Exhibit R-2, RDT&E Budget Item Justification: PB 2025 Air Force											Date: March 2024	
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force* / BA 7: *Operational Systems Development*					R-1 Program Element (Number/Name) PE 1203109SF / *Narrowband Satellite Communications*							
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	110.493	103.855	230.785	228.435	0.000	228.435	449.286	672.402	706.163	647.965	Continuing	Continuing
673109: *SATCOM MUOS*	110.493	103.855	230.785	228.435	0.000	228.435	449.286	672.402	706.163	647.965	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		
Program MDAP/MAIS Code: 345												

A. Mission Description and Budget Item Justification

Narrowband Satellite Communications provides a worldwide, multi-service population of mobile and fixed-site terminal users with Ultra High Frequency (UHF) Narrowband, beyond line of sight satellite communications (SATCOM). Mobile User Objective System (MUOS) significantly increases performance and capacity in support of critical Combatant Command SATCOM priorities. MUOS is the replacement system for the UHF Follow-on (UFO) system, which is currently beyond its design life.

MUOS is comprised of Space, Ground, and User Entry Segments. The Space Segment consists of five geosynchronous satellites to support a four satellite constellation over the intended service life. Each satellite provides a legacy UHF payload that is backward compatible with UFO, and a Wideband Code Division Multiple Access (WCDMA) payload that provides cellular-like capability. MUOS reached full operational capability in October 2019.

The Ground Segment consists of four world-wide Radio Access Facilities (RAFs) and two satellite control facilities. Each RAF includes three 60 ft. antennas and numerous equipment racks. The RAFs in Hawaii and Virginia each include a Switching Facility (SF), and the RAF in Hawaii includes a Network Management Facility (NMF). The User Entry Segment consists of the MUOS waveform that is ultimately integrated into MUOS-capable terminals which are fielded by the services. In addition to providing UHF SATCOM for the Department of Defense, the USSF has the overall responsibility to deliver the End-to-End (E2E) MUOS capability to the warfighter. This responsibility involves systems engineering, integration, network management, and test management of all MUOS system-of-system components.

A Department of Defense Chief Information Officer assessment of anticipated narrowband satellite communication availability led to the Office of Under Secretary of Defense (OUSD) Acquisitions & Sustainment recommendation and OUSD Cost Assessment and Program Evaluation (CAPE) direction to initiate MUOS Service Life Extension (SLE) to acquire and launch two additional MUOS satellites (without legacy payloads). MUOS SLE is projected to extend worldwide WCDMA constellation availability to at least FY 2035 and the supporting ground segment service life to at least FY 2040.

This PE funds systems optimization and modernization to address the dynamic, worldwide electromagnetic and cybersecurity environment in which MUOS operates and MUOS SLE. The PE includes a MUOS Baseline effort, and a MUOS SLE effort. Cost to complete is "Continuing" in the cost table, as the USSF is in the process to determine the cost estimate for this post Milestone C program.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver the MUOS system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 1206392SF and 1206398SF.

Exhibit R-2, RDT&E Budget Item Justification: PB 2025 Air Force	Date: March 2024
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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 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total
Previous President's Budget	110.142	230.785	435.486	0.000	435.486
Current President's Budget	103.855	230.785	228.435	0.000	228.435
Total Adjustments	-6.287	0.000	-207.051	0.000	-207.051
• 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	-2.525	0.000			
• SBIR/STTR Transfer	-3.762	0.000			
• Other Adjustments	0.000	0.000	-207.051	0.000	-207.051

Change Summary Explanation

FY 2023: -2.525M; Reprogramming for STP BTR
FY 2025: -76.700M; Adjustment to align with Non-Advocate Cost Assessment (NACA)
FY 2025: -2.600M; Re-alignment to 3022 Procurement, Space Force, Space Procurement P-1 Line MUOS00/Mobile User Objective System to align with NACA
FY 2025: -94.651M; Re-alignment to higher Space Force priorities
FY 2025: -33.100M; Funding request reduction to account for the availability of prior year execution balances

C. Accomplishments/Planned Programs ($ in Millions)	FY 2023	FY 2024	FY 2025
Title: Mobile User Objective System (MUOS) Baseline Upgrade	53.525	43.110	30.434
Description: System optimization and modernization to address the dynamic, worldwide electromagnetic and cybersecurity environment in which MUOS operates. ***FY 2024 Plans:*** Continue system optimization, cybersecurity updates, and electro-magnetic interference (EMI) mitigation efforts to ensure capacity is available to the end user, including the development and fielding of EMI mitigation solutions and inclination control and eclipse contingency studies for the space segment. Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Continue E2E MUOS usability enhancements including terminal certification, integration, and test. Continue to investigate and begin development of alternatives to mitigate Legacy UHF communications			

