Selected Acquisition Report (SAR)

RCS: DD-A&T(Q&A)823-345

Mobile User Objective System (MUOS)

As of FY 2019 President's Budget

Defense Acquisition Management
Information Retrieval
(DAMIR)

Table of Contents

Sensitivity Originator

No originator info Available at this time.

Common Acronyms and Abbreviations for MDAP Programs

Acq O&M - Acquisition-Related Operations and Maintenance
ACAT - Acquisition Category
ADM - Acquisition Decision Memorandum
APB - Acquisition Program Baseline
APPN - Appropriation
APUC - Average Procurement Unit Cost
$B - Billions of Dollars
BA - Budget Authority/Budget Activity
Blk - Block
BY - Base Year
CAPE - Cost Assessment and Program Evaluation
CARD - Cost Analysis Requirements Description
CDD - Capability Development Document
CLIN - Contract Line Item Number
CPD - Capability Production Document
CY - Calendar Year
DAB - Defense Acquisition Board
DAE - Defense Acquisition Executive
DAMIR - Defense Acquisition Management Information Retrieval
DoD - Department of Defense
DSN - Defense Switched Network
EMD - Engineering and Manufacturing Development
EVM - Earned Value Management
FOC - Full Operational Capability
FMS - Foreign Military Sales
FRP - Full Rate Production
FY - Fiscal Year
FYDP - Future Years Defense Program
ICE - Independent Cost Estimate
IOC - Initial Operational Capability
Inc - Increment
JROC - Joint Requirements Oversight Council
$K - Thousands of Dollars
KPP - Key Performance Parameter
LRIP - Low Rate Initial Production
$M - Millions of Dollars
MDA - Milestone Decision Authority
MDAP - Major Defense Acquisition Program
MILCON - Military Construction
N/A - Not Applicable
O&M - Operations and Maintenance
ORD - Operational Requirements Document
OSD - Office of the Secretary of Defense
O&S - Operating and Support
PAUC - Program Acquisition Unit Cost

PB - President's Budget
PE - Program Element
PEO - Program Executive Officer
PM - Program Manager
POE - Program Office Estimate
RDT&E - Research, Development, Test, and Evaluation
SAR - Selected Acquisition Report
SCP - Service Cost Position
TBD - To Be Determined
TY - Then Year
UCR - Unit Cost Reporting
U.S. - United States
USD(AT&L) - Under Secretary of Defense (Acquisition, Technology and Logistics)

Program Information

Program Name
Mobile User Objective System (MUOS)

DoD Component
Navy

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Date Assigned: September 1, 2017

References

SAR Baseline (Production Estimate)

Defense Acquisition Executive (DAE) Approved Acquisition Program Baseline (APB) dated March 15, 2008

Approved APB

Component Acquisition Executive (CAE) Approved Acquisition Program Baseline (APB) dated October 3, 2017

Mission and Description

The Mobile User Objective System (MUOS) is a narrowband Military Satellite Communications (MILSATCOM) system that supports a worldwide, multi-Service population of mobile and fixed-site terminal users in the Ultra High Frequency (UHF) band, providing increased communications capabilities to smaller terminal users while still supporting interoperability to legacy terminals.

MUOS adapts a commercial third generation Wideband Code Division Multiple Access (WCDMA) cellular phone network architecture and combines it with geosynchronous satellites (in place of cell towers) to provide a new and more capable UHF MILSATCOM system. The constellation of four operational satellites and ground network control will provide greater than ten times the system capacity of the current UHF Follow-On (UFO) constellation.

MUOS includes the satellite constellation, a ground control and network management system, and a new waveform for user terminals. The space segment is comprised of a constellation of four geosynchronous satellites, plus one on-orbit spare. The ground system includes the ground transport, network management, satellite control, and associated infrastructure to both fly the satellites and manage the users' communications. MUOS is designed to support users that require greater mobility, higher data rates, and improved operational availability. The new waveform is termed the MUOS Common Air Interface (CAI), a Software Communications Architecture compliant modulation technique for the Joint Tactical Radio System terminals.

The flow of information between users when MUOS is operational will be much different than today's systems. Users will communicate with the satellite via UHF WCDMA links and the satellites will relay this to one of four interconnected ground sites located in Wahiawa (Hawaii), Chesapeake (Virginia), Niscemi (Italy), and Geraldton (Australia) via a Ka-band feeder link. These facilities identify the destination of the communications, and route the information to the appropriate ground site for Ka-band uplink to the satellite and UHF WCDMA downlink to the correct users. A network management facility, located at Wahiawa, will feature a government-controlled, priority-based resource management capability that will be adaptable and responsive to changing operational communications requirements. Additionally, MUOS will provide access to select Defense Information System Network services, providing a voice and data capability that has not been available to UHF MILSATCOM users on prior systems. For satellite telemetry, tracking, and commanding, MUOS will use existing control centers operated by the Naval Satellite Operations Center Headquarters at Point Mugu, California, and their detachment at Schriever Air Force Base, Colorado Springs, Colorado.

When MUOS is fielded, it will serve a mixed terminal population. Some users will have terminals only able to support the legacy waveforms while other users will have newer terminals able to support the MUOS CAI. Each MUOS satellite carries a legacy payload similar to that flown on UFO-11. These legacy payloads will continue to support legacy terminals, allowing for a more gradual transition to the MUOS WCDMA waveform.

Executive Summary

This is the final SAR submission for the MUOS program. Pursuant to section 2432 of title 10, U.S. Code, this is the final SAR submission for MUOS because the program is more than 90% expended and 100% delivered.

The Director, Operational Test and Evaluation (DOT&E) MUOS Multi-Service Operational Test and Evaluation-2 (MOT&E-2) report (dated June 20, 2016) evaluated MUOS as not operationally effective and not operationally suitable. Overall Wideband Code Division Multiple Access (WCDMA) call performance was assessed as very good, but deficiencies were identified in WCDMA network management and ground system stability and maturity. The program office is working with the operational stakeholder and test community to address the MOT&E findings. The program has a detailed plan of action that addresses MOT&E findings. The plan includes intermediate test points to determine readiness for Follow-on Operational Test and Evaluation (FOT&E) in FY 2019.

