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Exhibit R-2, RDT&E Budget Item Justification: PB 2025 Air Force **Date:** March 2024

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 1206433SF / <i>Wideband Global SATCOM (SPACE)</i>
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COST (\$ in Millions)	Prior Years	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
Total Program Element	-	46.618	49.445	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
657107: <i>WGS Space Systems Resiliency Upgrade</i>	-	46.618	49.445	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Wideband Global SATCOM (WGS) System provides the Department of Defense (DoD) with high data rate military satellite communication (MILSATCOM) services in accordance with the Joint Space Management Board-approved MILSATCOM architecture (August 1996), the Joint Requirements Oversight Council (JROC)-approved MILSATCOM Capstone Requirements Document (October 1997), and JROC-approved WGS Operational Requirements Document (May 2000). Dual-frequency WGS satellites augment, then replace the DoD's Defense Satellite Communications System X-band service and augment one-way Global Broadcast Service Ka-band capabilities. In addition, WGS provides a high capacity two-way Ka-band Service. This program was originally conceived to augment the near-term "bandwidth gap" in warfighter communications needs but it remains to be the DoD's primary wideband system. WGS has 10 operational legacy satellites and WGS-11 and WGS-12 (WGS-11 & 12) are in development as the first modern digital payloads using commercial technologies providing more coverage beams than their existing WGS predecessors combined and delivering twice the operational capacity than previous WGS analog satellites. Funding for this effort supports the advanced capabilities for WGS-11 & 12 under development for launch in FY 2025 and FY 2027, respectively. Project 657107, WGS Space Systems Resiliency Upgrade, is for WGS Beam Optimization & Operational Management (WGS-BOOM) enhancements to maximize efficiency/warfighter use of the additional number of beams provided by WGS-11 & 12 by improving the functionality of the legacy WGS ground systems to rapidly change the planned coverage scheme.

The 10 operational legacy WGS satellites on-orbit were each developed by building on heritage WGS capabilities. Continually improving WGS capability and leveraging advances in Boeing commercial technology, in FY 2018 the DoD has procured a more advanced single WGS-11 satellite (previously referenced as WGS-11+ to designate meeting the Congressional intent of two satellites, herein referenced as WGS-11 with the new Congressional add of WGS-12) enhancing support to the US military, DoD, and allied nations with more flexibility and mission capacity to support dispersed users than previous WGS spacecraft. The new capabilities allow operators to create unique coverage anywhere within the satellite's field of view and custom designed for the mission at hand. In FY 2024, the DoD will procure a WGS-12, an expected clone of the WGS-11 spacecraft with the Protected Tactical SATCOM (PTS) as a hosted payload. WGS-12 will be added to the WGS Block II Follow On (B2FO) contract and is supported by current work on WGS-BOOM enhancements. The advanced beam management capabilities of WGS-11 & 12 payloads will produce more coverage beams (over 1500) than the entire existing WGS constellation and deliver twice the mission capacity than WGS-10 can, thereby operationally increase the availability of military-grade communications.

The objective of the WGS-BOOM effort is for the development, integration, and test of advanced beam management to enhance WGS-11 & 12 baseline beam management tools in support of rapid planning and control. This effort will develop and deploy capabilities across the WGS enterprise to provide WGS-11 & 12 management and control (M&C) ground enhancements with responsive end-to-end mission planning, protection, and terminal synchronized capabilities. WGS BOOM development includes upgrades to the WGS-11 & 12 payload control system, Global SATCOM Configuration Control Element (GSCCE), to decrease operational

