

CH-47 Block II Improved Cargo Helicopter

The CH-47F Block II Cargo Helicopter is operationally effective, suitable, and survivable. The Initial Operational Test and Evaluation (IOT&E) and live fire testing were adequate and executed in accordance with the Director, Operational Test and Evaluation (DOT&E)-approved test plans.

The CH-47F is operationally effective. The CH-47F Block II successfully accomplished 10 of 10 assigned assault and lift missions. The aircraft exceeds performance requirements for internal lift, external lift, and self deployment. The digital moving map and other cockpit displays reduce pilot workload and improve crew situational awareness. The digital map and other cockpit enhancements reduce pilot workload. Improvements in subsystem integration with the Aviation Mission Planning System (AMPS) and the Flight Management System (FMS) are necessary.

The CH-47F is operationally suitable. During the 62.7 hour operational test, the CH-47F 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. The CH-47F has features that provide added flexibility for shipboard operations.

Operational and live fire testing demonstrated that the CH-47F is survivable in expected threat environments. The CH-47F LFT&E program consisted of a review of existing static test data to address the unresolved dynamic test issues from Phase I and includes vulnerability analysis to Man-portable Air Defense Systems (MANPADS).

System Overview

The CH-47F Block II Chinook is a tandem-rotor, heavy lift helicopter that transports personnel and delivers time-sensitive critical supplies. The CH-47F is a multipurpose cargo aircraft equally capable of supporting air assault operations in the mountains of Afghanistan and domestic disaster relief operations. CH-47F aircraft operate in aviation companies of 12 to 15 aircraft assigned to General Support Aviation Battalions. Each aircraft is flown by two pilots, assisted by two crew chiefs in the rear cabin. CH-47F aircrews employ the aircraft in single or multi-ship formations, dictated by mission requirements. The Army approved the original CH-47F requirements on November 17, 1996, and the updated requirements with Change 4 on June 26, 2006.

The CH-47 Chinook helicopter was originally designed in the 1960s. The CH 47F Block I program restored CH-47D airframes to their original condition and extends the aircraft life another 20 years. In addition, the following improvements were designed into the CH-47F Block I aircraft:

- Digital cockpit and interoperability with the Army's Tactical Internet
- Fuselage stiffening to reduce vibrations in the forward cabin

This report covers the CH-47F Block II which has the following enhancements:

- Common cockpit and digital flight control systems
- Monolithic frames to extend airframe durability
- Compliant with Global Air Traffic Management System requirements

In November 2004, the Army Acquisition Executive approved entry of this program into full-rate production based on the results of the Initial Operational Test and Evaluation Phase I of two prototype CH-47F Block I aircraft. The production decision was limited to the MH-47G aircraft for Special Operations Aviation and the initial production of CH-47F Block II aircraft. This report supports the Army decision to continue the production of a total acquisition of 333 CH-47F Block II aircraft, of which 119 will be new-build aircraft. The prime contractor is Boeing.

Test Adequacy

CH-47F test plans and execution were adequate to assess operational effectiveness, suitability, and survivability. The IOT&E and live fire testing were executed in accordance with the DOT&E-approved test plans. Data to support this assessment was collected from operational testing (supplemented by developmental testing) and live fire test as described in the DOT&E-approved Test and Evaluation Master Plan. The Army conducted testing and evaluation for the CH-47F aircraft in two phases. Phase I was conducted in May 2004, and Phase II in March 2007. Phase II of the Initial Operational Test at Fort Campbell, Kentucky, from March 6 to 27, 2007, was adequate to support an assessment of operational effectiveness, suitability, and survivability. This report covers the CH-47F IOT&E Phase II.

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The CH-47F Live Fire Test and Evaluation (LFT&E) was based mainly on prior static testing and new analyses. The CH-47F LFT&E program consisted of a review of existing static test data to address the three unresolved dynamic test issues from Phase I.

