

AH-64E

Executive Summary

- The Army conducted the Lot 4 AH-64E FOT&E I at Eglin AFB, Florida, from August 4 –15, 2014. The test included training, force-on-force missions in an operational Link 16 network, adversarial cybersecurity testing, and was preceded by two years of developmental testing that included component qualification, joint interoperability, cybersecurity, and live fire testing.
- FOT&E I was adequate and demonstrated that Link 16 enhances the operational effectiveness of Lot 4 AH-64E units. Lot 4 AH-64E air weapons teams found small target formations more quickly using Link 16 target tracks than when using other onboard sensors. Air weapons teams, equipped with Link 16, enhanced overall situational awareness by providing battlefield information to the joint tactical air picture.
- Lot 4 AH-64E enhancements add 700 pounds to the aircraft compared to the Lot 1 AH-64E. AH-64E demonstrated in testing and in a recent unit deployment to Afghanistan that the aircraft can meet operational performance requirements at 6,000 feet pressure altitude and 95 degrees Fahrenheit if permitted to use all available engine power.
- The Lot 4 AH-64E remains operationally suitable and demonstrated improvements in reliability, availability, and maintainability compared to Lot 1 AH-64E operational test results.
- The Lot 4 AH-64E remains as survivable as the Lot 1 AH-64E against ballistic threats. Survivability against infrared threats is degraded compared to the Lot 1 AH-64E. Radar and laser-warning systems degrade pilot situational awareness.
- Lot 4 AH-64E aircraft ballistic vulnerability and personnel force protection is comparable to the Lot 1 AH-64E.

System

- The Army received an approved mission design series change renaming the AH-64D Apache Block III to AH-64E in September 2012.
- The AH-64E is a modernized version of the AH-64D Attack Helicopter. The Army intends to sustain the Apache fleet through the year 2040. The AH-64E is organized in Attack/Reconnaissance Battalions assigned to the Combat Aviation Brigades. Each Battalion has 24 aircraft.
- The AH-64E's advanced sensors, improved flight performance, and ability to integrate off-board sensor information provide increased standoff and situational awareness in support of the joint force.
- The major Lot 1 AH-64E capability improvements included:



- The AH-64E aircrew's ability to control the flight path and the payload of an Unmanned Aircraft System
- Improved aircraft performance with 701D engines, composite main rotor blades, and an improved rotor drive system
- Enhanced communication capability, which includes satellite communication and an integrated communication suite to meet global air traffic management requirements
- Lot 4 AH-64E retains Lot 1 capabilities and adds hardware and software for Link 16 network participation.
- The Army acquisition objective is to procure 690 AH-64E aircraft: 634 remanufactured and 56 new-build aircraft.

Mission

AH-64E-equipped units shape the area of operations and provide the Joint Force Commander and Ground Maneuver Commander the ability to defeat the enemy at a specified place and time. The Attack/Reconnaissance Battalions assigned to the Combat Aviation Brigade employ the AH-64E to conduct the following types of missions:

- Attack
- Movement to contact
- Reconnaissance
- Security

Major Contractors

- Aircraft: The Boeing Company Integrated Defense Systems – Mesa, Arizona
- Sensors and Unmanned Aircraft System datalink: Longbow Limited – Orlando, Florida, and Baltimore, Maryland

FY14 ARMY PROGRAMS

Activity

- The Army conducted ballistic testing of the Lot 4 AH-64E Reduced-size Crashworthy External Fuel System (RCEFS) in May 2013 in accordance with the military standard for evaluation of fuel tanks on rotary-wing aircraft.
- The 46th Test Squadron conducted waveform conformance testing of the Small Tactical Terminal Radio, version 2.9.2 at Eglin AFB, Florida, in February 2014.
- The Joint Interoperability Test Command completed joint interoperability testing of the Small Tactical Terminal Radio version 3.1.2 at Mesa, Arizona, in May 2014. The AH-64E exchanged the required Lot 4 Link 16 messages to joint participants.
- The Army conducted a cooperative cybersecurity assessment of the Lot 4 AH-64E configuration from June 24 – 26, 2014, at Redstone Arsenal, Alabama.
- The Army conducted the Lot 4 AH-64E FOT&E I in accordance with the DOT&E-approved test plan from August 4 – 15, 2014, at Eglin AFB, Florida. FOT&E I consisted of a unit equipped with Lot 4 Apache aircraft conducting force-on-force missions against a dedicated opposing force and supported by an operational Link 16 network.
 - AH-64E Air Weapons Teams equipped with two Lot 4 AH-64E aircraft flew 120 hours conducting 22 force-on-force missions under varying environmental conditions, with and without Link 16 targeting information, against small (less than 10 vehicles) and large (10 or more vehicles) target formations.
 - AH-64E Air Weapons Teams provided support to friendly maneuver forces in vehicles, dismounted, and aboard a large transport watercraft. Enemy forces employed fast-attack craft, a large mine-laying boat, armored vehicles, mechanized air defense vehicles, dismounted infantry with small arms and man-portable air defense systems, mortar teams, and technical vehicles. Both friendly and enemy forces were instrumented with Real-Time Casualty Assessment equipment to ensure operational realism.
 - The Army Threat Systems Management Officer conducted an adversarial cybersecurity assessment from August 11 – 15, 2014. The test team investigated deficiencies identified during the IOT&E in 2012, and conducted passive scans of the AH-64E and its associated networks.
- The Army completed system-level ballistic vulnerability and personnel protection analyses of the Lot 4 AH-64E with RCEFS and the latest armor configuration and provided a draft report in August 2014.
- The Army conducted infrared survivability testing in September 2014 at Redstone Arsenal, Alabama. The test compared the susceptibility of the Lot 4 AH-64E equipped with Aircraft Survivability Product Improvements (ASPI) with the susceptibility of the Lot 4 AH-64E without ASPI to infrared threat seekers.

