

## Army Integrated Air & Missile Defense (IAMD)

### Executive Summary

- Army Integrated Air and Missile Defense (AIAMD) is a command and control system that will enable an integrated air and missile defense (AMD) system of systems.
- In January 2016, the Army conducted developmental testing of AIAMD that included a Cooperative Vulnerability and Penetration Assessment and missile flight tests. Also, the Army conducted an AIAMD Limited User Test (LUT) in March through May 2016, which included sustained operations to assess system reliability, two missile flight tests, and hardware-in-the-loop (HWIL) events to assess effectiveness and suitability.
- During the HWIL events, operators' assessment was limited to basic air defense missions because of software immaturity and instability, as well as a lack of training for operators on new equipment and new capability operations.
- The IAMD Battle Command System (IBCS) software is neither mature nor stable, as evidenced in numerous software problem reports. This precludes a full assessment of capabilities. Also, software immaturity contributed to the AIAMD Engagement Operations Center's (EOC) reduced reliability; operator workstations often became sluggish or ceased to operate
- AIAMD was unable to effectively operate on the Link 16 network.
- AIAMD system setup, operations, and maintenance technical manuals were incomplete or inadequate.

### System

- AIAMD is a command and control system that integrates sensors, weapons, and a common mission command capability across an integrated fire control network (IFCN) to provide a single air picture.
- The IBCS provides the capabilities to control and manage AIAMD-enabled sensors and weapons.
- AIAMD's IBCS will replace and enhance Patriot Data Information Link communication structure, integrate with the currently fielded Sentinel air surveillance sensors, and improve command and control of missile employment.
- The IBCS includes the EOC, hardware interface kits, and IFCN Relays.
  - EOCs provide the operating environment for all levels (battalion and battery) of employment. They will be



equipped with IBCS software that enables operators to monitor, interface with, and direct sensor employment and engagement of air threats.

- Hardware interface kits connect IBCS with the current Patriot and Sentinel missiles, and will incorporate future AMD capabilities to support engagement of air threats. The IFCN is the primary organic communications infrastructure for AIAMD system of systems and provides the capability for fire control connectivity and distributed operations.
- The IFCN Relay provides a mobile IFCN communications node with an interface kit which extends connectivity to remote launcher and sensor platforms.

### Mission

- Army commanders will use AIAMD to provide timely detection, identification, monitoring, and (if required) engagement of air threats (e.g. aircraft, cruise missiles, ballistic missiles, rockets, artillery, and mortars) in an assigned area of responsibility.
- AMD forces deploy to provide active protection for the following:
  - Air defense of the homeland
  - Air defense of priority critical assets and locations
  - Air defense of forces

### Major Contractors

- Northrop Grumman – Huntsville, Alabama
- Raytheon – Huntsville, Alabama, and Andover, Massachusetts
- Lockheed Martin – Dallas, Texas

### Activity

- In May 2015 (Missile Flight Test 2) and November 2015 (Missile Flight Test 1), the Army conducted two live fire developmental tests in accordance with the DOT&E-approved Test and Evaluation Master Plan (TEMP) during which

Northrop Grumman contractors used AIAMD to defeat missile threats. Both tests were conducted at White Sands Missile Range, New Mexico.

# FY16 ARMY PROGRAMS

- In January 2016, the Army conducted a Cooperative Vulnerability and Penetration Assessment as part of a developmental test effort. The test was not conducted in accordance with a DOT&E-approved test plan. Results from this test will be incorporated in future software builds.
- From March through May 2016, the Army completed a LUT on AIAMD at White Sands Missile Range, New Mexico, and Fort Bliss, Texas. The LUT was conducted in accordance with a DOT&E-approved test plan. The LUT consisted of three phases:
  - Sustained operations phase (three 72-hour mission pulses)
  - Missile Flight Test 3-1 and 3-2
  - HWIL phase
- In July 2016, the Army conducted a developmental test of new IBCS software, version 3.2.1. Numerous system performance deficiencies were identified during Government Software Integration Laboratory assessments and soldier check-out events.

## Assessment

- During the LUT, the operators' assessment was limited to basic air defense missions because of software immaturity and instability, as well as a lack of training for operators on new equipment and new capability operations. Due to AIAMD software immaturity and limited capability to effectively operate at a multi-echelon level, soldiers were unable to effectively coordinate with engagement and identification authorities, a key function in air defense.
- As of February 3, 2016, AIAMD's IBCS software had 32 Severity 1 and 2 software problem reports. Also, AIAMD demonstrated poor system reliability, with 6 to 8 hours of Mean Time Between System Abort (MTBSA) compared to the LUT entrance criteria of 31 hours MTBSA.
  - Despite DOT&E's concerns that AIAMD is an immature system and not ready for a Milestone C decision, the Army elected to proceed with the LUT as an operational test.
- During the LUT, AIAMD demonstrated a 6 percent likelihood that it could operate for 72 hours without experiencing a failure that would result in system abort.
  - The warfighter requirement is a 90 percent likelihood that the system will operate for 72 hours without experiencing a failure that results in system abort.
- The EOC, a critical subsystem of AIAMD, demonstrated an average operating time of up to 16 hours without a failure that results in ineffective operations; this is significant when compared to the minimum requirement to operate for up to 446 hours.
- The computer workstations in the EOC were not reliable and a constant source of frustration for operators.
  - Due to IBCS software immaturity, workstations lagged and froze during mission operations, significantly affecting crew operations and mission execution.
  - The median time to repair a workstation was approximately 13 minutes. During air defense operations against aircraft and missile threats, this could result in multiple failed engagements and loss of critical defended assets.
- During the majority of the sustained operations phase, the workstations showed multiple false tracks when only one test target aircraft was flying. The operators often struggled to identify targets of interest in the cluttered air picture.
- AIAMD was unable to effectively operate on the Link 16 network and had significant problems with dual tracks and reporting responsibility with the IBCS network. The LUT was the first time AIAMD attempted interoperability with the Marine Tactical Air Operations Center.
- The IFCN relays were not reliable. Additionally, on multiple occasions the IFCN relay was inoperable thus disconnecting the associated radar or shooter from the AIAMD system. Once the IFCN is disconnected, the operators are unable to employ that associated radar or shooter.
- The AIAMD system setup, operations, and maintenance technical manuals were incomplete or inadequate.
- In surveys, 40 percent of operators identified poor training (includes training time, documentation, and lesson plans) on system employment.
- In August 2016, Milestone C (planned for November 2016), was placed on hold until IBCS software deficiencies are resolved in accordance with contracted requirements. The Program Management Office is working with Northrop Grumman Corporation to resolve IBCS software deficiencies.

## Recommendations

- Status of Previous Recommendations. This is the first annual report for this program.
- FY16 Recommendations. The Army should:
  1. Fix all Severity 1 and 2 software problem reports and conduct another operational assessment of AIAMD performance to inform a Milestone C decision.
  2. Develop and publish an AIAMD operational mode summary/mission profile for planned AIAMD employment.
  3. Update the program TEMP in accordance with updated program acquisition way forward.
  4. Determine the required IBCS reliability for initial fielding and outline a reliability growth plan in an updated program TEMP.
  5. Correct and formalize all AIAMD system documentation and training deficiencies.