

## Apache Block III (AB3) Upgrade

### Executive Summary

- In September 2010, the USD(AT&L) granted Milestone C approval permitting low-rate initial production of the first 51 remanufactured Apache Block III (AB3) aircraft.
- In response to deficiencies noted during the November 2009 Limited User Test (LUT), the AB3 program redesigned and retested the Integrated Helmet and Display Sight System (IHADSS) and made software corrections.
- The Army continued developmental testing of subsystems including the AB3 transmission and drive system, the Modernized Targeting Acquisition Designation Sight (M-TADS), voice communication and navigation subsystems, IHADSS, Fire Control Radar (FCR), and the rocket and gun systems.
- The program continues to collect, report, track, and score reliability, availability, and maintainability data and pursue corrective actions to improve reliability.
- The Army has begun interoperability flight testing between the AB3 and the Gray Eagle unmanned aircraft system (UAS).
- The Army Research Lab completed all ballistic tests in accordance with the AB3 Alternative LFT&E Strategy. Analysis of data is ongoing and a vulnerability assessment is scheduled to be completed by 2QFY12.

### System

- The AB3 is a modernized version of the AH-64D Attack Helicopter that is intended to sustain the Apache fleet through the year 2040. The Army intends to organize the AB3 in Attack/Reconnaissance Battalions assigned to the Combat Aviation Brigades. Each Battalion will have 24 aircraft.
- The Army acquisition objective is 690 AB3 aircraft: 634 remanufactured and 56 new builds.
- The AB3 aircraft increase in capability includes:
  - Level 2 through 4 UAS control
    - Level 2 receives UAS video feed
    - Level 3 controls the UAS sensor
    - Level 4 controls the sensor and flight of the UAS
  - Improved Radar Electronic Unit to provide radio frequency interferometer passive ranging, extended fire control radar range, and maritime targeting capability
  - Improved performance with 701D engines, composite main rotor blades, weight reduction through processor and avionics upgrades, and an improved drive system



- Enhanced survivability with integrated aircraft survivability equipment and additional crew and avionics armoring
- Enhanced communication capability, which includes satellite communication and Link 16 datalink, and an integrated communication suite to meet global air traffic management requirements
- Improved reliability and maintainability using embedded system-level diagnostics, improved electronic technical manuals, and reduced obsolescence

### Mission

The Attack/Reconnaissance Battalions assigned to the Combat Aviation Brigade will employ the AB3 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 UAS datalink: Longbow Limited – Orlando, Florida, and Baltimore, Maryland

### Activity

- The USD(AT&L) granted Milestone C approval in September 2010 permitting low-rate initial production of the first 51 remanufactured aircraft. The Army inducted

the first airframe in March 2011 and the program expects to complete the first fully-assembled production AB3 aircraft in October 2011.

# ARMY PROGRAMS

- Following the November 2009 DOT&E-approved LUT, the program continued developmental testing with two fully-configured AB3 prototype aircraft and one Improved Drive System-configured aircraft used for performance and flight maneuvers testing. As of September 30, 2011, the AB3 program completed 1,587 developmental flight test hours. IOT&E is scheduled for April 2012.
- In response to deficiencies noted during the LUT, the program redesigned the IHADSS helmet to improve its fit and functionality, and has made software corrections to make it easier to adjust radio squelch, provide feedback to the pilot while changing radio frequencies, simplify UAS linkup procedures, and achieve compliance with interoperability standards.
- Developmental testing completed since the LUT included:
  - Laser designation and rangefinder accuracy and boresight retention testing of the M-TADS
  - Characterization and vibration analysis of the 30 mm gun
  - Ground and flight testing of the voice communication and navigation subsystems
  - Pilot evaluation of the IHADSS
  - Flight testing of the covert lighting system and flight performance and handling qualities evaluation
  - Endurance qualification and oil-out testing of the AB3 transmission and drive train
  - Regression testing of the FCR
  - Accuracy and verification testing of the rocket system
- The AB3 program conducted a Logistics Demonstration from January to March 2011 at the Boeing facilities in Mesa, Arizona.
- The program continues to collect, report, track, and score reliability, availability, and maintainability data and pursue corrective actions to improve reliability.
- In March and July 2011, the Army conducted manned-unmanned teaming exercises at El Mirage, California, to assess AB3 interoperability with the Gray Eagle unmanned aircraft and the One-System Ground Control Station.
- In August 2011, the Army collected infrared and ultraviolet signature measurements of the AB3 in-flight at Redstone Arsenal, Alabama. This data will be used to evaluate AB3 survivability against man-portable infrared air defense systems.
- The Army Research Lab completed all ballistic tests in accordance with the DOT&E-approved AB3 Alternative LFT&E Strategy. This included system-level dynamic and subsystem-level static shots against the drive system and the composite main rotor blades, and static shots against the redesigned crew armor.
- During flight testing, pilots discovered that the M-TADS video vibrates excessively during certain flight regimes. Subsequent testing revealed that the cause of the vibration was the natural frequency of the TADS Electronics Display and Control overlays with the main rotor frequency. The Army is exploring options to correct the problem.
- The Logistics Demonstration suggests that AB3 is largely supportable with the current technical manual and tools. Maintenance personnel completed 3,282 AB3-unique maintenance tasks using the draft Interactive Electronic Technical Manual (IETM). Maintainers accepted approximately 97 percent of these tasks with minor changes for incorporation into the IETM. The program plans to retest the 101 rejected tasks in a follow-on logistics demonstration in 3QFY12.
- The Army reviewed the damage incurred during static and dynamic ballistic tests performed on the new composite main rotor blades and improved drive system components in September 2011. The Army is updating their vulnerability model by incorporating these results. The model, along with the results of ballistic and non-ballistic testing, will be used to make an overall assessment of the aircraft's vulnerability in 2QFY12.
- In Limited Verification Testing of the AB3 FCR, the radar met or exceeded 37 of 44 specification thresholds. Where the AB3 FCR did not meet thresholds, it performed as well or better than the legacy FCR.
- Interoperability testing between the AB3 and Gray Eagle unmanned aircraft is ongoing. Ground and flight testing between the Gray Eagle and AB3 programs have identified the following connectivity problems:
  - A difference in frame size of the video output from Gray Eagle (640 x 480 pixels) and the frame size expected by AB3 (720 x 480 pixels)
  - Sensor movement commands sent from AB3, when received by Gray Eagle, were inverted; when the AB3 pilot wanted the sensor to slew up it went down, and when he wanted it to slew right it went left
  - Differences in the data rate and data format between AB3 and Gray Eagle

## Recommendations

- Status of Previous Recommendations. The Army continues to address all FY09 and FY10 recommendations. The results of developmental testing and the IOT&E will provide data to assess the progress in each area.
- FY11 Recommendations. The Army should:
  1. Assess the operational impact of M-TADS video vibration during the IOT&E.
  2. Resolve the connectivity problems discovered during interoperability testing between AB3 and Gray Eagle before IOT&E.

## Assessment

- The AB3 demonstrated compliance with all of the flight performance thresholds with the exception of Hover Out-of-Ground Effect. The Hover Out-of-Ground Effect capability met 99 percent of the performance requirement. The 1 percent shortfall should have little operational impact.