Exhibit R-2, RDT&E Budget Item Justification: PB 2025 Air Force	Date: March 2024
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 1203109SF *I Narrowband Satellite Communications*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2023	FY 2024	FY 2025
shortfalls. Activities may include, but are not limited to studies, technical analysis, experimentation, and interoperability and integration efforts with other DoD systems. ***FY 2025 Plans:*** Award follow-on ground segment sustainment and modernization contract. Continue systems engineering, system optimization, cybersecurity updates, and EMI mitigation efforts to ensure capacity is available to the end user, including the development and fielding of EMI mitigation solutions and inclination control and eclipse contingency studies for the space segment. Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Continue E2E MUOS usability enhancements including terminal certification, integration, and test. Continue development of alternative Integrated Broadcast Service (IBS) solution to mitigate Legacy UHF communications shortfalls and integration and interoperability efforts with other DoD and commercial systems. ***FY 2024 to FY 2025 Increase/Decrease Statement:*** FY 2025 decreased due to ramp down of baseline Ground segment updates as equipment will be replaced/modernized under SLE.			
Title: Mobile User Objective System (MUOS) Service Life Extension (SLE) ***Description:*** MUOS SLE to acquire and launch two additional MUOS satellites without legacy payloads and modernize the ground segment to extend service life from 2030 to 2040. ***FY 2024 Plans:*** Continue systems engineering to support space, ground, and waveform segments. Continue satellite design and risk reduction activities for up to two vendors. Activities include spacecraft design, interface control document development, and preparing and conducting systems requirements and tailored design reviews. Initiate ground system modernization across all four radio access facilities, with associated laboratory equipment and associated program office support, through migration to an extensible digital processing architecture. Ground activities include interface testing & verification, and architecture updates. 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 2025 Plans:*** Complete satellite early design and risk reduction activities for up to two vendors. Activities include spacecraft design, interface control document development, and preparing and conducting systems requirements and tailored design reviews. Continue ground system modernization across all four radio access facilities, with associated laboratory equipment and associated program office support, through migration to an extensible digital processing architecture. Ground activities include interface testing & verification, and architecture updates. Additional activities may include, but are not limited to program office support, Narrowband	50.330	187.675	198.001

Exhibit R-2, RDT&E Budget Item Justification: PB 2025 Air Force	Date: March 2024
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C. Accomplishments/Planned Programs ($ in Millions)	FY 2023	FY 2024	FY 2025
Analysis of Alternatives (AoA) follow-on studies, technical analysis, experimentation, prototyping, and activities that may leverage commercial and international opportunities. ***FY 2024 to FY 2025 Increase/Decrease Statement:*** FY 2025 increased due to ramp up of modernization work required to ensure the Ground Segment will be ready prior to the launch of MUOS SV6.			
Accomplishments/Planned Programs Subtotals	103.855	230.785	228.435

D. Other Program Funding Summary ($ in Millions)

Line Item	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
• SPSF 01 BA01 MUOS00: *Mobile User Objective System*	46.833	101.147	51.601	-	51.601	49.962	51.209	52.290	53.343	0.000	406.385