On October 3, 2017, the Assistant Secretary of the Navy for Research, Development and Acquisition approved an updated APB that updated the FOC threshold to April 2020, updated the cost estimate, and reduced satellite quantities from six to five.

The program is estimated to meet performance thresholds with the exception of Constellation Availability of 70% over the required length of service (i.e., FOC + 10 years = estimated 2030). Four of five satellites will be beyond their 15-year design life by 2030. The constellation may not meet its full mission requirement due to age and current health of the on-orbit assets. The program office is implementing enhancements to extend the service life of the constellation and working within the Department on options to satisfy Ultra High Frequency (UHF) satellite communications (SATCOM) capability. Additional funding to be provided in FY 2019 supports the UHF Narrowband SATCOM Analysis of Alternatives.

With the final acceptance of the MUOS-5 satellite on October 11, 2017, the MUOS constellation is complete and the MUOS prime contract is 100% delivered. The MUOS prime contract was reported as more than 90% complete in the December 2016 SAR. The legacy capability is fully operational. The WCDMA capability is available to U.S. Strategic Command (USSTRATCOM) for early combatant command use and is expected to be fully operational in FY 2020 following FOT&E. USSTRATCOM accepted the MUOS legacy payloads for standard combatant command use in February 2018.

The network management and ground system stability issues identified by DOT&E are being addressed during incremental software updates as part of the ground sustainment.

There are no significant software-related issues with this program at this time.

Threshold Breaches

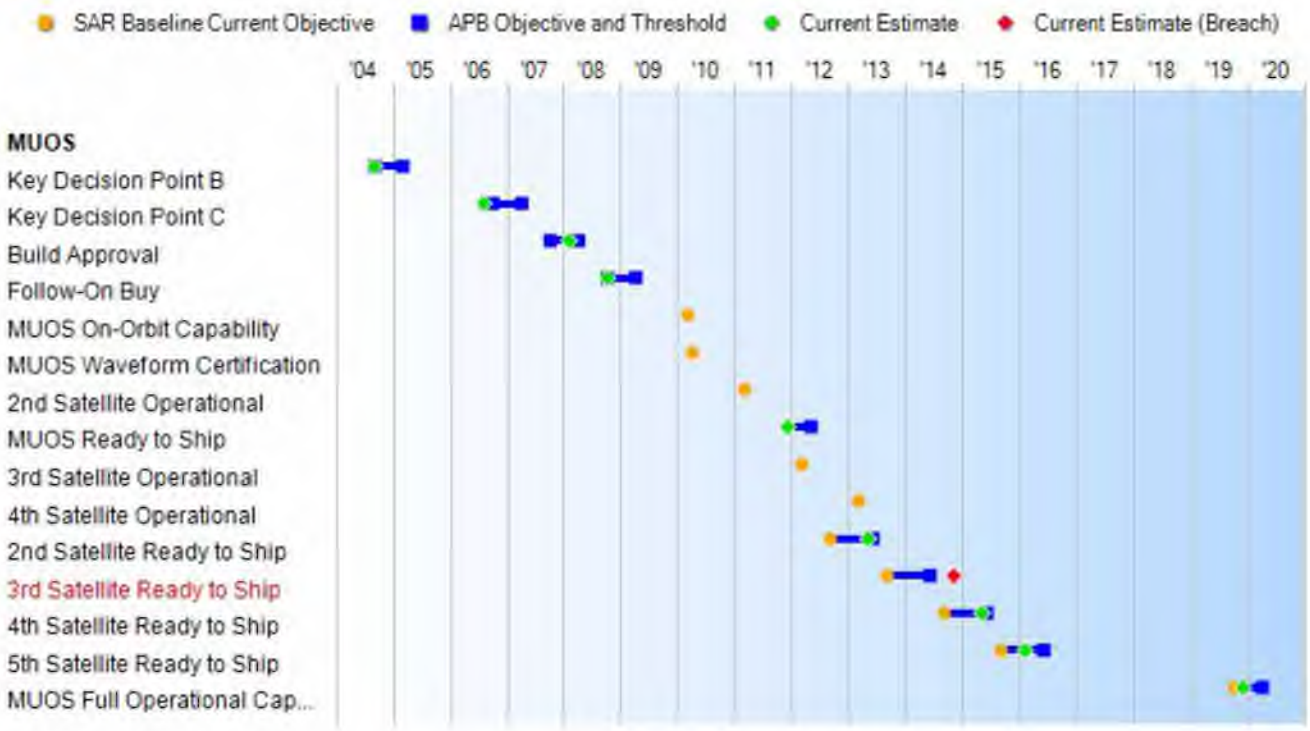
APB Breaches		
Schedule		☑
Performance		☐
Cost	RDT&E	☐
	Procurement	☐
	MILCON	☐
	Acq O&M	☐
O&S Cost		☐
Unit Cost	PAUC	☐
	APUC	☐

Nunn-McCurdy Breaches		
Current UCR Baseline		
	PAUC	None
	APUC	None
Original UCR Baseline		
	PAUC	None
	APUC	None

Explanation of Breach

The schedule breach to the 3rd Satellite Ready to Ship milestone was previously reported in the December 2013 SAR. The milestone was met when the satellite was shipped in November 2014 and subsequently launched in January 2015.

Schedule


SAR Baseline Current Objective
APB Objective and Threshold
Current Estimate
Current Estimate (Breach)
'04
'05
'06
'07
'08
'09
'10
'11
'12
'13
'14
'15
'16
'17
'18
'19
'20
MUOS
Key Decision Point B
Key Decision Point C
Build Approval
Follow-On Buy
MUOS On-Orbit Capability
MUOS Waveform Certification
2nd Satellite Operational
MUOS Ready to Ship
3rd Satellite Operational
4th Satellite Operational
2nd Satellite Ready to Ship
3rd Satellite Ready to Ship
4th Satellite Ready to Ship
5th Satellite Ready to Ship
MUOS Full Operational Cap...

