

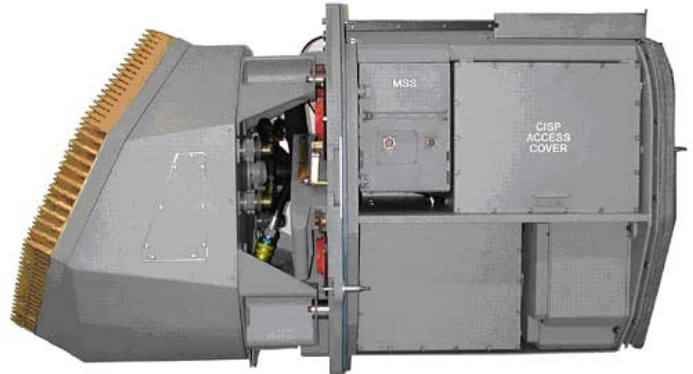
Active Electronically Scanned Array (AESA)

Executive Summary

- Operational evaluation of the Active Electronically Scanned Array (AESA) radar system as installed on the F/A-18E/F Super Hornet began in July 2006 and continued through December 2006.
- The Navy deferred some functionality from the initial software build (Software Configuration Set (SCS) H3E) in order to conduct the operational evaluation while supporting the first AESA-equipped squadron transition schedule.
- The first deployment of AESA-equipped F/A-18F's is planned for early 2008 with SCS H4E.

System

- The APG-79 AESA radar system is an upgrade to the F/A-18E/F Super Hornet, replacing the APG-73 mechanically-scanned planar array radar. The APG-79 radar is one of several sub-systems that comprise the F/A-18E/F planned common avionics suite upgrade (Block 2), which will be integrated into Lot 26 aircraft and beyond.
- The APG-79 AESA radar system was designed to correct current APG-73 deficiencies while supporting a continued growth path for the Super Hornet as an integrated weapon system.
- The antenna, consisting of a fixed array of more than 1,100 transmit/receive modules, does not scan back and forth like a conventional radar antenna. The radar beam is "steered" electronically by the aircraft's mission computers. Reliability should be significantly better than older radars because of the elimination of moving parts, which have historically been the leading cause of failures.
- The fixed array of transmit/receive modules provides a total radiated power, which is much greater than that of conventional radars, thus enhancing initial detection ranges. Failure of several modules does not significantly degrade overall system performance.



- Operational requirements are being implemented in three phases:
 - Phase I supports initial operational capability.
 - Phase II adds electronic warfare upgrades.
 - Phase III adds additional capability upgrades as funded or desired.

Mission

- The operational commander whose force employs the F/A-18E/F fitted with AESA should have the capability to detect and track enemy air and ground targets at longer ranges than current systems, increasing operational effectiveness and survivability.
- The radar simultaneously tracks airborne targets and provides data link information to missiles in-flight.
- Aircrews equipped with the APG-79 AESA radar use this system to locate all air-to-air threats while developing situational awareness of surface targets. AESA also supports the concept envisioned for the F/A-18F of allowing each cockpit to conduct separate air-to-air and air-to-ground tasks. Conventional radars are capable of doing only one of these missions at a time.

Activity

- The Navy conducted an operational assessment during October and November 2005. Two aircraft flew 19 flights for a total of 26.7 flight hours. Additional data were collected during 22 developmental and combined developmental/operational test sorties.
- Because of remaining concerns with system performance and readiness for operational test, the operational test squadron (VX-9) conducted a Developmental Test Assist in May 2006, which consisted of three missions from the operational test plan flown using four AESA-equipped aircraft and the latest software build, SCS H3E.
- Four live AIM-120 missiles were fired in three scenarios of integrated testing prior to the commencement of operational testing during 2-3QFY06.
- DOT&E approved the Test and Evaluation Master Plan (TEMP) No. 0201-07 (Revision C) for F/A-18 APG-79 AESA and its associated operational test plan in July 2006. The TEMP and test plan are adequate to complete the operational evaluation. A new TEMP and test plan will be submitted to address follow-on operational testing to be conducted in FY07.

Assessment

- During the fall 2005 operational assessment, poor reliability, inconsistent air-to-air detection and track performance, and immature built-in test detection and isolation were observed. Additionally, poor AIM-120 data link support during missile flight was observed. Overall system stability and inconsistencies in air-to-air and air-to-ground performance adversely impacted accomplishment of key Air Warfare and Strike Warfare missions. The Navy concluded that while AESA warranted continued development, it was not ready for operational evaluation. While improvements in reliability and performance had been seen in radar software builds since the operational assessment conducted in 2004, overall system performance remained well below important operational thresholds. The Navy recommended the addition of a formal Developmental Test Assist period in order to mitigate risk entering operational test.
- During the three Developmental Test Assist missions conducted in May 2006, only one instance of software instability was observed; however, other inconsistent performance was still apparent. This included inconsistent detection range, dropped track files at missile firing, poor short-range search performance, and poor track performance on maneuvering targets.
- The live AIM-120 shots verified AESA radar integration with the missile while also demonstrating the capability to support multiple missiles in-flight.
- The AESA operational evaluation is ongoing. Emerging results indicate that system stability remains a concern. The Navy issued anomaly reports for poor reliability, immature built-in test, and erratic gun reticle behavior in both air-to-air and air-to-ground modes. However, when the radar is operating consistently, performance has been better than that of the APG-73. In particular, the air-to-ground modes produce high quality imagery and exceptional weapons delivery accuracy.

Recommendations

- Status of Previous Recommendations. The Navy completed action on the two FY05 DOT&E recommendations.
- FY06 Recommendation.
 1. The Navy must correct AESA deficiencies, particularly the reliability deficiency, prior to commencement of AESA follow-on test and evaluation.