

## AGM-88E Advanced Anti-Radiation Guided Missile (AARGM) Program

### Executive Summary

- The Navy postponed the operational test readiness review for IOT&E from September 2009 to February 2010 because of continuing hardware and software deficiencies discovered in developmental test.
- IOT&E started in June 2010 after DOT&E required additional low-rate initial production (LRIP) missiles that included firmware and hardware corrections not included in the production-representative model (PRM) missiles. IOT&E began with four LRIP missiles and eight PRM missiles.
- During IOT&E, the AARGM experienced six operational missile failures during captive carry flight test (four PRM failures and two LRIP failures). AARGM completed 12 percent of the 100 planned sorties, accumulating 48.1 hours of missile operating time.
- Following the six missile failures, the Navy de-certified the AARGM for IOT&E and focused on fault identification and correction of deficiencies.
- DOT&E rescinded the IOT&E Test Plan approval, requiring the Navy to re-plan testing using LRIP missiles incorporating all of the discovered corrections of deficiencies.

### System

- The AARGM is the follow-on to the AGM-88B/C/D High Speed Anti-Radiation Missile using a modified AGM-88B/C/D missile body and fins. AARGM is carried on F/A-18C/D/E/F/G platforms.
- The AARGM changes will incorporate Millimeter Wave (MMW), GPS, digital Anti-Radiation Homing (ARH), a Weapon Impact Assessment (WIA) Transmitter, and an Integrated Broadcast Service Receiver (IBS-R).
  - MMW technology allows enhanced target discrimination during terminal guidance of the weapon.
  - ARH improvements include an increased field-of-view and larger frequency range.



- The GPS allows position accuracy in location, time, and WIA transmissions.
- The IBS-R allows reception of national broadcast data.

### Mission

- Units equipped with AARGM conduct pre-planned, on-call, and time-sensitive anti-radiation targeting for the degradation and destruction of radio frequency-enabled surface-to-air missile systems.
- Commanders use the AARGM to provide real-time weapons impact assessment via a national broadcast data system.

### Major Contractor

Alliant Techsystems, Defense Electronics Systems Division – Woodland Hills, California

### Activity

- The Navy postponed the operational test readiness review for IOT&E from September 2009 to February 2010 due to continuing hardware and software deficiencies discovered in developmental test.
- The Navy clarified the Capability Production Document requirements by approving the following changes: 1) defer one Key Performance Parameter target to FOT&E; 2) clarify the target environment; and 3) clarify reactive targeting language. These substantial changes were required to better explain or

- defer the missile performance requirements before the start of IOT&E.
- The Navy planned for the use of 11 PRM and two LRIP missiles for the IOT&E. DOT&E learned late that the majority of the PRMs included firmware and hardware deficiencies; these deficiencies were corrected in the LRIP design. All of the PRMs were prone to WIA overheat failure if temperatures exceeded a specific value, and half of the missiles had electrical servo-motor connections that were

prone to break, resulting in steering failure. Therefore, the PRMs would not provide adequate confidence in the full-rate production decision following IOT&E.

- DOT&E did not concur that the PRMs were adequate for IOT&E. The Navy agreed to include two additional LRIP missiles and fewer PRM missiles for the IOT&E, with a final configuration of four LRIP and eight PRM missiles.
- The Navy started AARGM IOT&E in June 2010 at Air Test and Evaluation Squadron Nine (VX-9) in China Lake, California, with two LRIP and eight PRM missiles. The remaining two LRIP missiles arrived shortly after the start of test.
- Commander, Operational Test Force (COTF) conducted testing in accordance with the DOT&E-approved test plan. IOT&E was appropriately scoped and resourced with 10 live missile firings, along with captive carry, reliability, and compatibility testing in operational environments against threat-representative targets. COTF representatives validated and accredited targets for AARGM before the start of IOT&E.
- As of August 2010, AARGM suffered six operational missile failures during captive carry flight test, with VX-9 publishing eight anomaly reports.
- In September 2010, the Navy de-certified the AARGM for IOT&E, stopping test and evaluation before a live fire test event to resolve the identified deficiencies and to prepare for the eventual re-start of the IOT&E.
- The Navy completed 12 percent of 100 planned sorties, accumulating 48.1 hours of missile operating time before stopping test.
- As a result of the missile failures and de-certification of AARGM, DOT&E rescinded the IOT&E Test Plan approval, requiring the Navy to correct all the discovered deficiencies before returning to test with LRIP missiles.

## Assessment

- The six operational missile failures during captive carry flight test included three unrecoverable weapon failure indications, a communications hold failure, a guidance and control section failure, and an emitter misidentification of an unambiguous target.
  - Four of the eight PRM missiles and two of the four LRIP missiles experienced failures that would have resulted in mission abort.
  - Four of the weapons failed on their first captive carry flight, one failed on the second flight, and one failed on the third flight. This indicates the AARGM design is prone to early failures.
- Failures and deficiencies identified during IOT&E indicate developmental testing was insufficient to characterize system performance and will require root-cause corrective action for each failure before returning to test and evaluation.

## Recommendations

- Status of Previous Recommendations. The Navy satisfied the FY09 recommendation to accredit the surrogate targets to be used in operational testing, but did not complete the recommendation to fully characterize the MMW and ARH sensors in developmental testing to prevent discovery of deficiencies in operational test and evaluation.
- FY10 Recommendations.
  1. The Navy must fully characterize the MMW and ARH sensors in developmental test prior to the restart of formal operational test in order to ensure that operational test and evaluation is a period of confirmation vice discovery.
  2. All future operational test assets should be conducted using LRIP missiles incorporating correction of deficiencies.