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timelines to be able to better track and support airborne ISR missions as they move through the theater. Additionally, a Power Control Management Subsystem (PCMS) will be developed to provide superior situational awareness of user resource usage as well as automated configuration capability to restore users. Finally, a classified version of the WGS planning system, Common Network Planning Software (CNPS), will be developed to act as an automated source of truth for classified missions, which would reduce resource planning timelines. Funding the engineering and development for enhanced element M&C will provide greater routing complexity and mission planning flexibility to support 80 times more X and Ka-band spot beams on WGS-11 & 12 than on WGS 1-10 spacecraft. This funding will be used to develop and integrate WGS-11 & 12 advanced beam management capabilities & power control capabilities facilitating contested and mobile operations on tactically relevant timescales. Updated WGS-11 & 12 M&C interfaces will improve planning data responsiveness through access to automated equipment configuration registries and enable WGS-11 & 12 integration into the broader DoD SATCOM Enterprise. External WGS-11 & 12 interfaces may be leveraged to support planning, situational awareness, power control, and real time equipment orchestration.

WGS Block I consists of satellites 1-3, Block II consists of satellites 4-6 and B2FO currently includes satellites 7-10 and plans to add WGS 11 & 12 in FY 2023. WGS satellites 1-10 have been funded, procured and launched in previous budget cycles. With the operation of WGS-5, the constellation provided global coverage and Full Operational Capability (FOC) was declared on 12 May 2014.

In the Consolidated Appropriations Act, FY 2018, Congress added \$600M Space Force Procurement in FY 2018 for "full funding for WGS-11 and WGS-12." A sole source Request for Proposal was released to Boeing in June 2018. A final decision was made to procure a single satellite (once designated as WGS-11+ but will herein forward be referenced as WGS-11) with twice the operational capacity of WGS-10 as the best approach to delivering the directed additional WGS capacity in a cost-effective manner. WGS-11 will host a PTS payload providing robust anti-jam capability to tactical warfighters, funded by the PTS program in PE 1206761SF.

In the Consolidated Defense Appropriations Act, FY 2023, Congress added \$442M Space Force Procurement in FY 2023 for "Protected Wideband Satellite" to procure a protected wideband satellite providing resilient, jam resistant tactical communications to support warfighter needs. The United States Space Force (USSF) has interpreted the Congressional add is intended to procure a WGS-12 satellite equipped with the tactical anti-jam capabilities delivered with WGS-11 with the PTS hosted payload. The funding is expected to cover costs for a WGS-12 spacecraft clone of the WGS-11 to include a PTS hosted payload. The current B2FO Acquisition Program Baseline (APB) allows for procurement of a WGS-12 and the acquisition is planned to be a Firm Fixed Price effort with integration of PTS in FY 2026 and launch in FY 2027. The Congressional add does not include funding for ground, launch and operation/maintenance activities. USSF is pursuing a mix of USSF and International Partner (IP) sources to cover additional funding required by FY 2025 for launch vehicle, ground and other Government costs.

IPs receive constellation-wide WGS resources commensurate with their financial contributions to the WGS system. Investment from IPs to cooperatively enhance the system started in November 2007 through a bilateral Memorandum of Understanding (MOU) with Australia to fund WGS space vehicle (SV)-6, launch and launch services. Five countries (Canada, Denmark, Netherlands, Luxembourg, New Zealand) signed a new multilateral WGS MOU in CY 2012 and funded the procurement of WGS SV-9. In CY 2017, Amendment One to the WGS MOU leveraged additional funding for resiliency enhancements from two new IPs (Czech Republic and Norway). There is an International Agreement via the State Department regarding IP collaboration with WGS-11. In May 2022, nine countries signed Amendment Two to the multilateral MOU (adds Belgium and United Kingdom) to cover necessary ground upgrades and launch costs for WGS-11 was not covered by the FY 2018 Congressional add, and extends the duration of the WGS MOU, as amended, through September 2039. Space Systems Command (SSC) provides program

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management, integration, and engineering expertise through FY 2026. Discussions for potential future partnerships regarding the WGS program continue in support of National Space Policy and improved operational efficiency.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver WGS-11 & 12 for 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.

