

## UH-60M Black Hawk Upgrade Utility Helicopter

### Executive Summary

- UH-60M Baseline demonstrated performance during operational testing exceeded requirements for internal lift, external lift, and self deployment; is more reliable than the current UH-60A/L; and overall susceptibility to surface-to-air threats is lower when compared to the legacy UH-60A/L aircraft.
- The UH-60M Upgrade Test and Evaluation Master Plan (TEMP) is adequate to evaluate technical issues associated with pre-planned product improvements and to determine the operational effectiveness and suitability of the UH-60M Black Hawk Upgrade. The Army extended the LFT&E program during FY08 to adequately address pre-planned product improvement changes that may affect vulnerability of the aircraft.
- The Army completed a Limited Users Test (LUT) for the UH-60M Upgrade in the System Integration Laboratory at Redstone Arsenal, Alabama, during October 2008. LUT results along with limited developmental testing data are intended to inform a Low-Rate Initial Production (LRIP) cut-in decision currently scheduled for December 2008, for not more than 11 UH-60M Upgrade aircraft.
- The contractor conducted qualification ballistic testing of the new servo actuators and the composite tailcone. The Army also updated an earlier vulnerability assessment that includes the latest live fire test results of various components that have been tested during the last two years. Results of the ballistic testing identified component design shortcomings that are being addressed in the re-design. Follow-on ballistic testing will be required to evaluate the damage tolerance of the new component designs.

### System

- The UH-60M Baseline and UH-60M Upgrade are modernized UH-60A or UH-60L Black Hawk medium-lift helicopters.
- The Assault Helicopter Battalion is organized as three companies of 10 aircraft each.
- The acquisition objective is for 1,806 UH-60M Black Hawks, with 1,227 projected to be UH-60M variant and the remaining to be UH-60Ls. The program projects that 199 aircraft will be UH-60M Baseline aircraft, and the remaining 1,028 will be UH-60M Upgrade aircraft.
- The UH-60M Baseline aircraft include:
  - Digital cockpit with Blue Force Tracker



- Power and airframe improvements with the 701D engine, wide chord blades for enhanced performance, and monolithic machined parts that should provide structural improvement over the A/L model Black Hawk
- Improved survivability with enhanced laser warning and infrared suppression for anti-missile defense
- The UH-60M Upgrade design adds:
  - Fly-by-wire (FBW) advanced flight controls
  - A Common Avionics Architecture System (CAAS) and networked digital connectivity for enhanced commonality with other Army aircraft
  - Improved handling qualities optimized for minimum pilot workload and increased safety in degraded environments
  - Composite tailcone and tail rotor drive shafts, and new main and tail rotor actuators

### Mission

Assault Aviation and General Support Aviation Battalions will employ the UH-60M Upgrade to conduct the following missions:

- Air Assault lift for 11 combat Soldiers or equipment less than 9,000 pounds for mobile strike and counter mobility operations
- Sustainment Operations to resupply the force through internal and external cargo lift capability
- Casualty and medical evacuation
- Command and control

### Prime Contractor

- Sikorsky

### Activity

- DOT&E approved the updated UH-60M Upgrade TEMP on January 10, 2008.
- In FY08, as part of the updated Army LFT&E program, the contractor performed qualification ballistic testing of the

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composite tail cone assembly, and the new servo actuators. Results of the ballistic testing identified component design shortcomings, which are being addressed in the re-design. Follow-on ballistic testing will be required to evaluate the damage tolerance of the new component designs. An updated vulnerability assessment incorporates recent ballistic test results since the earlier assessment.

- The Joint Live Fire (JLF) program conducted a series of ballistic tests in May 2008 on the main rotor mast and mast extension under static condition (no load applied) to determine the extent of damage of these components when impacted by armor piercing projectiles.
- During FY08, the Army conducted testing and integration of UH-60M Upgrade pre-planned product improvements such as the fly-by-wire advanced flight controls and CAAS cockpit integration primarily in flight simulation laboratories at the contractor's facilities.
- Both risk reduction testing using the Rotorcraft Aircrew Systems Concepts Airborne Laboratory (RASCAL) research helicopter and specific Special Operations Forces testing are complete.
- A combined contractor and government test team began developmental ground testing in June 2008 and flight testing in August 2008, on two prototype UH-60M Upgrade aircraft. Initial testing is focused on the FBW advanced flight controls and CAAS cockpit integration.
- The Army conducted a LUT for the UH-60M Upgrade in the System Integration Laboratory at Redstone Arsenal, Alabama, in October 2008. Army pilots conducted 18 tactical and non-tactical utility helicopter missions in a simulated operational environment. Primary areas of evaluation were pilot-vehicle interface, cockpit workload, and situational awareness.
- In September 2008, the Army proposed a risk reduction plan by modifying the Acquisition Strategy that would add an additional LRIP decision supported by a second LUT currently scheduled for 4QFY09.

## Assessment

- LUT results along with limited developmental test data will inform a LRIP cut-in decision currently scheduled for December 2008, for not more than 11 UH-60M Upgrade aircraft. The UH-60M Upgrade IOT&E is currently scheduled for 2QFY10.

- The Army executed the UH-60M Upgrade operational and live fire testing in accordance with DOT&E-approved test plans.
- Assembly and flight control system software development delayed the first flight from February 2008 to August 2008, and the overall developmental flight test program and LUT execution, causing the cut-in initial production decision to slide from September to December 2008. This delay impacts the projected lead time required to build LRIP aircraft for instructor and key personnel training and the IOT&E. The program intends to complete 409 developmental test flights hours and 120 operator training flight hours prior to the IOT&E start.
- Approval of an additional LRIP decision supported by a second LUT will require a robust user test with production representative aircraft flying operational missions after updates to the Acquisition Strategy, TEMP, and detailed test plans.
- Qualification ballistic test results to date have provided the contractor valuable data about the damage tolerance of the new servo-actuators and composite tailcone and drive shaft components for final redesign.

## Recommendations

- Status of Previous Recommendations. The May 2007 DOT&E combined OT&E and LFT&E Report for the UH-60M Baseline aircraft included a set of 14 recommendations to improve operational effectiveness, suitability, and survivability. The Army will address these 14 recommendations on the UH-60M Upgrade aircraft.
- FY08 Recommendations. The Army should continue to conduct event-driven testing as outlined in the approved UH-60M Upgrade TEMP, to include the following:
  1. Reduce the potential for transmission gearbox chip detector screen blockage resulting from ballistic hits to the main transmission assembly.
  2. Install an additional fire detector and fire suppression agent dispenser nozzle to the engine nacelle compartment, add fire detection and extinguishment to the fuel plumbing enclosure, and reinforce the latch mechanism of the engine nacelle door.
  3. Address the ballistic damage tolerance and provide structural analysis of the new monolithic structural frames.