Schedule Events					
Events	SAR Baseline Production Estimate	Current APB Production Objective/Threshold		Current Estimate	
Key Decision Point B	Sep 2004	Sep 2004	Mar 2005	Sep 2004	
Key Decision Point C	Oct 2006	Oct 2006	Apr 2007	Aug 2006	
Build Approval	Oct 2007	Oct 2007	Apr 2008	Feb 2008	
Follow-On Buy	Oct 2008	Oct 2008	Apr 2009	Oct 2008	
MUOS On-Orbit Capability	Mar 2010	N/A	N/A	N/A	
MUOS Waveform Certification	Apr 2010	N/A	N/A	N/A	
2nd Satellite Operational	Mar 2011	N/A	N/A	N/A	
MUOS Ready to Ship	N/A	Dec 2011	May 2012	Dec 2011	
3rd Satellite Operational	Mar 2012	N/A	N/A	N/A	
4th Satellite Operational	Mar 2013	N/A	N/A	N/A	
2nd Satellite Ready to Ship	N/A	Sep 2012	Jun 2013	May 2013	
3rd Satellite Ready to Ship	N/A	Sep 2013	Jun 2014	**Nov 2014**[†]	
4th Satellite Ready to Ship	N/A	Sep 2014	Jun 2015	May 2015	
5th Satellite Ready to Ship	N/A	Sep 2015	Jun 2016	Feb 2016	
MUOS Full Operational Capability	Mar 2014	Oct 2019	Apr 2020	Dec 2019	(Ch-1)

[†] *APB Breach*

Change Explanations

(Ch-1) The Current Estimate for the milestone "MUOS Full Operational Capability" changed from April 2020 to December 2019 and reflects the PM's estimate to meet the milestone.

Performance

Performance Characteristics					
SAR Baseline Production Estimate	**Current APB Production Objective/Threshold**		**Demonstrated Performance**	**Current Estimate**	
Coverage					
24 hours/day communications services at all latitudes and longitudes	24 hours/day communications services at all latitudes and longitudes	24 hours/day communications services from 65 degrees North to 65 degrees South latitude at all longitudes	Initially demonstrated via modeling and analysis (December 2011) that each MUOS satellite always has optical line of site to one MUOS Radio Access Facility and there is at least one MUOS satellite accessible from any point within the coverage area from 65 degrees North to 65 degrees South measured at every 0.1 degree increments of longitude over the worst case 24 hour orbital period. More recently, polar demonstrations showed available coverage above 65 degrees.	Communications services coverage from 65 degrees North to 65 degrees South latitude at all longitudes. Coverage above 65 degrees (North and South) at all longitudes is probable but not guaranteed 24 hours/day.	
Capacity					
300% worldwide simultaneous accesses (5,991 at 117.6 Mbps) associated with the CMTW scenario	300% worldwide simultaneous accesses (5,991 at 117.6 Mbps) associated with the CMTW scenario	1,997 worldwide simultaneous accesses (39.2 Mbps) with 502 simultaneous theater accesses (3 Mbps)	Demonstrated via analysis that threshold capacity requirement is met while simultaneously meeting all other service requirements, such as link availability	1,997 worldwide simultaneous accesses (39.2 Mbps) with 502 simultaneous theater accesses (3 Mbps)	
Access and Control					
Resources planned, allocated, prioritized, and dynamically configured or	Resources planned, allocated, prioritized, and dynamically configured or	Resources planned, allocated, prioritized, and dynamically configured or	Testing of the automated functionality for resource planning,	Configuration/ reconfiguration of all types of networks within	(Ch-1)

reconfigured in less than 5 minutes for all networks; and priority-based access is provided or the request is queued and feedback provided to the user within 3 seconds 90% of the time and 6 seconds 99% of the time	reconfigured in less than 5 minutes for all networks; and priority-based access is provided or the request is queued and feedback provided to the user within 3 seconds 90% of the time and 6 seconds 99% of the time	reconfigured within 15 minutes and for selected high priority networks within 5 minutes; and priority-based access is provided or the request is queued and feedback provided to the user within 6 seconds 90% of the time and 10 seconds 99% of the time	allocation and prioritization during the second Technical Evaluation (TECHEVAL-2) demonstrated a need for improved responsiveness and system status reporting. Network configuration/ reconfiguration was demonstrated via program office capabilities assessment to meet objective performance (September 2014). System access functionality was successfully demonstrated for point-to-point (P2P) and netted communications during TECHEVAL-2 with mixed results. System handling of priority-based access and queueing was demonstrated with nominal results in April 2017.	2.5 minutes. P2P/Point-to-network services meet the system access or queue and inform user within 6 seconds (90%) and 10 seconds (99%) requirement; Netted communications currently averages 10 seconds.
Net Ready				
Fully support execution of all operational activities identified in the applicable joint and system integrated architectures and the system must satisfy the technical requirements for Net-Centric military operations to include 1) DISR mandated GIG IT standards and profiles identified in the TV-1, 2) DISR mandated GIG KIPs	Fully support execution of all operational activities identified in the applicable joint and system integrated architectures and the system must satisfy the technical requirements for Net-Centric military operations to include 1) DISR mandated GIG IT standards and profiles identified in the TV-1, 2) DISR mandated GIG KIPs	Fully support execution of joint critical operational activities identified in the applicable joint and system integrated architectures and the system must satisfy the technical requirements for transition to Net-Centric military operations to include 1) DISR mandated GIG IT standards and profiles identified in the TV-1, 2) DISR	JITC Memorandum "Mobile User Objective System (MUOS) Net Ready Key Performance Parameter (NR KPP) Interim Status Letter" of May 2, 2013 summarized the interim evaluation of MUOS NR KPP compliance. For the final assessment, JITC has coordinated with the MUOS program	Fully support joint/critical operational activities identified in the applicable joint and system integrated architecture and Net Centric operations

