

Advanced Extremely High Frequency (AEHF) Satellite Communications System

Executive Summary

- The Advanced Extremely High Frequency (AEHF) satellite one (AEHF-1) reached its orbital position on October 24, 2011. AEHF-2 and AEHF-3 have been built and are in storage awaiting shipment for their planned launch dates in 2012.
- Air Force Space Command declared the AEHF Mission Control Segment (MCS) Increment 4 as their system of record and is using the MCS to plan Milstar communications and control the Milstar Constellation.
- The program has made significant progress; however, the quality of the complex mission control software has proved challenging. Air Force Operational Test and Evaluation Center (AFOTEC) is planning a 2QFY12 Operational Utility Evaluation (OUE) to support the fielding of the second release of MCS software supporting command and control of the hybrid Milstar-AEHF constellation.

System

- The AEHF system represents the third generation of Extremely High Frequency Satellite Communications capability protected from nuclear effects and jamming activities.
- The AEHF system will follow the Milstar program as the protected backbone of the DoD's integrated military satellite communications architecture. The AEHF is expected to increase system throughput capacity by a factor of 10.
- The overall AEHF system has three segments:
 - Space segment – comprised of an integrated constellation of Milstar and AEHF satellites.
 - Mission Control segment – includes fixed and mobile telemetry, tracking, and commanding sites; fixed and transportable communication planning elements; and the common user interface with the Space Ground-Link Subsystem and the Unified S-Band capability.

Activity

- The Defense Acquisition Executive authorized fabrication and assembly of the first four satellites and development of the Control and User segments. He also directed the Air Force to plan for the acquisition of satellite vehicles five and six. A block buy of satellites five and six is planned and funded for FY12.
- AEHF-1, launched on August 12, 2010, suffered a large apogee engine malfunction while trying to achieve geosynchronous orbit during the initial boost phase. This malfunction resulted in a reduced operational lifespan and



- Terminal (or User) segment – includes ground-fixed, ground-mobile, man-portable, transportable, airborne, submarine, and shipboard configurations.
- The operational AEHF constellation is defined as four interconnected satellites per the AEHF Operational Requirements Document, dated October 2, 2000.

Mission

Combatant commanders and operational forces worldwide will use the AEHF system to provide secure, responsive, and survivable space-based, strategic, and tactical military communications.

Major Contractor

Lockheed Martin Space Systems – Sunnyvale, California

a 14-month delay in AEHF-1 reaching its intended orbital position. The program manager has identified the root cause of the AEHF-1 large apogee engine malfunction, and AEHF-2 and AEHF-3 have been inspected and tested to mitigate the possibility of recurrence.

- AEHF-1 orbit raising maneuvers are progressing as planned, and AEHF-1 reached its orbital position on October 24, 2011. AEHF-2 and AEHF-3 have completed contractor testing and are in storage awaiting shipment for their planned launch dates in 2012.

AIR FORCE PROGRAMS

- Air Force Space Command declared the MCS Increment 4 as its system of record for planning Milstar communications and controlling the Milstar Constellation in June 2011.
- AFOTEC is planning an OUE in FY12 to support fielding of the second release of the MCS supporting command and control of the hybrid Milstar–AEHF constellation. The updated Test and Evaluation Master Plan is in staffing to reflect this change in test strategy.
- AFOTEC has developed a plan to test the AEHF anti-jamming capability during the Multi-Service Operational Test and Evaluation.
- AFOTEC and the Arnold Engineering Center, Tullahoma, Tennessee, are developing a scintillation test capability. Scintillation is a fluctuation in radio wave propagation that can result from atmospheric effects or a nuclear detonation.
- The interim mobile command and control low-profile antenna and associated trailer are being redesigned to meet required road speed and transportation load requirements.

Assessment

- The program has made significant progress; however, the quality of the complex mission control software has proved

challenging. The OUE planned for 2QFY12 may be delayed while the program manager addresses deficiencies in this software.

- The program manager is modifying the interim mobile command and control system to be a supportable operational system. He is doing this in order to meet near- and mid-term operational needs due to delays with the Family of Advanced Beyond-Line-of-Sight Terminal (FAB-T) program.
- The operational testers have made good progress in planning a modeling and simulation strategy to assess the nulter antenna anti-jamming performance. This testing is now funded and planned to occur during the FY13 IOT&E.
- The operational testers are on track to develop a scintillation simulator in time to support the FY13 IOT&E.

Recommendations

- Status of Previous Recommendations. The Air Force has made satisfactory progress on all previous recommendations.
- FY11 Recommendations. None