

## Advanced Extremely High Frequency (AEHF) Satellite Communications System

### Executive Summary

- Production representative user terminals will not be available at the start of Advanced Extremely High Frequency (AEHF) operational testing for sea and air platforms. If the Navy and the Air Force terminal programs continue to lag in the development and modification of the user segment, adequate operational testing will be at risk.
- The contractor expended an unforeseen amount of schedule time to resolve first-time test article and satellite test fixture problems. This will most likely impact the launch schedule.
- Test planning activities are progressing satisfactorily to support integrated testing and dedicated operational test and evaluation. However, operational testing of the AEHF satellite's anti-jam capabilities in a realistic threat environment poses unique challenges for the AEHF program.

### System

- AEHF represents the third generation of Extremely High Frequency Satellite Communications capability protected from nuclear effects and jamming activities.
- The AEHF system will follow the Military Strategic, Tactical, and Relay (Milstar) program as the protected backbone of 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: The space segment comprises an integrated constellation of Milstar and AEHF satellites.
  - Mission Control segment: The 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.



- Terminal (or User) segment: The terminal segment includes ground fixed, ground mobile, man-portable, transportable, airborne, submarine, and shipboard configurations.
- The first AEHF satellite will have the capabilities of a Milstar II satellite at launch, but the software will be upgraded to full AEHF capability after the launch of the second satellite, which will be launched as a fully capable AEHF satellite.
- The Defense Acquisition Board authorized fabrication and assembly of the first three satellites and development of the Control and User segments.

### Mission

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

### Activity

- The integrated test team's planning activity focused on preparation for operational test of three distinct segments: communications planning, command and control, and resource monitoring.
- The program conducted inter-segment testing using a Milstar satellite simulator which demonstrated interoperability and backward compatibility of the AEHF Satellite Mission Control System with the legacy Milstar system. This was an important step in preparation for the control of the legacy Milstar system with the new AEHF control segment next year.
- The program conducted interoperability testing of the Milstar crosslinks with the AEHF crosslinks, and it conducted

significant risk reduction testing of the AEHF control segment with the AEHF space segment.

- An extensive rewrite of the Test and Evaluation Master Plan (TEMP) is underway to accommodate the substantial program changes that have occurred since the original TEMP was approved in 2001.
- During integrated system testing, the program identified a potential technical problem with Low Data Rate (LDR) legacy terminal satellite acquisition in the presence of the Extended Data Rate (XDR) waveform.

# AIR FORCE PROGRAMS

## Assessment

- For effective mission performance and successful Multi-Service Operation Test and Evaluation, the program must aggressively synchronize the development of AEHF space, mission control, and user segments.
- If the potential LDR legacy terminal problem is significant, and the XDR waveform interferes with legacy terminal operation, legacy terminal users will be obliged to either accept a degradation in performance or retrofit a filter.
- The contractor expended an unforeseen amount of schedule time to resolve first-time test article and satellite test fixture problems. This will most likely impact the launch schedule.
- Test planning activities are progressing satisfactorily to support integrated testing and dedicated operational test and evaluation.

## Recommendations

- Status of Previous Recommendations. There were no FY06 recommendations. The Air Force made progress on FY05 recommendations; two of the original five FY05 recommendations remain valid. While the Air Force is planning for integrated testing of AEHF, the Services should resolve user terminal delivery schedules to support both space segment operations and operational testing requirements. The integrated testing should exercise network control interoperability and user segment terminal configuration compatibility.
- FY07 Recommendation.
  1. The Air Force should test the anti-jam capabilities of the AEHF antennas in an operationally relevant manner.