

UH-60M BLACK HAWK



The UH-60 BLACK HAWK is a single rotor medium-lift helicopter that provides utility and assault lift capability in support of the full spectrum of combat and peacetime missions. The BLACK HAWK is the primary helicopter for air assault, general support, and aeromedical evacuation. The BLACK HAWK can also be configured to perform command and control, electronic warfare, and special operations missions.

BACKGROUND INFORMATION

The Army began fielding the UH-60A in 1978. A 1989 power train upgrade resulted in a model designation change from UH-60A to UH-60L. Since 1989, the Army has procured about 539 of the newer UH-60L models, but has not modernized the previously fielded UH-60A aircraft. Procurement of 60 more UH-60L BLACK HAWKs is funded through FY05. Commencing in 2002, the Army plans to recapitalize 193 UH-60A aircraft until these aircraft can be inducted into the UH-60M program in 2006.

The Operational Requirements Document approved in March 2001 establishes a blocked approach to development and modernization. The near-term Block 1 aircraft, the UH-60M, is intended to extend airframe service life while providing a digital cockpit, improved performance, and improved reliability and maintainability (relative to the UH-60A) for the Black Hawk fleet. The Block 2 requirements establish the UH-60X Black Hawk with significantly increased performance and survivability requirements. The Army plans to leverage new engine technology that will provide increased lift capability, while improving fuel efficiency. Survivability of the UH-60X is intended to be enhanced by two systems in development now: the Suite of Integrated Radio Frequency Countermeasures and the Suite of Integrated Infrared Countermeasures; and by improving the ballistic damage tolerance of the fuel subsystem, flight controls, and the main and tail rotor systems.

In May 2000, OSD approved the TEMP for Block 1 (UH-60M) testing of the BLACK HAWK modernization program. In August 2000, USD (A&T) waived the requirement for full-up, system level LFT&E based on an alternate plan approved by DOT&E. Lastly, the TEMP was updated and approved by OSD in 1QFY02.

TEST & EVALUATION ACTIVITY

The Army successfully developed, integrated, and operationally tested a modified UH-60L medical evacuation Black Hawk, the UH-60Q, with a semi-digital cockpit that will be the baseline for the UH-60M configuration. While finding that pilot situational awareness was enhanced significantly, the Army encountered electromagnetic interference problems with the UH-60Q cockpit during developmental testing. Follow-on electromagnetic environmental effects (E3) testing of the UH-60Q should show that subsequent integration and modifications have addressed these E3 problems specific to the MEDEVAC aircraft.

Working in concert with industry, the Army has conducted flight testing of the wide chord blade (WCB) and the advanced flight control computer (AFCC). Both technologies will be installed on the UH-60M. The WCB offers increased lift, range, and speed as well as reduced procurement and maintenance costs compared to the current Black Hawk blades. The dual AFCC, coupled with a new digital Flight Director, will retain current functionality while enhancing aircraft handling qualities, reducing pilot workload, and improving flight safety margins while conducting low speed tactical missions under limited visibility conditions.

The alternative LFT&E plan will be conducted in two phases (static and dynamic). The first phase will consist of ballistic vulnerability tests performed on individual components, while the second phase will address system-level vulnerability. In addition, the LFT&E program will take advantage of ongoing Navy (MH-60R and MH-60S programs) LFT&E activities and will cost-share some of the required testing.

Currently, the program has procured several damaged Army and Navy H-60 family aircraft, and a fully operational, but not flight worthy, prototype YCH-60 that will serve as the ground test vehicle. The availability of these actual components should provide the majority of the hardware required for the conduct of the LFT&E program. First phase ballistic testing was initiated during 3QFY01 and will continue through FY04, while second phase dynamic ballistic testing will begin in 1QFY02 and continue through 4QFY04.

TEST & EVALUATION ASSESSMENT

The primary technical risk for the UH-60M is the digital cockpit. Thus far in developmental testing, the operational benefits of the digital cockpit have not been convincingly demonstrated. In post-flight surveys, pilots believe that digital cockpits improve their own awareness of aircraft status and the tactical situation, but the benefits to the aviation commander and supported units are unknown. The Army has not yet demonstrated effective digital communications. The UH-60M test program will provide ample opportunity to evaluate the effectiveness of the digital cockpit.

The Army tested the WCB on the UH-60A/L last year. Handling qualities were unchanged from those with standard blades with two exceptions.

Migration of Cyclic Control. The UH-60A/L with WCBs installed exhibited a left lateral stick migration during turns. The migration was more pronounced in right hand turns at higher loading and steep angles of bank, maneuvers near the edge of the performance envelope. Unless corrected, this deficiency could result in loss of controlled flight when attempting to recover from steep right-hand rolls

in a dive at low altitude. Currently, the program office is conducting a 12-month risk reduction effort that will address this deficiency prior to the UH-60M system Preliminary Design Review (PDR).

Vibration. Lateral vibration levels were slightly higher with the WCB installed on UH-60L aircraft than with the standard blades. Testing demonstrated that roll absorbers must be installed for WCB vibration levels to be acceptable. While existing UH-60L roll absorbers corrected for most vibrations, the lateral component of vibration due to WCBs was not fully corrected. To rectify this situation, the UH-60M program will implement an Active Vibration Control (AVC) system in place of the fielded UH-60A/L passive vibration control system. The AVC will provide a lighter weight system and correct the vibration levels to an acceptable level.

The current aircraft design weight barely allows the UH-60M to achieve its external lift requirement. Specific plans for refurbishment of the airframe are yet to be decided. Selection and design of digital cockpit components will be finalized by system PDR. Solutions to the vibration and cyclic control problems induced by the WCB may result in increased airframe structure, and thus increased overall weight. These issues, coupled with the historic weight growth of aircraft programs in development, may degrade aircraft performance to the point that satisfactory demonstration of the external lift requirement may be at risk.

The LFT&E plan takes into account vulnerability reduction features that have been incorporated into the Black Hawk since its initial fielding in 1978. This plan also will use combat damage experience, subsystem qualification efforts, computer modeling and simulation, as well as sister Services' testing on similar aircraft through the H-60 (Army/Navy) Combined LFT&E Integrated Product Team. The initial component testing on the Main Rotor Flight Controls has been completed. The Main Rotor Flight Controls included the main rotor pitch control links and the swash plate, under static flight loads. Actual results are classified but the initial indications are favorable (improved survivability) for the two improved components tested to date.

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