identified in the KIP declaration table, 3) NCOW RM Enterprise Services 4) Information assurance requirements including availability, integrity, authentication, confidentiality, and nonrepudiation, and issuance of an ATO by the DAA, and 5) Operationally effective information exchanges; and mission critical performance and information assurance attributes, data correctness, data availability, and consistent data processing specified in the applicable joint and system integrated architecture views	identified in the KIP declaration table, 3) NCOW RM Enterprise Services 4) Information assurance requirements including availability, integrity, authentication, confidentiality, and nonrepudiation, and issuance of an ATO by the DAA, and 5) Operationally effective information exchanges; and mission critical performance and information assurance attributes, data correctness, data availability, and consistent data processing specified in the applicable joint and system integrated architecture views	mandated GIG KIPs identified in the KIP declaration table, 3) NCOW RM Enterprise Services 4) Information assurance requirements including availability, integrity, authentication, confidentiality, and nonrepudiation, and issuance of an IATO by the DAA, and 5) Operationally effective information exchanges; and mission critical performance and information assurance attributes, data correctness, data availability, and consistent data processing specified in the applicable joint and system integrated architecture views	office and Commander, Operational Test and Evaluation Force and will use Information Exchange performance data from both the MUOS TECHEVAL-2 and second Multi-service Operational Test and Evaluation events	
Types of Service				
Support synchronous and asynchronous broadcast, point-to-point, and netted communicat-ions topologies plus support an asymmetrical multicast communications topology	Threshold plus support an asymmetrical multicast communications topology	Support synchronous and asynchronous broadcast, point-to-point, and netted communications topologies	Demonstrated via Technical Evaluation that both voice and data are communicated via broadcast, P2P, and netted topologies with some suitability issues noted	Support synchronous and asynchronous broadcast, P2P, and netted communications topologies
Communications on the Move				
Support communications on the move when and where needed in all environments while engaged in combat operations	Support communications on the move when and where needed in all environments while engaged in combat operations	Support communications on the move when and where needed in all environments while engaged in combat operations	Demonstrated via analysis that service requirements can be met in all required environments based on expected user radio performance (May 2013). Testing during Technical Evaluation demonstrated	Communications in all environments.

			successful communications in the urban, forested, and clear environments available at the testing sites with a performance difference across the environments of less than 10%	
Availability				
Provide an operational link availability of at least 99% averaged over any year of operation and a constellation availability over the required length of service of at least 90%	Provide an operational link availability of at least 99% averaged over any year of operation and a constellation availability over the required length of service of at least 90%	Provide an operational link availability of at least 97% averaged over any year of operation and a constellation availability over the required length of service of at least 70%	Link availability was demonstrated via analysis and showed that all MUOS users (as defined by the capacity scenario) will have greater than 97% link availability averaged over a year (May 21, 2013). Constellation availability was demonstrated via analysis, with results showing that the probability of 4 operational satellites on orbit over the required length of service is 82%. Link Availability demonstration date is May 2013. Constellation Availability demonstration date is December 2016.	Link availability at least 97% (average/year). Constellation Availability is expected to fall below the 70% requirement in November 2027 as reported in the Functional Availability Report dated October 31, 2016.

Requirements Reference

CPD dated January 15, 2008

Change Explanations

(Ch-1) The Access and Control KPP's Demonstrated Performance and Current Estimate were updated for system handling from "to be demonstrated in 2017" to "was demonstrated in April 2017."

Acronyms and Abbreviations

ATO - Approval to Operate
CMTW - Combined Major Theater War
DAA - Designated Approval Authority
DISR - DOD Informational Technology Standards Region
GIG - Global Information Grid
IATO - Interim Approval to Operate
IT - Information Technology
JITC - Joint Interoperability Test Command
KIPs - Key Interface Profiles
Mbps - megabits per second
NCOW RM - Net-Centric Operations and Warfare Reference Model
NR - Net Ready
P2P - Point-to-Point
TECHEVAL-2 - Second MUOS Technical Evaluation
TV-1 - Technical View 1

Track to Budget

RDT&E

Appn	BA	PE
Navy 1319	07	0303109N

Project	Name	
2472	Mobile User Objective System (MUOS)	(Sunk)

Appn	BA	PE
Navy 1319	07	1203109N

Project	Name
2472	Mobile User Objective Sys (MUOS)

Procurement

Appn	BA	PE
Navy 1507	02	0303109N

Line Item	Name	
2433	Fleet Satellite Communications Follow-On	(Sunk)

MILCON

Appn	BA	PE
Navy 1205	01	0301376N

Project	Name		
P131	Facilities Restoration & Mod - Communication	(Shared)	(Sunk)

Acq O&M

Appn	BA	PE
Navy 1804	04	0303109N

Subactivity Group	Name		
4A6M	Servicewide Communications	(Shared)	(Sunk)

Cost and Funding

Cost Summary

Total Acquisition Cost							
Appropriation	BY 2004 $M			BY 2004 $M	TY $M		
	SAR Baseline Production Estimate	Current APB Production Objective/Threshold		Current Estimate	SAR Baseline Production Estimate	Current APB Production Objective	Current Estimate
RDT&E	3245.2	3654.8	4020.3	3643.6	3636.2	4121.1	4106.4
Procurement	2460.3	1694.8	1864.3	1695.2	3104.1	2010.8	2010.8
Flyaway	--	--	--	1513.5	--	--	1793.1
Recurring	--	--	--	1513.5	--	--	1793.1
Non Recurring	--	--	--	0.0	--	--	0.0
Support	--	--	--	181.7	--	--	217.7
Other Support	--	--	--	181.7	--	--	217.7
Initial Spares	--	--	--	0.0	--	--	0.0
MILCON	30.7	30.8	33.9	30.8	34.5	34.6	34.6
Acq O&M	32.7	24.4	26.8	24.4	35.8	25.9	25.9
Total	5768.9	5404.8	N/A	5394.0	6810.6	6192.4	6177.7

Cost Notes

The reduction in the Total Acquisition Cost is due to the removal of the sixth satellite and aligns to the October 3, 2017 APB.

