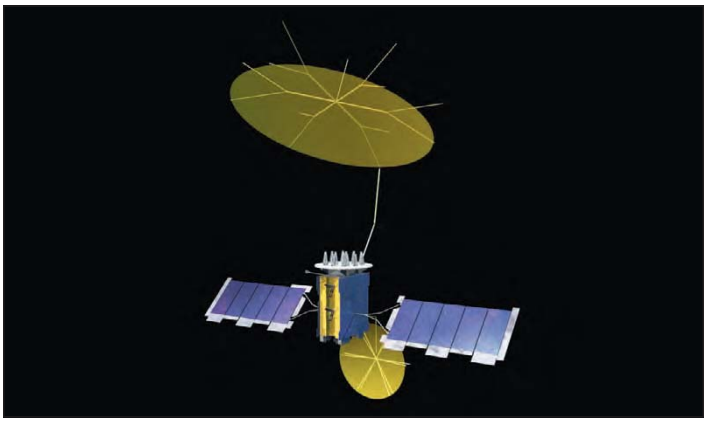
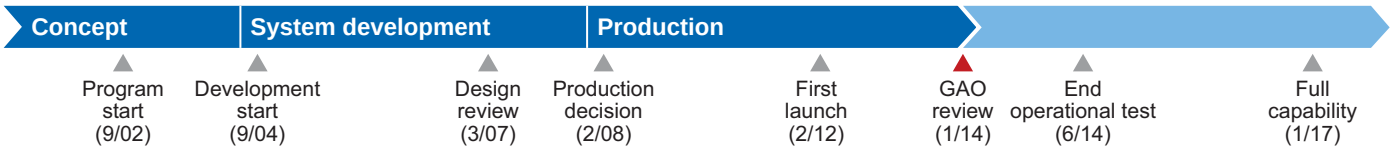
Mobile User Objective System (MUOS)

The Navy's MUOS, a satellite communication system, is expected to provide a worldwide, multiservice population of mobile and fixed-site terminal users with increased narrowband communications capacity and improved availability for small terminal users. MUOS will replace the Ultra High Frequency (UHF) Follow-On (UFO) satellite system currently in operation and provide interoperability with legacy terminals. MUOS consists of a network of satellites and an integrated ground network. We assessed both the space and ground segments.



Source: © 2007 Lockheed Martin.



Program Essentials

Prime contractor: Lockheed Martin Space Systems
Program office: San Diego, CA
Funding needed to complete:
- R&D: $176.9 million
- Procurement: $975.1 million
- Total funding: $1,152.0 million
- Procurement quantity: 1

Program Performance (fiscal year 2014 dollars in millions)

	As of 12/2004	Latest 09/2013	Percent change
Research and development cost	$3,836.4	$4,511.6	17.6
Procurement cost	$3,192.1	$2,867.4	-10.2
Total program cost	$7,069.1	$7,448.1	5.4
Program unit cost	$1,178.186	$1,241.345	5.4
Total quantities	6	6	0.0
Acquisition cycle time (months)	90	NA	NA

Latest acquisition cycle time could not be calculated because the most recent MUOS program baseline does not estimate dates for operational capability.

The MUOS program's critical technologies are mature, its design is stable, and according to the program office, its manufacturing process maturity has increased. The first satellite was launched in February 2012—26 months later than planned at development start—and the second satellite was launched in July 2013. Subsequent launches of MUOS satellites remain important due to the past operational failures of two UFO satellites and predicted end-of-life of on-orbit UFO satellites, one of which was taken off-line in November 2012. A remaining challenge is that users will not be able to utilize advanced MUOS capabilities in large part because of delays in the development, testing, and fielding of new user terminals. Current MUOS user terminal procurement and fielding are managed by the Army's Tactical Radios Project Office.

Attainment of Product Knowledge

As of January 2014

Resources and requirements match

- Demonstrate all critical technologies in a relevant environment ●
- Demonstrate all critical technologies in a realistic environment ●
- Complete preliminary design review ●

Product design is stable

- Release at least 90 percent of design drawings ●
- *Test a system-level integrated prototype*

Manufacturing processes are mature

- *Demonstrate critical processes are in control*
- *Demonstrate critical processes on a pilot production line*
- *Test a production-representative prototype*

● Knowledge attained
○ Knowledge not attained
▪▪▪▪ Information not available
Not applicable

MUOS Program

Technology, Design, and Production Maturity

The MUOS program's technologies are mature, its design is stable, and its manufacturing process maturity has increased. The first two satellites have been launched and three other satellites are being built. We could not assess whether critical manufacturing processes were in control as the program does not collect statistical process control data. The program has experienced quality problems in the past that resulted in cost increases and schedule delays; however, the number of manufacturing defects on the space segment has decreased over time. According to the program, multiple corrective action boards collect and track all defects in manufacturing processes and the program uses this data to assess the maturity of production. Examples of specific metrics used include number of defects per 1,000 hours of touch labor, amount of deferred work and associated risk, and rate of resolving nonconformance issues. According to the program office, these metrics indicate continuing increases in MUOS production maturity and show program goals are being met.

Other Program Issues

The first MUOS satellite was launched in February 2012, 26 months later than initially planned, and the second satellite was launched in July 2013. According to the program office, the remaining MUOS satellites are needed because most on-orbit UFO satellites are past their design lives. Two of these unexpectedly failed—one in June 2005 and another in September 2006—and a third was taken off-line in November 2012. Program officials stated that the required availability level of legacy UHF communication capabilities has been provided and based on the projected launch schedule for the remaining MUOS satellites, the required availability of legacy UHF communication capabilities is predicted to be maintained through May 2020.

Since 2007, we have reported that synchronizing deliveries of MUOS satellites with compatible Joint Tactical Radio System (JTRS) Handheld, Manpack, and Small Form Fit (HMS) terminals has been a challenge. Launching MUOS satellites is important to sustain legacy UHF communications capability. However, utilization of over 90 percent of MUOS's planned capability is dependent on the development of the MUOS waveform—which completed formal qualification testing in November 2012—and porting the MUOS capability onto operational user terminals. The Army's HMS program is developing the first operational terminal to incorporate the MUOS waveform. Additionally, according to the MUOS program, other vendors wanting to integrate the MUOS waveform into their radios are being supported with MUOS waveform software and government-operated MUOS test resources.

To date, the HMS program has conducted multiple developmental tests on the Manpack radio and an operational test was conducted in 2012. This testing, conducted without the MUOS waveform, found that the terminals did not meet all performance and reliability requirements. However, according to the MUOS program, the radio demonstrated improved performance at subsequent test events and was selected for fielding to Army units without the MUOS waveform due to the capability increases it would provide. Limited testing has been conducted on terminals with the MUOS waveform to date. Operational testing and initial fielding of the HMS terminals with the MUOS waveform is planned to begin in 2014.

Program Office Comments

In commenting on a draft of this assessment, the program officials provided technical comments, which were incorporated as appropriate.