

CH-47F Improved Cargo Helicopter Executive Summary

This combined Operational Test and Evaluation and Live Fire Test and Evaluation report provides my evaluation of the CH-47F Improved Cargo Helicopter. Submission of this report fulfills the provisions of Title 10, United States Code, Sections 2399 and 2366. It assesses the adequacy of the operational and live fire test, and the overall operational effectiveness, suitability, and survivability of the Block 1 modifications to the CH-47F Improved Cargo Helicopter.

System Overview

The CH-47F helicopter is a service-life extension and selected component upgrade program for the current CH-47D helicopter fleet. The Army plans for this program to increase performance and extend the aircraft's service life another 20 years. The CH-47F is a twin-turbine tandem rotor heavy lift helicopter designed for combat support, combat service support, and combat assault missions.

The Army developed an evolutionary acquisition/two-block approach for meeting requirements. The Army plans to test and evaluate this two-block approach in three phases of operational test and evaluation.

Block 1 modifications include digital cockpit displays, improved navigation avionics, limited digital messaging, airframe rebuild and stiffening to reduce cockpit vibrations, and modifications to provide for easy removal of the aft pylon for enhanced air transportability. Phase 1 of Initial Operational Test and Evaluation (IOT&E), which this report covers, tested these capabilities.

Block 2 modifications will include all Block 1 capabilities, additional interoperability with digital messaging networks, and the integration of Global Air Traffic Management capability. In addition, the Army plans to install new monolithic machined frames in the cabin, floor, and aft sections of the aircraft; complete the restoration of dynamic components to like-new condition; and integrate the Common Avionics Architecture System cockpit, the Common Missile Warning System, and Blue Force Tracker for increased situational awareness. Phases 2 and 3 of IOT&E will evaluate the addition of these Block 2 capabilities in FY06 and FY07, respectively.

Between now and FY07, production and fielding will focus on the MH-47G Special Operations variant of the aircraft, which is produced on the same production line and is a separate acquisition program. The Army plans to field 452 CH-47F aircraft with Block 2 capabilities starting in FY07.

Test Adequacy

Operational testing and live fire testing were adequate and conducted in accordance with the Director, Operational Test & Evaluation (DOT&E)-approved Test and Evaluation Master Plan, the Phase 1 IOT&E Test Plan, and the Alternative Live Fire Test & Evaluation (LFT&E) Strategy.

Members of the DOT&E staff monitored these tests, reviewed test data, and analyzed test results. This report summarizes the results of the independent evaluation of the CH-47F Block 1 aircraft.

Operational Effectiveness

The CH-47F is operationally effective. During testing, the system demonstrated a high overall degree of mission accomplishment when employed by representative personnel in an environment planned or expected for operational employment. The CH-47F's demonstrated performance exceeded the mission requirements for self-deployment, external cargo lift, and internal transport of combat troops. The integration of navigation aids with the digital moving map and flight plan enhanced pilot situational awareness and reduced pilot workload.

Operational Suitability

The CH-47F Block 1 aircraft is not operationally suitable. The system did not demonstrate program goals to integrate communications systems with the new digital cockpit, improve digital interoperability, or increase system reliability. Additionally, there are unresolved electrical concerns with the CH-47F, which result in battery power drainage. Inadequate integration of communications systems resulted in reduced communications clarity for the crew. High frequency radio operational capability did not occur during testing and the system demonstrated an immature digital messaging capability. The demonstrated CH-47F communications capability is less suitable than the existing CH-47D capabilities, and the CH-47F

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did not meet the Interoperability Key Performance Parameter to demonstrate all Information Exchange Requirements for the Block 1 system. In addition to not meeting two of the four reliability requirements during IOT&E, other test data reveals that airframe cracks due to metal fatigue continue to affect the aft sections of the aircraft. Reliability failures in the CH-47F are common to legacy CH-47D aircraft and suggest that restoration of major dynamic components to a “like-new” condition is required to meet reliability goals in the future. The Army is planning to implement this component recapitalization effort, as well as addressing the vibration/metal fatigue issues by adding monolithic machined metal formers to the airframe, for Block 2 aircraft.

Survivability

The overall survivability of the CH-47F is comparable to that of the CH-47D aircraft. The effectiveness of the aircraft survivability equipment integrated onto the CH-47F was not demonstrated during testing.

The CH-47F vulnerability to projected ballistic threats is similar to that of the CH-47D. In some cases, the test results indicate the CH-47F is more survivable than the original design indicated. Combat threats considered in the 1960’s CH-47 basic design were not as lethal as the threats used in this evaluation. The vulnerability assessment against ballistic threats indicates that the probability of kill against the CH-47D and CH-47F are essentially the same. The Army considers the Man-Portable Air Defense Systems (MANPADS) threat an overmatch (i.e., almost certain to kill the aircraft). They intended to evaluate the vulnerability to MANPADS by analysis, but model development is not complete.

Recommendations

The Army should consider the following recommendations to improve the operational effectiveness and operational suitability of the CH-47F Cargo Helicopter:

- Improve the communications system to reduce electromagnetic interference, eliminate bleed over and headset static, and make communications controls more accessible to pilots.
- Replace and strengthen airframes throughout the aircraft to eliminate stress cracking and metal fatigue.
- Improve the reliability of baseline and new aircraft components. The restoration of dynamic components to a “like-new” condition should help.
- Conduct additional operational testing to evaluate anticipated changes to the CH-47F before fielding in 2007 and to demonstrate that the aircraft can meet interoperability and reliability requirements.

The Army should consider the following recommendations to improve survivability to expected threats:

- Conduct additional testing to confirm the integration of aircraft survivability equipment onto the CH-47F aircraft.
- Complete the three planned, but not conducted, dynamic live fire tests. These tests should demonstrate the CH 47F’s ability to withstand damage while under dynamic load, as well as the capability to continue its mission or safely return to base after a ballistic impact.
- Continue development of tools for assessment of CH-47F survivability to MANPADS.
- Review and update Battle Damage Assessment and Repair (BDAR) manuals to reflect the available repair capability.