In accordance with Section 842 of the National Defense Authorization Act for FY 2017, which amended title 10 U.S.C. § 2334, the Director of Cost Assessment and Program Evaluation, and the Secretary of the military department concerned or the head of the Defense Agency concerned, must issue guidance requiring a discussion of risk, the potential impacts of risk on program costs, and approaches to mitigate risk in cost estimates for MDAPs and major subprograms. The information required by the guidance is to be reported in each SAR. This guidance is not yet available; therefore, the information on cost risk is not contained in this SAR.

Total Quantity			
Quantity	SAR Baseline Production Estimate	Current APB Production	Current Estimate
RDT&E	2	2	2
Procurement	4	3	3
Total	6	5	5

Quantity Notes

The units of measure for the MUOS program consist of five satellites, five launch vehicles, the entire ground system, and the associated support.

On October 3, 2017, the Assistant Secretary of the Navy for Research, Development and Acquisition approved an updated APB that reduced satellite quantities from six to five.

Cost and Funding

Funding Summary

Appropriation Summary FY 2019 President's Budget / December 2017 SAR (TY$ M)									
Appropriation	Prior	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	To Complete	Total
RDT&E	3997.3	14.0	20.5	14.5	14.9	13.9	14.2	17.1	4106.4
Procurement	2010.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2010.8
MILCON	34.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	34.6
Acq O&M	25.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	25.9
PB 2019 Total	6068.6	14.0	20.5	14.5	14.9	13.9	14.2	17.1	6177.7
PB 2018 Total	6068.7	14.0	15.7	15.0	15.3	14.3	10.8	17.1	6170.9
Delta	-0.1	0.0	4.8	-0.5	-0.4	-0.4	3.4	0.0	6.8

Quantity Summary FY 2019 President's Budget / December 2017 SAR (TY$ M)										
Quantity	Undistributed	Prior	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	To Complete	Total
Development	2	0	0	0	0	0	0	0	0	2
Production	0	3	0	0	0	0	0	0	0	3
PB 2019 Total	2	3	0	0	0	0	0	0	0	5
PB 2018 Total	2	3	0	0	0	0	0	0	0	5
Delta	0	0	0	0	0	0	0	0	0	0

Cost and Funding

Annual Funding By Appropriation

Annual Funding 1319 | RDT&E | Research, Development, Test, and Evaluation, Navy							
Fiscal Year	Quantity	TY $M					
		End Item Recurring Flyaway	Non End Item Recurring Flyaway	Non Recurring Flyaway	Total Flyaway	Total Support	Total Program
2000	--	--	--	--	--	--	8.6
2001	--	--	--	--	--	--	27.1
2002	--	--	--	--	--	--	32.5
2003	--	--	--	--	--	--	67.0
2004	--	--	--	--	--	--	84.4
2005	--	--	--	--	--	--	375.2
2006	--	--	--	--	--	--	449.5
2007	--	--	--	--	--	--	637.2
2008	--	--	--	--	--	--	591.3
2009	--	--	--	--	--	--	497.0
2010	--	--	--	--	--	--	398.3
2011	--	--	--	--	--	--	391.4
2012	--	--	--	--	--	--	223.3
2013	--	--	--	--	--	--	141.2
2014	--	--	--	--	--	--	35.9
2015	--	--	--	--	--	--	11.6
2016	--	--	--	--	--	--	15.6
2017	--	--	--	--	--	--	10.2
2018	--	--	--	--	--	--	14.0
2019	--	--	--	--	--	--	20.5
2020	--	--	--	--	--	--	14.5
2021	--	--	--	--	--	--	14.9
2022	--	--	--	--	--	--	13.9
2023	--	--	--	--	--	--	14.2
2024	--	--	--	--	--	--	9.2
2025	--	--	--	--	--	--	7.9
Subtotal	2	--	--	--	--	--	4106.4

Annual Funding 1319 | RDT&E | Research, Development, Test, and Evaluation, Navy							
Fiscal Year	Quantity	BY 2004 $M					
		End Item Recurring Flyaway	Non End Item Recurring Flyaway	Non Recurring Flyaway	Total Flyaway	Total Support	Total Program
2000	--	--	--	--	--	--	9.0
2001	--	--	--	--	--	--	28.0
2002	--	--	--	--	--	--	33.2
2003	--	--	--	--	--	--	67.5
2004	--	--	--	--	--	--	82.7
2005	--	--	--	--	--	--	358.3
2006	--	--	--	--	--	--	416.3
2007	--	--	--	--	--	--	576.0
2008	--	--	--	--	--	--	524.9
2009	--	--	--	--	--	--	435.6
2010	--	--	--	--	--	--	344.0
2011	--	--	--	--	--	--	330.1
2012	--	--	--	--	--	--	185.3
2013	--	--	--	--	--	--	115.9
2014	--	--	--	--	--	--	29.1
2015	--	--	--	--	--	--	9.3
2016	--	--	--	--	--	--	12.3
2017	--	--	--	--	--	--	7.9
2018	--	--	--	--	--	--	10.6
2019	--	--	--	--	--	--	15.3
2020	--	--	--	--	--	--	10.6
2021	--	--	--	--	--	--	10.7
2022	--	--	--	--	--	--	9.8
2023	--	--	--	--	--	--	9.8
2024	--	--	--	--	--	--	6.2
2025	--	--	--	--	--	--	5.2
Subtotal	2	--	--	--	--	--	3643.6

