPS IIIIF R&D and Production phases fall under a Fixed Price Incentive Firm Target (FPIF) contract type with progress payments. Mandatory funding obligations and progress payment withholds will cause the program to lag traditional expenditure benchmarks, painting an inaccurate portrait of overall program health.

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Exhibit R-4A, RDT&E Schedule Details: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F / 5	R-1 Program Element (Number/Name) PE 1203269SF / <i>GPS III Follow-On (GPS IIIIF)</i>	Project (Number/Name) 653170 / <i>GPS IIIIF</i>

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
GPS IIIIF				
GSS 1 & 2 Subsystem Procurement & Build	1	2021	3	2021
GSS 1 & 2 Hardware Available	2	2021	3	2021
GSS 1&2 Integration	3	2021	1	2024
GSS 1&2 Delivered	2	2024	2	2024
GNST+ Subsystem Procurement & Build	1	2021	2	2022
GNST+ Integration	3	2022	4	2023
SV11 Subsystem Procurement & Build	1	2021	3	2022
SV11 System Integration & Test	4	2022	4	2025
SV12 Subsystem Procurement & Build	1	2021	2	2023
SV12 System Integration & Test	3	2023	4	2025