Operational Effectiveness

The CH-47F is operationally effective. The CH-47F successfully accomplished 10 of 10 assigned assault and lift missions. Internal and external lift missions were successfully executed in simulated stressful day and night combat environments. The aircraft exceeds performance requirements for internal lift, external lift, and self deployment. The digital moving map and other cockpit displays reduce pilot workload and improve crew situational awareness.

While the CH-47F Block II provides significant improvements over the CH-47D, improvements in subsystem integration to the Aviation Mission Planning System and the Flight Management System are necessary. The radar warning receiver and digital messaging systems were degraded in 50 percent of aircraft sorties. In spite of the degraded subsystems, CH-47F crews successfully completed assigned missions. Adding an integrated cargo handling system or adding the current cargo handling system to each aircraft will improve the operational effectiveness of CH-47F units.

Operational Suitability

The CH-47F is operationally suitable. During the 62.7 hour 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.

The CH-47F has features that provide added flexibility for shipboard operations. Operators found aircraft systems to be, well-integrated, and compatible for human use. Some subsystems warrant redesign or improved training to make them more usable by operational crews. Additional development is needed to improve the electronic maintenance manual.

Operational Survivability

The CH-47F aircraft is operationally survivable in most threat environments. Enhancements to aircraft survivability equipment reduce the probability of successful engagement by enemy infrared-guided missiles.

The Common Missile Warning System (CMWS) provides a significant increase in countermeasure effectiveness against infrared-guided threat missiles compared to the legacy missile warning system. The APR-39A radar warning receiver is not reliable and provides inaccurate warning of radar threat systems, undermining its usefulness against radar-guided threat systems.

The CH-47F is no more vulnerable than the CH-47D, but improvements could be incorporated to increase its survivability. The live fire tests performed earlier, and presented in the 2004 BLRIP report to Congress, indicated that there were three unresolved dynamic tests; specifically the engine fire detection and suppression system, dynamic rotor blades, and the tunnel region. During 2006, halon concentration tests were conducted to evaluate the engine fire suppression system and indicated that the system does not meet required halon concentration levels. Recent analysis includes a MANPADS vulnerability assessment that was postponed from the earlier evaluation. A live fire analysis to evaluate the new monolithic airframe components, determined that the new monolithic structure is no more vulnerable than the CH-47D model to withstand damage after ballistic impacts.

Recommendations

The CH-47F Cargo Helicopter is operationally effective, suitable, and survivable. The CH-47F program executed the IOT&E and live fire testing in accordance with the DOT&E-approved test plans. I recommend the Army consider the following recommendations:

Operational Effectiveness

- Complete integration of Aviation Mission Planning System (AMPS) and the Common Avionics Architecture System (CAAS) interface to transfer mission information such as hazards, phase lines/boundaries, and engagement areas, from the AMPS to the Flight Management System.
- Develop an integrated cargo handling system for each aircraft or increase the number of the current cargo handling system from two per company to one per aircraft.
- Develop aviation tactics, techniques, and procedures for digital messaging in an aviation environment.

Operational Suitability

- Complete integration and testing of the Common Avionics Architecture System and the Digital Automatic Flight Control System.
- Further develop electronic maintenance manuals to better address maintenance procedures for the new F-model systems.

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Survivability

- Ensure that CMWS provides improved protection against infrared missile threats in comparison to legacy infrared jammers.
- Develop an effective radar warning receiver or improve the APR-39 radar warning receiver performance to increase threat reporting accuracy for the aircrew.
- Continue the effort to meet the required halon concentration levels in the engine nacelle, and to evaluate the nacelle fire detection/suppression system when impacted by ballistic threats.
- Add design features to reduce the fuel leaks and fire hazard to the passengers from the fuel plumbing.
- Evaluate the feasibility of using suction fuel pumps to the maximum extent to improve fuel system safety and crashworthiness.
- Include improved crashworthy crew seats (such as those currently used on the Royal Air Force Chinooks), crash attenuating troop seats (like the UH-60L), and an evaluation/improvement in the crash worthiness of the landing gear to accommodate the increase in maximum gross weight from the original 33,000 pounds.

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