Annual Funding 1507 | Procurement | Weapons Procurement, Navy							
Fiscal Year	Quantity	TY $M					
		End Item Recurring Flyaway	Non End Item Recurring Flyaway	Non Recurring Flyaway	Total Flyaway	Total Support	Total Program
2008	--	--	182.3	--	182.3	21.5	203.8
2009	1	314.3	--	--	314.3	25.2	339.5
2010	1	332.3	142.4	--	474.7	35.1	509.8
2011	1	325.4	154.7	--	480.1	14.6	494.7
2012	--	--	166.0	--	166.0	72.1	238.1
2013	--	--	10.4	--	10.4	11.0	21.4
2014	--	--	0.8	--	0.8	13.0	13.8
2015	--	--	164.5	--	164.5	23.7	188.2
2016	--	--	--	--	--	1.5	1.5
Subtotal	3	972.0	821.1	--	1793.1	217.7	2010.8

Annual Funding 1507 | Procurement | Weapons Procurement, Navy							
Fiscal Year	Quantity	BY 2004 $M					
		End Item Recurring Flyaway	Non End Item Recurring Flyaway	Non Recurring Flyaway	Total Flyaway	Total Support	Total Program
2008	--	--	160.2	--	160.2	18.9	179.1
2009	1	272.2	--	--	272.2	21.9	294.1
2010	1	283.0	121.3	--	404.3	29.9	434.2
2011	1	271.9	129.3	--	401.2	12.2	413.4
2012	--	--	136.7	--	136.7	59.4	196.1
2013	--	--	8.4	--	8.4	9.0	17.4
2014	--	--	0.6	--	0.6	10.5	11.1
2015	--	--	129.9	--	129.9	18.7	148.6
2016	--	--	--	--	--	1.2	1.2
Subtotal	3	827.1	686.4	--	1513.5	181.7	1695.2

Annual Funding 1205 | MILCON | Military Construction, Navy and Marine Corps	
Fiscal Year	TY $M Total Program
2007	26.1
2008	8.5
Subtotal	34.6

Annual Funding 1205 | MILCON | Military Construction, Navy and Marine Corps	
Fiscal Year	**BY 2004 $M** **Total Program**
2007	23.3
2008	7.5
Subtotal	30.8

Annual Funding 1804 | Acq O&M | Operation and Maintenance, Navy	
Fiscal Year	TY $M Total Program
2002	4.1
2003	4.6
2004	4.5
2005	--
2006	--
2007	--
2008	4.6
2009	5.0
2010	3.1
Subtotal	25.9

Annual Funding 1804 | Acq O&M | Operation and Maintenance, Navy	
Fiscal Year	BY 2004 $M Total Program
2002	4.2
2003	4.6
2004	4.4
2005	--
2006	--
2007	--
2008	4.1
2009	4.4
2010	2.7
Subtotal	24.4

Low Rate Initial Production

There is no LRIP for this program.

Foreign Military Sales

None

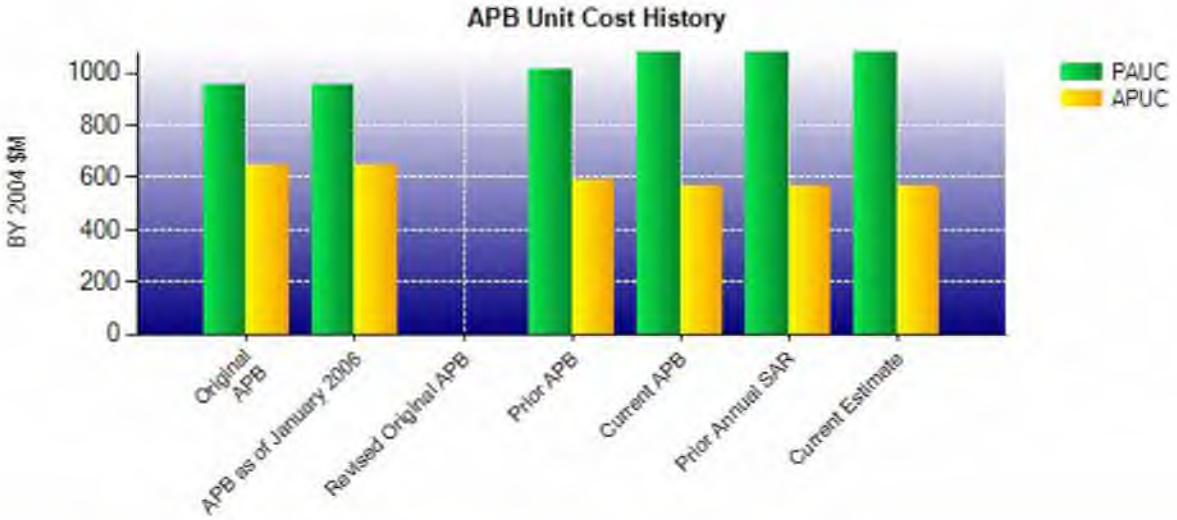
Nuclear Costs

None

Unit Cost

Current UCR Baseline and Current Estimate (Base-Year Dollars)			
Item	BY 2004 $M Current UCR Baseline (Oct 2017 APB)	BY 2004 $M Current Estimate (Dec 2017 SAR)	% Change
Program Acquisition Unit Cost			
Cost	5404.8	5394.0	
Quantity	5	5	
Unit Cost	1080.960	1078.800	-0.20
Average Procurement Unit Cost			
Cost	1694.8	1695.2	
Quantity	3	3	
Unit Cost	564.933	565.067	+0.02

Original UCR Baseline and Current Estimate (Base-Year Dollars)			
Item	BY 2004 $M Original UCR Baseline (Dec 2004 APB)	BY 2004 $M Current Estimate (Dec 2017 SAR)	% Change
Program Acquisition Unit Cost			
Cost	5738.0	5394.0	
Quantity	6	5	
Unit Cost	956.333	1078.800	+12.81
Average Procurement Unit Cost			
Cost	2591.0	1695.2	
Quantity	4	3	
Unit Cost	647.750	565.067	-12.76