Assessment

- FOT&E I was adequate and demonstrated that Link 16 enhances the operational effectiveness of Lot 4 AH-64E-equipped units.
 - Air Weapons Teams equipped with Link 16 enhanced joint interoperability. The aircrews exchanged Link 16 message sets indicating their location, heading, weapons, and fuel status with live and simulated Air Force fighters and command and control aircraft.
 - Lot 4 AH-64E Air Weapons Teams found small-target formations on average seven minutes faster using Link 16 target tracks than when using other onboard sensors. Large target formations with five or more vehicles were detected just as quickly with other onboard sensors as when using Link 16 data.
 - Link 16 targeting data cluttered the aircrew's display and increased pilot workload when five or more targets were present. In an environment with less than five targets, Link 16 targeting data aided the aircrew's target acquisition and reduced pilot workload. Total aircrew workload during the test, including the use of Link 16, was low.
 - Lot 4 AH-64E aircrews used the Small Tactical Terminal Radio to participate in a joint Link 16 environment with live and simulated Air Force fighters and command and control aircraft. The Small Tactical Terminal Radio experienced no critical or operational mission failures, remained synchronized with the network 87 percent of the time, and demonstrated a 95 percent message completion rate.
- Air-to-Air-to-Ground video transfer enhanced the Lot 4 AH-64E Air Weapons Team's situational awareness. The aircrews transmitted video between aircraft in flight and to the maneuver operations center on the ground. Aircrews provided favorable feedback on the video quality and utility.
- The Enhanced Image Intensified Television mode of the Pilot Night Vision System enhanced performance and improved the pilot's ability to see light sources and avoid obstacles at night.
- The adversarial cybersecurity assessment found that a vulnerability of the Apache electronics architecture identified during the IOT&E in 2012 has been addressed and identified new cybersecurity vulnerabilities on the Lot 4 AH-64E and interfacing systems.
- The Lot 4 AH-64E remains operationally suitable and demonstrated improvements in reliability, availability, and maintainability compared to Lot 1 AH-64E operational test results. Transfer of in-flight maintenance data to a ground-based maintenance section while the aircraft is in mission profile was successful. The System-Level Embedded Diagnostics aided in aircraft recovery after mission completion.
- The Lot 4 AH-64E remains as survivable as the Lot 1 AH-64E against ballistic threats. Survivability against infrared threats is degraded compared to the Lot 1 AH-64E. Infrared threat acquisition ranges are unchanged or increased. Flare

FY14 ARMY PROGRAMS

effectiveness is decreased depending on the threat and the flight profile of the aircraft.

- Consistent with the IOT&E evaluation, radar- and laser-warning systems were not effective during FOT&E I and degraded pilot situational awareness. Threat-warning systems performed poorly and are not effectively integrated on the aircraft. Aircrews received frequent false alarms, had no selective volume control of the warning systems, and experienced cluttered or conflicting threat displays. Aircrews ignored radar- and laser-warning systems that continuously announced inaccurate threat identifications.
- Lot 4 AH-64E enhancements add 700 pounds to the aircraft compared to Lot 1 AH-64E.
- External fuel tanks met ballistic survivability requirements and supported all FOT&E I missions. The RCEFS revealed no threat of sustained fire or catastrophic structural failures.
- The updated system-level vulnerability and force protection assessments for the Lot 4 AH-64E showed sustained ballistic protection of the aircraft and crew.

Recommendations

- Status of Previous Recommendations. The Army has addressed some recommendations from the FY12 Apache Block III Annual Report. The following recommendations have not been fully implemented:
 1. Consider incorporating improvements to current threat-warning systems as they are developed. Upgrade

radar- and laser-warning systems and provide for adjustable controls for each warning system.

2. Address pilot's confidence concerns with regard to the transmission design. Investigate the feasibility of alternate transmission designs that provide redundant hydraulic and electrical power in the event of loss of power to the tail rotor.
 3. Perform a structural analysis of the composite main rotor blades to better understand the load-carrying capabilities of the blade that was damaged during ballistic testing.
- FY14 Recommendations. The Army should:
 1. Improve infrared countermeasures performance, upgrade radar- and laser-warning systems, and improve integration of aircraft survivability equipment on the Lot 4 AH-64E.
 2. Address demonstrated cybersecurity vulnerabilities. Plan and conduct unconstrained exploitation of vulnerabilities during adversarial cybersecurity testing.
 3. Modify aircraft performance charts and aircraft software to allow mission planning using actual engine performance ratings.
 4. Continue development of Link 16 capabilities and conduct follow-on testing during FOT&E II.
 5. Develop procedures to establish and maintain independent Link 16 training networks.

FY14 ARMY PROGRAMS