

AH-64E Apache

Executive Summary

- The Army completed FOT&E II of the Version 6 AH-64E in 3QFY19. FOT&E II included training, realistic comparative force-on-force tactical scenarios with Version 4 AH-64E aircraft, live ordnance firing, and adversarial cybersecurity testing.
- The Version 6 includes numerous enhancements that improves the lethality, operational effectiveness, and survivability of the AH-64E.
- The Modernized Day Sensor Assembly (MDSA) increases the range at which aircrews can positively identify targets during daytime conditions allowing for greater standoff engagement ranges. The Modernized Radar Frequency Interferometer (MRFI) provides passive geolocation of emitting radar threats. The addition of a maritime mode and extended range of existing modes on the Fire Control Radar (FCR) expands engagement opportunities.
- Manned-Unmanned Teaming (MUMT) effectiveness for Version 4 and Version 6 units was limited during FOT&E II. Aircraft interfaces, employment concepts, procedures, and documentation are not mature and contributed to the lack of interoperability between AH-64E aircraft and unmanned aircraft systems.
- The Version 6 Adversarial Assessment (AA) revealed no critical vulnerabilities that would immediately lead to the degradation of the aircraft's confidentiality, availability, or integrity from an insider or nearsider threat posture.
- The Army completed joint live fire testing of the fire detection and expansion system, demonstrating an increase in force protection in the case of tail boom fires.

System

- The AH-64 Apache Attack Helicopter is a tandem cockpit, four-bladed, twin-engine helicopter that operates in all tactical environments. The aircraft type was first fielded as the AH-64A in 1986 and has undergone two major modernizations: AH-64D in 1997 and AH-64E in 2012.
- The Version 6 AH-64E is the final planned modernization of the AH-64D. The Army will continue the AH-64D modernization program, which remanufactures aircraft into the Version 6. It will institute a retrofit program to update all earlier versions of the AH-64E to the Version 6. The Apache will sustain the Army's Attack Helicopter fleet through 2050.
- The Army uses the AH-64E in Attack Reconnaissance Battalions assigned to Combat Aviation Brigades. Each battalion has 24 aircraft. The current Army procurement objective is 791 aircraft.
- The Version 6 adds the MDSA to the Modernized Target Acquisition Designation Sight, integration of the Joint Air-to-Ground Missile (JAGM), the Cognitive Decision Aiding System to improve pilot situational awareness, a Data



Correlation Engine to merge icons, and the Fire Detection and Expansion System to improve survivability in the event of an onboard fire.

- The Army intends Version 6 to improve and expand the capabilities of the FCR by adding a maritime capability and expanding ranges of existing capabilities, updates to an MRFI to provide passive detection and geolocation of emitting radar threats, and expanding unmanned capabilities with the MUMT – eXpanded (MUMT-X), which increases interoperability control of unmanned platforms and improves Link-16 functionality.

Mission

The Joint Force Commander and Ground Maneuver Commander employ AH-64E-equipped units to shape the area of operations and 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
- Targeting Sensors and Unmanned Aircraft System datalink:
 - Longbow Limited Liability Company – Orlando, Florida, and Baltimore, Maryland
 - Lockheed Martin Corporation – Orlando, Florida, and Owego, New York
- L3 Communications Systems – Salt Lake City, Utah

FY19 ARMY PROGRAMS

Activity

- The Army completed all testing in accordance with a DOT&E-approved Test and Evaluation Master Plan, operational and live fire test plans, and Live Fire Strategy.
- Developmental testing of Version 6 software and major subsystems in 2018 revealed multiple performance deficiencies. One or more deficiencies affected the Multi-Core Mission Processor, Modernized Radar Interferometer, the Fire Control Radar, the Target Acquisition Designation Sight, and MUMT. The discovery of these problems resulted in postponement of the planned Version 6 FOT&E until FY19. DOT&E supported the Army decision to fix problems discovered and delay FOT&E II.
- In 2019, the Army conducted development and regression testing of subsystems to verify that fixes to the problems discovered in FY18 had been corrected. This testing verified the functionality of the pilot vehicle interface for employment of the JAGM missile.
- Apache aircraft supported integrated testing of 70 JAGM missiles using Version 4.5 and Version 6 Apache software.
- The Army conducted a Cooperative Vulnerability and Penetration Assessment in September 2017 and conducted an AA of the Version 6 in June 2019.
- The Army completed FOT&E II for the Version 6 in 3QFY19. FOT&E II included training, realistic comparative force-on-force tactical scenarios with the Version 4 aircraft, live ordnance firing, and adversarial cybersecurity testing.
- In August 2018 and May 2019, the Army Research, Development and Engineering Command/Survivability/Lethality Analysis (RDECOM/SLAD) performed Joint Live Fire-funded tests under operationally representative flight loading to assess the effectiveness of a fire barrier and fire-resistant intumescent paint previously added to production AH-64s to minimize fire-induced damage effects.
- Testing of the onboard engine nacelle halon fire suppression system is delayed and is now expected to begin in 2QFY20.
- New Link 16 functionality reduced target acquisition timelines for threat radars and helped coordinate engagements among Apache aircrews. The FCR added maritime engagement modes and increased target ranges for existing modes.
- While most of the enhancements worked as the Service anticipated, improvements to MUMT-X could not be demonstrated in an operational environment. When connectivity could be established, interoperability showed no improvement over that of the MUMT-2 found on legacy AH-64D/E platforms.
- MUMT effectiveness for Version 4 and Version 6 units was limited during FOT&E. Interoperability and video sharing between AH-64E Apaches, unmanned aircraft systems, and ground stations is complicated and requires exacting pre-mission coordination of technical information across multiple organizations and systems. Aircraft interfaces, employment concepts, procedures, and documentation are not mature and contributed to the lack of interoperability between AH-64E aircraft and unmanned aircraft systems.
- Version 6 aircraft have improved operational suitability compared to Version 4. Pilots report that the Version 6 is easier to use and has lower workload than the Version 4. Version 6 aircraft are as reliable, available, and maintainable as Version 4 aircraft and achieved reliability requirements with statistical confidence.
- Version 6 units were more survivable than Version 4 units during FOT&E II. MRFI provided automatic, passive detection of radar threat locations. MDSA assisted in pinpointing threat emitter locations to enable Version 6 units to find and engage threat radars at a rate 4.5 times higher than Version 4 units. Lacking a similar level of threat awareness, Version 4 units maneuvered cautiously through the objective area, taking care to remain below line-of-sight, but often failing to find and defeat threat radars during the mission.
- Joint Live Fire testing of the loaded tail boom with fire barrier and intumescent paint demonstrated a 2.5 minute increase in the time before the structure degraded and the tail boom failed. Version 6 with the fire detection and expansion system provides improved force protection over legacy Apache aircraft without these modifications.

Assessment

- Version 6 have improved operational effectiveness compared to the units equipped with Version 4. Version 6 units had higher mission success scores and engaged targets at greater ranges than Version 4 units.
- The JAGM employment timeline was comparable to that of HELLFIRE missiles and provides increased capability against countermeasures and targets at longer ranges.
- The Version 6 Adversarial Assessment conducted in 3QFY19 revealed no critical vulnerabilities that would immediately lead to the degradation of aircraft confidentiality, availability, or integrity from an insider or nearsider threat posture.

Recommendation

1. The Army should improve interoperability with unmanned aircraft systems, simplify pilot vehicle interfaces, and improve training documentation for MUMT.