

CH-47F – Chinook Cargo Helicopter

Executive Summary

- DOT&E published a combined OT&E/LFT&E report in June 2007 and found that the CH-47F is operationally effective, suitable, and survivable.
- The CH-47F successfully accomplished 10 of 10 assigned assault and lift missions during the IOT&E Phase II. The aircraft exceeds performance requirements for internal lift, external lift, and self deployment.
- During the operational test, the CH-47 did not have a mission abort and reliability failures were infrequent. CH-47F aircraft exceeded reliability and maintainability requirements and were available for mission assignment 90 percent of the time.
- Operational and live fire testing demonstrated that the CH-47F is survivable in expected threat environments.
- The Army conducted realistic operational testing of two production Block II CH-47F aircraft during the IOT&E Phase II from March 6 - 27, 2007, at Fort Campbell, Kentucky. IOT&E Phase II included a five-day battalion-level field deployment and executed 20 aircraft sorties.

System

- The CH-47F is a remanufactured and modernized CH-47D Chinook Helicopter.
- The CH-47F is designed to transport artillery and light equipment up to 16,000 pounds, or 31 combat troops.
- The CH-47F program fulfills the Army Aviation Transformation Chinook requirement for upgraded aircraft with both remanufactured and new aircraft. The acquisition objective is 452 CH-47Fs (333 rebuilt aircraft and 119 new aircraft).
- The CH-47F incorporates:
 - A Common Avionics Architecture System cockpit to increase crew situational awareness and increase cockpit commonality with other Army aircraft
 - A Digital Automatic Flight Control System to improve handling qualities and decrease pilot workload



- Engine upgrades for increased power
- Fuselage stiffening, corrosion protection, and a new monolithic airframe structure to reduce cockpit vibration and increase airframe durability

Mission

- The CH-47F provides lift capability to the ground tactical commander by rapidly projecting tactical airlift support and supply sustainment to accomplish critical tasks.
- General Support Battalions of the Multi-Functional Aviation Brigades equipped with the CH-47F will:
 - Conduct air assault missions to transport ground forces
 - Conduct resupply operations to move fuel, ammunition, and other battle-critical cargo
 - Conduct mass casualty evacuation
 - Support peacetime missions of logistics resupply, medical evacuation, disaster relief, and fire-fighting
- CH-47F equipped units employ the aircraft in single or multi-ship formations to execute air assault and resupply operations as an integrated element of a combined arms team.

Activity

- DOT&E approved the CH-47F Test and Evaluation Master Plan (TEMP) on January 5, 2007, and test plan on February 20, 2007.
- During October and November of 2006, CH-47F production aircraft flew a 100-hour flight test program. Testing included establishing aircraft flight characteristics, Information Assurance, electromagnetic environmental effects, joint interoperability, and Common Missile Warning System integration.
- Developmental testing in FY07 resulted in an airworthiness certification and demonstration of acceptable aircraft handling qualities for entry into IOT&E Phase II.
- Digital communications capabilities of the CH-47F during the Software Block 1 testing demonstrated that the CH-47F can successfully exchange digital messages via Blue Force Tracker with various Army aircraft and beyond line-of-sight operations centers.

ARMY PROGRAMS

- The Army conducted realistic operational testing of two production Block II CH-47F aircraft during the 62.7 hour IOT&E Phase II from March 6-27, 2007, at Fort Campbell, Kentucky. IOT&E Phase II included a five-day battalion level-field deployment and executed 20 aircraft sorties.
- During FY07, the Live Fire Integrated Product Team analyzed three deficiencies found during previous CH-47F testing. The three issues include insufficient concentration of Halon fire extinguishing agent for the engine fire detection and suppression system, incomplete dynamic main rotor blade testing, and the vulnerability of the synchronization and main rotor drive shafts.
- The Army investigations during FY07 included an analysis of CH-47F vulnerability to man-portable air defense system (MANPADS) and an analysis of damage tolerance of the new high-speed machined monolithic airframe components.

Assessment

- CH-47F IOT&E Phase II and live fire testing were executed in accordance with the DOT&E-approved test plans. CH-47F test plans and execution were adequate to assess operational effectiveness, suitability, and survivability.
- DOT&E published a combined OT&E/LFT&E report in June 2007 and found that the CH-47F was operationally effective, suitable, and survivable.
- The CH-47F is operationally effective. The CH-47F Block II successfully accomplished 10 of 10 assigned assault and lift missions during the IOT&E. The aircraft exceeds performance requirements for internal lift, external lift, and self deployment. The digital map and other cockpit enhancements reduce pilot workload, although some improvements in subsystem integration to the Aviation Mission Planning System and Flight Management System to include digital messaging are necessary. More cargo handling systems would assist in mission accomplishment.
- The CH-47F is operationally suitable. During the operational test, the CH-47 did not have a mission abort and reliability failures were infrequent. CH-47F aircraft exceeded reliability and maintainability requirements and were available for mission assignment 90 percent of the time. While mission accomplishment was demonstrated, an expanded program is needed for crew training for digital communications, operation of the Flight Management System, and Aircraft Survivability Equipment.
- Operational and live fire testing demonstrated that the CH-47F is survivable in expected threat environments. The APR-39A radar warning receiver performance was poor.

- Live fire assessments include:
 - The engine fire detection and suppression system testing showed the current system does not meet the specified Halon concentration level requirements.
 - Static test results and analysis conducted were sufficient to accurately estimate ballistic threats to the main rotor blades.
 - The vulnerability of the synchronization and main rotor drive shafts is no more vulnerable than the CH-47D.
 - The man-portable air defense system vulnerability analysis remains to be validated.
 - The results of the structural analysis of the monolithic frames indicate the structure is no more vulnerable than the original built-up frames.

Recommendations

- Status of Previous Recommendations. The Army satisfactorily resolved all previous recommendations.
- FY07 Recommendations. The June 2007 DOT&E combined OT&E and LFT&E Report included a set of 10 recommendations to the Army to improve operational effectiveness, operational suitability, and survivability. These included:
 1. Expand integration and continue development of CH-47F subsystems to include:
 - The transfer of Aviation Mission Planning System data to the Flight Management System
 - Tactics, techniques, and procedures for digital messaging in an aviation environment
 - The Common Avionics Architecture System and the Digital Automatic Flight Control System
 - The installation of an effective radar warning receiver or the improvement of the APR-39 radar warning receiver performance to increase threat reporting accuracy for the aircrew
 2. Develop an integrated cargo handling system for each aircraft or increase the number of the current cargo handling systems from two per company to one per aircraft.
 3. Continue to develop maintenance manuals to better address maintenance procedures for new CH-47F helicopters.
 4. Improve the engine compartment fire extinguishing system and add design features to reduce the fuel leaks and fire hazard to the passengers from the fuel plumbing.
 5. Increase crashworthiness with improved crew seats and improved landing gear to accommodate the increased gross weight of the aircraft.