APB Unit Cost History					
Item	Date	BY 2004 $M		TY $M	
		PAUC	APUC	PAUC	APUC
Original APB	Dec 2004	956.333	647.750	1080.183	776.025
APB as of January 2006	Dec 2004	956.333	647.750	1080.183	776.025
Revised Original APB	N/A	N/A	N/A	N/A	N/A
Prior APB	Jul 2012	1015.700	588.550	1182.650	724.075
Current APB	Oct 2017	1080.960	564.933	1238.480	670.267
Prior Annual SAR	Dec 2016	1077.600	564.900	1234.180	670.267
Current Estimate	Dec 2017	1078.800	565.067	1235.540	670.267

SAR Unit Cost History

Initial SAR Baseline to Current SAR Baseline (TY $M)									
Initial PAUC Development Estimate	Changes								PAUC Production Estimate
	Econ	Qty	Sch	Eng	Est	Oth	Spt	Total	
1080.183	49.000	0.000	2.750	0.000	3.167	0.000	0.000	54.917	1135.100

Current SAR Baseline to Current Estimate (TY $M)									
PAUC Production Estimate	Changes								PAUC Current Estimate
	Econ	Qty	Sch	Eng	Est	Oth	Spt	Total	
1135.100	-19.680	94.720	14.020	42.640	-74.820	0.000	43.560	100.440	1235.540

Initial SAR Baseline to Current SAR Baseline (TY $M)									
Initial APUC Development Estimate	Changes								APUC Production Estimate
	Econ	Qty	Sch	Eng	Est	Oth	Spt	Total	
776.025	39.100	0.000	4.125	0.000	-43.225	0.000	0.000	0.000	776.025

Current SAR Baseline to Current Estimate (TY $M)									
APUC Production Estimate	Changes								APUC Current Estimate
	Econ	Qty	Sch	Eng	Est	Oth	Spt	Total	
776.025	-27.367	38.175	22.867	0.000	-212.033	0.000	72.600	-105.758	670.267

SAR Baseline History				
Item	SAR Planning Estimate	SAR Development Estimate	SAR Production Estimate	Current Estimate
Milestone A	N/A	N/A	N/A	N/A
Milestone B	N/A	Sep 2004	Sep 2004	Sep 2004
Milestone C	N/A	Oct 2006	Oct 2006	Aug 2006
IOC	N/A	N/A	N/A	N/A
Total Cost (TY $M)	N/A	6481.1	6810.6	6177.7
Total Quantity	N/A	6	6	5
PAUC	N/A	1080.183	1135.100	1235.540

Milestone (MS) B and C dates reflect National Security Space Acquisition Policy 03-01 dates for Key Decision Point B and C, not MS B and C as specified in DoD 5000.02.

Build Approval was authorized February 2008.

Increase in PAUC is due to the reduction of quantities from six to five. PAUC reflects the sum of five satellites, five launch vehicles, the entire ground segment, and the associated support, divided by the total quantity of five.

Cost Variance

Summary TY $M					
Item	RDT&E	Procurement	MILCON	Acq O&M	Total
SAR Baseline (Production Estimate)	3636.2	3104.1	34.5	35.8	6810.6
Previous Changes					
Economic	-15.9	-81.5	+0.1	+0.1	-97.2
Quantity	--	-661.5	--	--	-661.5
Schedule	+1.5	+68.6	--	--	+70.1
Engineering	+206.7	--	--	--	+206.7
Estimating	+271.1	-636.6	--	-10.0	-375.5
Other	--	--	--	--	--
Support	--	+217.7	--	--	+217.7
Subtotal	+463.4	-1093.3	+0.1	-9.9	-639.7
Current Changes					
Economic	-0.6	-0.6	--	--	-1.2
Quantity	--	--	--	--	--
Schedule	--	--	--	--	--
Engineering	+6.5	--	--	--	+6.5
Estimating	+0.9	+0.5	--	--	+1.4
Other	--	--	--	--	--
Support	--	+0.1	--	--	+0.1
Subtotal	+6.8	--	--	--	+6.8
Total Changes	+470.2	-1093.3	+0.1	-9.9	-632.9
CE - Cost Variance	4106.4	2010.8	34.6	25.9	6177.7
CE - Cost & Funding	4106.4	2010.8	34.6	25.9	6177.7

Summary BY 2004 $M					
Item	RDT&E	Procurement	MILCON	Acq O&M	Total
SAR Baseline (Production Estimate)	3245.2	2460.3	30.7	32.7	5768.9
Previous Changes					
Economic	--	--	--	--	--
Quantity	--	-437.1	--	--	-437.1
Schedule	-1.9	+2.5	--	--	+0.6
Engineering	+144.9	--	--	--	+144.9
Estimating	+249.9	-512.6	+0.1	-8.3	-270.9
Other	--	--	--	--	--
Support	--	+181.6	--	--	+181.6
Subtotal	+392.9	-765.6	+0.1	-8.3	-380.9
Current Changes					
Economic	--	--	--	--	--
Quantity	--	--	--	--	--
Schedule	--	--	--	--	--
Engineering	+4.6	--	--	--	+4.6
Estimating	+0.9	+0.4	--	--	+1.3
Other	--	--	--	--	--
Support	--	+0.1	--	--	+0.1
Subtotal	+5.5	+0.5	--	--	+6.0
Total Changes	+398.4	-765.1	+0.1	-8.3	-374.9
CE - Cost Variance	3643.6	1695.2	30.8	24.4	5394.0
CE - Cost & Funding	3643.6	1695.2	30.8	24.4	5394.0

Previous Estimate: December 2016

RDT&E	$M	
Current Change Explanations	Base Year	Then Year
Revised escalation indices. (Economic)	N/A	-0.6
Additional funding in FY 2019 to support the Ultra High Frequency Narrowband Satellite Communications Analysis of Alternatives. (Engineering)	+4.6	+6.5
Adjustment to reflect final funding controls in prior years. (Estimating)	+0.3	+0.3
Adjustment for current and prior escalation. (Estimating)	+0.1	+0.1
Adjustment due to application of new outyear escalation indices (Estimating)	+0.5	+0.5
RDT&E Subtotal	+5.5	+6.8