Remarks

E. Acquisition Strategy

Space Force will use existing MUOS requirements when developing two operationally- similar Service Life Extension (SLE) satellites. On 14 Apr 2022 the program competitively awarded technical and trade studies contracts to three vendors to inform program plans and understanding of required engineering design changes and potential trades. The Service Acquisition Executive approved the program's acquisition strategy on 14 Sep 2022 as a Major Capability Acquisition pathway, post-Milestone C program, and the program is executing to plan. The approved acquisition strategy includes an early FY 2024 competitive award to two vendors for MUOS SVs 6 and 7 design and risk reduction activities and the competitive award for the final design and production contract to one vendor in FY 2026. Service Acquisition Executive approved the Justification and Approval for a follow-on sole source integrated ground contract with General Dynamics Missions Systems. The ground modernization activities will be performed on the existing MUOS Ground contract until efforts transition to the follow-on contract in FY 2025.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2025 Air Force		Date: March 2024
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1203109SF / *Narrowband Satellite Communications*	**Project (Number/Name)** 673109 / *SATCOM MUOS*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2023 Cost	FY 2023 Award Date	FY 2024 Cost	FY 2024 Award Date	FY 2025 Base Cost	FY 2025 Base Award Date	FY 2025 OCO Cost	FY 2025 OCO Award Date	FY 2025 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
SLE Ground Engineering Contract	SS/ Various	General Dynamics : Scottsdale, AZ	7.842	16.643	Nov 2022	43.382	Nov 2023	-		-		-	0.000	67.867	-
SLE Ground Engineering Follow-on Contract	SS/ Various	General Dynamics : Scottsdale, AZ	0.000	-		-		138.781	Nov 2024	-		138.781	Continuing	Continuing	-
SLE Technical and Trade Studies	C/FP	Various : Various	13.273	-		-		-		-		-	0.000	13.273	-
SLE Crypto Replacement Plans and Interfaces	MIPR	NSA : Fort Meade, MD	0.553	-		-		-		-		-	0.000	0.553	-
SLE Satellite Design and Risk Reduction Activities	C/FP	TBD : TBD	0.000	23.000	Aug 2023	109.000	Nov 2023	15.300	Dec 2024	-		15.300	0.000	147.300	-
SLE Technical Mission Analysis	RO	Aerospace : El Segundo, CA	0.000	1.335	Oct 2022	2.968	Nov 2023	3.515	Nov 2024	-		3.515	Continuing	Continuing	-
Baseline Ground Engineering Contracts	SS/ Various	Various : Various	65.685	30.000	Nov 2022	35.841	Nov 2023	24.340	Nov 2024	-		24.340	Continuing	Continuing	-
Baseline Space Engineering Contract	SS/ Various	Lockheed Martin : Sunnyvale, CA	0.000	4.403	Nov 2022	0.970	Nov 2023	3.000	Nov 2024	-		3.000	Continuing	Continuing	-
Baseline Electromagnetic Interference	SS/TBD	Adaptive Dynamics Inc : San Diego, CA	4.284	0.600	Nov 2022	0.800	Nov 2023	-		-		-	0.000	5.684	-
L-Band Communications	C/FFP	CesiumAstro : Austin, TX	3.000	-		-		-		-		-	0.000	3.000	-
Baseline SBIR/STTR	Various	Not specified. : TBD	0.000	-		3.228		1.096	Apr 2025	-		1.096	Continuing	Continuing	-
SLE SBIR/STTR	Various	Not specified. : TBD	0.000	-		4.817		6.953	Apr 2025	-		6.953	Continuing	Continuing	-
Narrowband Analysis of Alternatives (AoA)	TBD	Various : Various	5.970	-		-		-		-		-	0.000	5.970	-
Follow-on AoA Studies	TBD	TBD : TBD	0.000	-		-		5.000	Nov 2024	-		5.000	0.000	5.000	-
		Subtotal	100.607	75.981		201.006		197.985		-		197.985	Continuing	Continuing	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2025 Air Force		Date: March 2024
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Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2023 Cost	FY 2023 Award Date	FY 2024 Cost	FY 2024 Award Date	FY 2025 Base Cost	FY 2025 Base Award Date	FY 2025 OCO Cost	FY 2025 OCO Award Date	FY 2025 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
SLE FFRDC	RO	Aerospace : El Segundo, CA	3.252	3.200	Oct 2022	4.988	Oct 2023	3.389	Oct 2024	-		3.389	Continuing	Continuing	-
SLE A&AS	C/CPFF	Various : Various	4.207	14.591	Mar 2023	15.854	Nov 2023	17.360	Nov 2024	-		17.360	Continuing	Continuing	-
SLE Other Support	Various	Various : Various	0.752	4.671	Oct 2022	6.666	Oct 2023	7.703	Oct 2024	-		7.703	Continuing	Continuing	-
Baseline A&AS	C/CPFF	Various : Various	0.693	1.297	Mar 2023	1.548	Nov 2023	0.933	Nov 2024	-		0.933	Continuing	Continuing	-
Baseline Other Support	Various	Not specified. : TBD	0.982	4.115	Oct 2022	0.723	Oct 2023	1.065	Nov 2024	-		1.065	Continuing	Continuing	-
		Subtotal	9.886	27.874		29.779		30.450		-		30.450	Continuing	Continuing	N/A

