

## E-2D Advanced Hawkeye

### Executive Summary

- The E-2D completed an Operational Assessment (OA) in December 2010 to support a decision to procure the next two lots of low-rate production aircraft.
- E-2D overland radar performance deficiencies may preclude successful assessment of the Theater Air Missile Defense/ Anti-Air Warfare mission area during IOT&E.
- Cooperative Engagement Capability (CEC) test schedule delays may delay the start of IOT&E.
- Weapon system suitability metrics currently do not meet requirements although recent software upgrades should provide improvement to these metrics.

### System

- The E-2D Advanced Hawkeye is a carrier-based Airborne Early Warning and Command and Control aircraft.
- Significant changes to this variant of the E-2 include replacement of the radar system, the communications suite, the mission computer, and the incorporation of an all-glass cockpit.
- The radar upgrade replaces the E-2C mechanical scan radar with a phased radar array that has combined mechanical and electronic scan capabilities.
- The upgraded radar is intended to provide significant improvement in Hawkeye littoral and overland detection performance, clutter management, and surveillance capabilities.



### Mission

The combatant commander, whether operating from the aircraft carrier or from land, will use the E-2D Advanced Hawkeye to accomplish the following missions:

- Theater air and missile sensing and early warning
- Battlefield management, command, and control
- Acquisition, tracking, and targeting of surface warfare contacts
- Surveillance of littoral area objectives and targets
- Tracking of strike warfare assets

### Major Contractor

Northrop Grumman Aerospace Systems – Bethpage, New York

### Activity

- The Navy's operational test organization for the E-2D program, Air Test and Evaluation Squadron One (VX-1), conducted an OA in accordance with the DOT&E-approved test plan from July 22 to December 3, 2010, during operations at Naval Air Station (NAS), Jacksonville, Florida; NAS Fallon, Nevada; and NAS Point Mugu, California. Their test report was completed on February 25, 2011, and supported the acquisition decision in 2QFY11 for E-2D Low-Rate Initial Production Lots 3 and 4. DOT&E delivered an operational test memorandum, which was supportive of VX-1's conclusions developed from the OA data, and identified potential radar performance deficiencies in the overland arena.
- CEC developmental testing began July 2011 and CEC engineering testing concluded in June 2011 with the exception of two flight events; these events will be completed as a part of developmental testing. As of December 2011, 93 percent of CEC test points are complete. Carrier suitability testing and the initial cadre of pilots completed carrier qualification in January, August, and September 2011, to support upcoming IOT&E.

- VX-1 took custody of three aircraft in anticipation of IOT&E (two from the Navy's test program and one from Northrop Grumman). VX-1 maintenance and aircrew training for IOT&E commenced in 3QFY11 and will continue until IOT&E commences in 2QFY12. One aircraft delivery remains (from Northrop Grumman in October 2011) to fulfill VX-1's full complement of four aircraft for IOT&E.
- The E-2D program developed a radar reliability growth program and growth curves. The test program has incorporated three software updates, which together reduced the number of outstanding Discrepancy Reports from 61 to 5.
- Operational Test Readiness Review is scheduled for January 2012.

### Assessment

- Based on OA and developmental test data, DOT&E identified potentially inadequate overland performance of the E-2D radar system as a risk to a successful Theater Air Missile Defense/

# NAVY PROGRAMS

Anti-Air Warfare mission effectiveness assessment during IOT&E.

- Discovery of hardware and software integration discrepancies significantly delayed E-2D/CEC integration and testing in FY11. The engineering test originally scheduled to conclude in February 2011 was not substantially complete until June 2011. Developmental testing was scheduled for completion by August 2011; however, it now appears CEC developmental testing will complete in 1QFY12 and is the pacing event for execution of the Operational Test Readiness Review and commencement of IOT&E. The IOT&E for the E-2D is also the IOT&E for new CEC aircraft hardware (AN/USG-3B) under development by the Navy. Further discovery of significant CEC-related problems will most likely delay the start of IOT&E and could result in a deferral of the AN/USG-3B IOT&E. CEC is necessary for E-2D to demonstrate its Net-Ready Key Performance Parameter.
- The radar system reliability, specifically radar mean time between failures, does not currently meet established requirements of 81 hours. While low radar mean time between failures has been a concern for the last two years, it has steadily improved and was 64.3 hours as of July 2011. However, it must continue to improve to meet the threshold requirement during IOT&E.
- During the recent OA, radar Mean Time Between Operational Mission Failure was 14.2 hours versus a requirement of 25 hours, while weapon system Mean Flight Hours Between Failure was 1.7 hours, versus a threshold of 0.8, and weapons system's Mean Flight Hours Between Operation Failure was 4.7 hours versus a 3.5-hour requirement. These data are

based on the relatively small sample size collected during the OA and therefore have a large uncertainty. In contrast to program office metrics, the OA data were gathered under more operationally representative conditions consistent with the upcoming IOT&E. Because of three recent radar software updates, improvements in these metrics are expected prior to IOT&E.

- As a result of the delivery schedules for the Hawkeye Integrated Training System for Aircrew and Maintenance, operational test personnel will not be able to completely resolve the Maintainability and Training Critical Operational Issues during IOT&E. However, the Hawkeye Integrated Training System for Aircrew and Maintenance will be available for operational evaluation during FOT&E.

## Recommendations

- Status of Previous Recommendations. The Navy satisfactorily addressed all FY10 recommendations.
- FY11 Recommendations.
  1. The Navy and E-2D program should investigate the potential radar performance benefits of a post IOT&E processor upgrade to buttress system performance in the challenging overland arena.
  2. The Navy and E-2D program office should take all necessary steps to ensure CEC integration testing is successfully completed in time to support IOT&E commencement.
  3. The E-2D program office should continue to improve radar reliability.