Procurement	$M	
Current Change Explanations	Base Year	Then Year
Revised escalation indices. (Economic)	N/A	-0.6
Adjustment for current and prior escalation. (Estimating)	+0.4	+0.4
Adjustment due to application of new outyear escalation indices (Estimating)	0.0	+0.1
Adjustment for current and prior escalation. (Support)	+0.1	+0.2
Decrease in Other Support due to application of new outyear escalation indices. (Support)	0.0	-0.1
Procurement Subtotal	+0.5	0.0

Contracts

General Notes
The MUOS constellation is complete and the MUOS prime contract is 100% delivered.

Deliveries and Expenditures

Deliveries				
Delivered to Date	Planned to Date	Actual to Date	Total Quantity	Percent Delivered
Development	2	2	2	100.00%
Production	3	3	3	100.00%
Total Program Quantity Delivered	5	5	5	100.00%

Expended and Appropriated (TY $M)			
Total Acquisition Cost	6177.7	Years Appropriated	19
Expended to Date	5993.0	Percent Years Appropriated	73.08%
Percent Expended	97.01%	Appropriated to Date	6082.6
Total Funding Years	26	Percent Appropriated	98.46%

The above data is current as of February 12, 2018.

Operating and Support Cost

Cost Estimate Details

Date of Estimate:	March 03, 2017
Source of Estimate:	SCP
Quantity to Sustain:	6
Unit of Measure:	Ground Station
Service Life per Unit:	21.00 Years
Fiscal Years in Service:	FY 2010 - FY 2030

O&S Cost is primarily for sustainment of the ground stations. The MUOS constellation consists of five satellites, specifically four operational and one on-orbit spare. MUOS O&S costs include sustainment of all satellites and six ground sites located in Wahiawa (Hawaii), Chesapeake (Virginia), Niscemi (Italy), Geraldton (Australia), and MUOS Ground System hardware and software at Naval Satellite Operations Center (NAVSOC) Point Mugu (California) and NAVSOC Detachment Delta.

Sustainment Strategy

The MUOS sustainment strategy employs a three-level concept (Organizational, Intermediate, and Depot) and includes hardware/software maintenance and help desk support. Organizational-level (O-level) maintenance is the responsibility of and performed by organizations (such as Naval Computer and Telecommunications Area Master Station, NAVSOC, and Army Forces Strategic Command) using MUOS equipment at the equipment site and consists of maintaining and replacing parts, minor assemblies, and sub-assemblies. Intermediate-level (I-level) maintenance is performed by the MUOS support contractor and consists of calibration, repair, or replacement of damaged or unserviceable parts, components, or assemblies, the emergency manufacture of non-available parts, maintenance/repair of items that do not have to go to the depot for repair, and providing technical assistance to using organizations at the equipment site. Depot-level (D-level) maintenance is performed by the contractor at the MUOS designated depot facility and entails materiel maintenance requiring the major repair, overhaul, or complete rebuilding of weapon systems, end items, parts, assemblies, and subassemblies, manufacture of parts, technical assistance, and testing. The sparing concept includes O-level, I-level, and D-level allocations and include both predicted and added allowance items provided by the program office. Software maintenance is provided by the MUOS contractor and includes a combination of refresh and maintenance, to include updates, fixes, and patches.

Antecedent Information

The antecedent system to MUOS is the Ultra High Frequency (UHF) Follow-On (UFO) satellite communications program. Comparisons of O&S costs for UFO are not provided. Although the MUOS system continues to support UHF capabilities, the infrastructure of MUOS and its sustainment are not comparable to UFO.

Annual O&S Costs BY2004 $M		
Cost Element	**MUOS Average Annual Cost Per Ground Station**	**UFO (Antecedent) Cost Per Ground Station Per Year**
Unit-Level Manpower	0.000	0.000
Unit Operations	0.000	0.000
Maintenance	1.632	0.000
Sustaining Support	3.749	0.000
Continuing System Improvements	3.881	0.000
Indirect Support	0.000	0.000
Other	0.000	0.000
Total	9.262	--

Item	Total O&S Cost $M			
	MUOS			UFO (Antecedent)
	Current Production APB Objective/Threshold		Current Estimate	
Base Year	1171.0	1288.1	1167.1	N/A
Then Year	1656.3	N/A	1642.6	N/A

Disposal Cost is included in the Operating and Support Cost of the current APB objective and threshold for this program.

Equation to Translate Annual Cost to Total Cost

The unitized annual costs reflect the total O&S cost divided by six ground stations and sustainment of the MUOS Ground System over 21 years (FY 2010 through FY 2030). The equation to translate annual cost to total cost is $9.262 BY 2004 $M x 6 ground stations x 21 years = $1167.1 BY 2004 $M.

O&S Cost Variance		
Category	**BY 2004 $M**	**Change Explanations**
Prior SAR Total O&S Estimates - Dec 2016 SAR	1171.0	
Programmatic/Planning Factors	0.0	
Cost Estimating Methodology	0.0	
Cost Data Update	0.0	
Labor Rate	0.0	
Energy Rate	0.0	
Technical Input	0.0	
Other	-3.9	Removal of disposal costs from the total O&S estimate.
Total Changes	-3.9	
Current Estimate	1167.1	

Disposal Estimate Details

Date of Estimate:	March 03, 2017
Source of Estimate:	POE
Disposal/Demilitarization Total Cost (BY 2004 $M):	Total costs for disposal of all Ground Station are 3.9

Ground stations will not be disposed of and are anticipated to be utilized and sustained by a follow-on program. Costs include the demilitarization/disposal of MUOS equipment not required by the follow-on program.