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 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total
Previous President's Budget	48.288	49.445	0.000	0.000	0.000
Current President's Budget	46.618	49.445	0.000	0.000	0.000
Total Adjustments	-1.670	0.000	0.000	0.000	0.000
• 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	-1.670	0.000			
• Other Adjustments	0.000	0.000	0.000	0.000	0.000

Change Summary Explanation

FY 2023 change from previous to current President's Budget is due to SBIR/STTR Transfer

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2023	FY 2024	FY 2025
Title: WGS Beam Optimization & Operational Management (BOOM) Planning Development, Systems Integration, and Test	2.675	7.240	0.000
Description: Develop and integrate WGS-11 & 12 advanced beam management capabilities driving improved warfighter ability to rapidly re-plan WGS-11 & 12 expanded coverage. Mature technical baseline and interface requirements for BOOM. Perform as the Government systems integrator through acquiring, designing, testing, and integrating the three key BOOM development segments and external interfaces with WGS. Support, configure, and conduct integrated testing of GSCCE, CNPS, and PCMS BOOM development efforts. Manage the MILSATCOM system architecture, refine interface requirements, and validate concept of operations through integrated system performance demonstrations. Leverage external WGS-11 & 12 interfaces to test and support planning, situational awareness, power control, and real time equipment orchestration.			

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C. Accomplishments/Planned Programs (\$ in Millions)		FY 2023	FY 2024	FY 2025
<p>FY 2024 Plans: Continue plans to support the mission planning, integration and test of the three key BOOM development efforts (GSCCE, CNPS, and PCMS) and beam management products within the DoD SATCOM Enterprise, to including software specifications to program shaped beams supporting MILSATCOM service topologies. Provide GSCCE & PCMS support in preparation for a parallel on-orbit checkout during WGS-11 on-orbit checkout in FY 2025. Manage interface requirements to externally managed enhancements, such as Enterprise Management & Configuration (EM&C) and SATCOM Ordering, Management, and Situational Awareness Tools (SOMSAT). Activities may include, but are not limited to: program office support, studies, technical analysis, experimentation, prototyping, etc.</p> <p>FY 2025 Plans: N/A</p> <p>FY 2024 to FY 2025 Increase/Decrease Statement: FY 2025 decreased due to completion of the BOOM effort.</p>				
<p>Title: WGS-BOOM Development - Global SATCOM Configuration Control Element (GSCCE)</p> <p>Description: WGS-BOOM-GSCCE is one of three BOOM development efforts to best improve the beam management panning ability for WGS-11 & 12 missions. GSCCE is an existing ground system with Boeing that performs payload commanding at all five of the Wideband SATCOM Operations Centers (WSOCs). WGS-BOOM-GSCCE development upgrade will reduce commanding/commit time due to increased commanding pace as a result of additional users/beams on WGS-11 & 12. This will result in the ability to rapidly plan WGS-11 & 12 missions.</p> <p>FY 2024 Plans: Continue efforts to provide automation functions for payload planning/control in support of WGS-11 & 12. Continue to leverage existing GSSCE contract that commands and establishes WGS payload for operations, for development upgrades. Continue the design and development phase with the focus on advanced beam management and ensuring mobile operations with tactically relevant timelines. Refactor GSCCE payload plan commit time, improve WSOC handover times, and improve other GSCCE functionality for faster commanding of beam repoints supporting user movement in theater. Prepare for parallel verification testing during WGS-11 on-orbit checkout in FY 2025. Implement risk mitigations, such as modifying legacy code or introducing new code and processes into a legacy system and ensure compatibility. Procure GSCCE licenses and infrastructure to address the WGS-11 baseline obsolescence gap during the WGS-11 transition period. Ensure interfaces like CNPS and WSTARS are compatible with new GSCCE capability. Activities may include, but are not limited to program office support, studies, technical analysis, experimentation, prototyping, etc.</p> <p>FY 2025 Plans:</p>		25.459	0.000	0.000