	Prior Years	FY 2023 Cost	FY 2023 Award Date	FY 2024 Cost	FY 2024 Award Date	FY 2025 Base Cost	FY 2025 Base Award Date	FY 2025 OCO Cost	FY 2025 OCO Award Date	FY 2025 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	110.493	103.855		230.785		228.435		-		228.435	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2025 Air Force		Date: March 2024
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1203109SF / *Narrowband Satellite Communications*	**Project (Number/Name)** 673109 / *SATCOM MUOS*

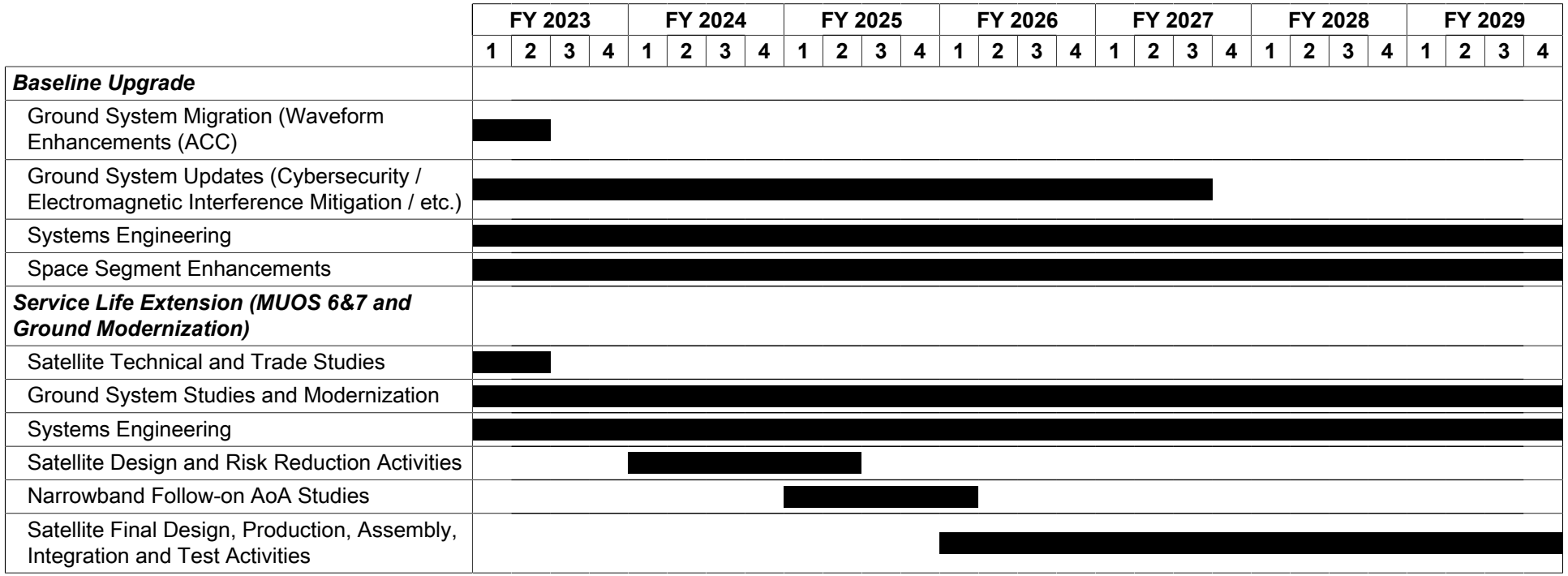

Exhibit R-4A, RDT&E Schedule Details: PB 2025 Air Force		Date: March 2024
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1203109SF / *Narrowband Satellite Communications*	**Project (Number/Name)** 673109 / *SATCOM MUOS*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Baseline Upgrade				
Ground System Migration (Waveform Enhancements (ACC)	1	2023	2	2023
Ground System Updates (Cybersecurity / Electromagnetic Interference Mitigation / etc.)	1	2023	3	2027
Systems Engineering	1	2023	4	2029
Space Segment Enhancements	1	2023	4	2029
Service Life Extension (MUOS 6&7 and Ground Modernization)				
Satellite Technical and Trade Studies	1	2023	2	2023
Ground System Studies and Modernization	1	2023	4	2029
Systems Engineering	1	2023	4	2029
Satellite Design and Risk Reduction Activities	1	2024	2	2025
Narrowband Follow-on AoA Studies	1	2025	1	2026
Satellite Final Design, Production, Assembly, Integration and Test Activities	1	2026	4	2029