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C. Accomplishments/Planned Programs (\$ in Millions)		FY 2023	FY 2024	FY 2025
N/A				
FY 2024 to FY 2025 Increase/Decrease Statement: FY 2025 decreased due to completion of the BOOM effort.				
Title: WGS-BOOM Development - Consolidated Network Planning System (CNPS)		0.000	10.000	0.000
Description: CNPS is an existing ground system with Northrup Grumman Corporation (NGC) that performs WGS payload planning, allocating users to beams, at all five WSOCs and also at the Regional SATCOM Support Centers (RSSCs). WGS-BOOM-GSCCE is one of three BOOM development efforts to best improve the ability to rapidly plan WGS-11 & 12 missions. WGS-BOOM-CNPS development will upgrade CNPS planning in a higher classification and enable automated mission checks of redacted mission information, eliminating current manual processes for users at different classification levels.				
FY 2024 Plans: Complete acquisition for PCMS enhancement and award contract from an open competition to commence PCMS design and development phase. Support power control and management interface capability with terminals to implement automated configuration, control and monitoring for rapid re-planning. PCMS will enhance elements along both the mission planning and then mission execution timelines along with early indication of issues to support continuation or restoral of services. Document interface requirements for terminals to be compatible with PCMS. Preparation activities to prepare for a parallel verification testing during WGS-11 on orbit checkout in FY 2025. Activities may include, but are not limited to program office support, studies, technical analysis, experimentation, prototyping, etc.				
FY 2025 Plans: N/A				
FY 2024 to FY 2025 Increase/Decrease Statement: FY 2025 decreased due to completion of the BOOM effort.				
Title: WGS-BOOM Development - Power Control Management Subsystem (PCMS)		18.484	32.205	0.000
Description: WGS-BOOM-PCMS is one of three BOOM development efforts to best improve the ability to rapidly plan WGS-11 & 12 missions. PCMS will establish machine-to-machine connection to terminals to provide automated RF configuration management when problems are indicated and rapid restoral of services to begin before operators identify a discrepancy.				
FY 2024 Plans: Complete acquisition for PCMS enhancement and award contract from an open competition to commence PCMS design and development phase. Support power control and management interface capability with terminals to implement automated configuration, control and monitoring for rapid re-planning. PCMS will enhance elements along both the mission planning and then				

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Appropriation/Budget Activity 3620F: Research, Development, Test & Evaluation, Space Force I BA 5: System Development & Demonstration (SDD)	R-1 Program Element (Number/Name) PE 1206433SF / Wideband Global SATCOM (SPACE)
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C. Accomplishments/Planned Programs (\$ in Millions)	FY 2023	FY 2024	FY 2025
mission execution timelines along with early indication of issues to support continuation or restoral of services. Document interface requirements for terminals to be compatible with PCMS. Preparation activities to prepare for a parallel verification testing during WGS-11+ on orbit checkout in FY 2025. Activities may include, but are not limited to: program office support, studies, technical analysis, experimentation, prototyping, etc. FY 2025 Plans: N/A FY 2024 to FY 2025 Increase/Decrease Statement: FY 2025 decreased due to completion of the BOOM effort.			
Accomplishments/Planned Programs Subtotals	46.618	49.445	0.000

D. Other Program Funding Summary (\$ in Millions)											
<u>Line Item</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>FY 2025</u> <u>Base</u>	<u>FY 2025</u> <u>OCO</u>	<u>FY 2025</u> <u>Total</u>	<u>FY 2026</u>	<u>FY 2027</u>	<u>FY 2028</u>	<u>FY 2029</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
• SPSF 01 GAP000: <i>Wideband Gapfiller Satellites (Space)</i>	463.982	-	10.000	-	10.000	-	-	-	-	0.000	473.982

Remarks

E. Acquisition Strategy
 WGS-BOOM development strategy strives to provide WGS enterprise enhancements efficiently using existing designs with reduced non-recurring engineering by leveraging, where possible, existing contracts and government relationships. To maximize resourced efforts and meet the speed of need, this strategy to initiate BOOM development enhancements relies heavily on work already being performed by the USSF and U.S Army to support WGS-11 launch in FY 2025 and WGS-12 launch in FY 2027. Award modifications to the existing Firm-Fixed Price (FFP) contracts for GSCCE and CNPS BOOM enhancements to Boeing in FY 2023 (USSF contract) and Northrup Grumman Corporation (NGC) (USA contract) in FY 2024, respectively, to leverage existing USA contracts with each respective Prime contractor for ongoing baseline GSCCE and CNPS system upgrades needed to add WGS-11 & 12 to the WGS constellation. The PCMS enhancement was competitively awarded in November 2023 (FY 2024).

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2025 Air Force												Date: March 2024			
Appropriation/Budget Activity				R-1 Program Element (Number/Name)				Project (Number/Name)							
3620F / 5				PE 1206433SF / Wideband Global SATC OM (SPACE)				657107 / WGS Space Systems Resiliency Upgrade							
Product Development (\$ in Millions)				FY 2023		FY 2024		FY 2025 Base		FY 2025 OCO		FY 2025 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
WGS-BOOM Planning Development, Systems Integration and Test	Various	Various : Various	-	1.938	Apr 2023	2.223	Jan 2024	-		-		-	0.000	4.161	-
WGS-BOOM - GSCCE	SS/FFP	Boeing : El Segundo, CA	-	25.459	Sep 2023	-		-		-		-	0.000	25.459	-
WGS-BOOM - CNPS	SS/FFP	NGC : Orlando, FL	-	-		10.000	Mar 2024	-		-		-	0.000	10.000	-
WGS-BOOM - PCMS	C/TBD	TBD : TBD	-	18.484	Nov 2023	32.000	Jan 2024	-		-		-	0.000	50.484	-
SBIR/STTR	Allot	Various : TBD	-	-		1.731	Mar 2024	-		-		-	0.000	1.731	-
Technical Mission Analysis	RO	Aerospace : El Segundo, CA	-	-		0.865	Jan 2024	-		-		-	0.000	0.865	-
SE&I	C/FP	Linquest : El Segundo, CA	-	-		0.820	Jan 2024	-		-		-	0.000	0.820	-
Subtotal			-	45.881		47.639		-		-		-	0.000	93.520	N/A
Management Services (\$ in Millions)				FY 2023		FY 2024		FY 2025 Base		FY 2025 OCO		FY 2025 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
A&AS	Various	Various : Various	-	0.737	Apr 2023	1.756	Nov 2023	-		-		-	0.000	2.493	-
Other Support	Various	Various : Various	-	-		0.050	Jan 2024	-		-		-	0.000	0.050	-
Subtotal			-	0.737		1.806		-		-		-	0.000	2.543	N/A
Project Cost Totals			-	46.618		49.445		-		-		-	0.000	96.063	N/A
Remarks															
BOOM-GSCCE \$23M fully funded in FY23 will support FY24 efforts. BOOM-PCMS \$18M partially funded in FY23															

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Exhibit R-4, RDT&E Schedule Profile: PB 2025 Air Force		Date: March 2024
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	FY 2023				FY 2024				FY 2025				FY 2026				FY 2027				FY 2028				FY 2029			
	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
WGS-11 & 12 Beam Planning Development																												
Management/System Integration/Test																												
WGS-BOOM-GSCCE																												
Design / Development																												
I&T / Fielding																												
WGS-BOOM-PCMS																												
Design / Development																												
I&T / Fielding																												
WGS-BOOM-CNPS																												
Design / Development																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2025 Air Force		Date: March 2024
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Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
WGS-11 & 12 Beam Planning Development				
Management/System Integration/Test	2	2023	4	2024
WGS-BOOM-GSCCE				
Design / Development	2	2023	2	2024
I&T / Fielding	2	2024	4	2024
WGS-BOOM-PCMS				
Design / Development	2	2023	2	2024
I&T / Fielding	2	2024	4	2024
WGS-BOOM-CNPS				
Design / Development	4	2023	4	2024

Note

Funding ends in FY 2024. GSCCE and PCMS schedule events continue efforts begun in FY 2023, included in WGS-11+Beam Planning Development funding/schedule line items in FY 2023.