

MV-22 Osprey

Executive Summary

- The Navy conducted FOT&E in June 2012.
- The Navy's Commander, Operational Test and Evaluation Force evaluated capabilities of the latest Block C software and six other minor enhancements.
- Testing demonstrated the utility of all new enhancements with the exception of the Traffic Advisory System (TAS). Intended to warn pilots of impending collision with approaching aircraft, the TAS does not distinguish between approaching aircraft and aircraft in formation. Additional development is needed to address operational test findings and improve the utility of TAS for the MV-22 fleet.
- The Block C aircraft demonstrated improved reliability, availability, and maintainability compared to Block B aircraft performance in previous operational tests. The MV-22 has met all RAM requirements in the Capability Production Document.
- The Navy continues to execute a viable reliability growth program for the MV-22 fleet.

System

- There are two variants of the V-22: the Marine Corps MV-22 and the Air Force/U.S. Special Operations Command CV-22. The air vehicles for Air Force and Marine Corps missions are nearly identical, with common subsystems and military components sustainable by each Service's logistics system.
- The Marine Corps is replacing the aging CH-46 and CH-53D helicopters with MV-22s. The MV-22 is a tilt rotor aircraft capable of conventional wing-borne flight and vertical take-off and landing.
- The MV-22 can carry 24 combat-equipped Marines and operate from ship or shore. It can carry an external load up to 10,000 pounds over 40 nautical miles ship-to-shore and return, and can self-deploy 2,267 nautical miles with a single aerial refueling.
- Block C (software version C1.01) enhancements include:
 - Redesigned Environmental Control System (ECS), which enhances system reliability and improves cabin cooling using directional nozzles, larger heat exchangers, and a new ECS controller.
 - Electronic Standby Flight Instruments (ESFI), which replace the analog standby instrument cluster.
 - Color Weather Radar System, which provides weather detection, ground mapping, and sea search functions.



- Day Heads-up Display (HUD), which provides basic flight and performance instrument information in a helmet-mounted monocular.
- TAS, which is intended to warn MV-22 pilots of other aircraft in close proximity or with the potential for collision.
- Cabin Situational Awareness Device, which displays essential mission information to troop commanders in the cabin and assists the troop commander to communicate with Marines independent of the aircrew.

Mission

- Squadrons equipped with MV-22s will provide medium-lift assault support in the following operations:
 - Ship-to-Objective Maneuver
 - Sustained operations ashore
 - Tactical recovery of aircraft and personnel
 - Self-deployment
 - Amphibious evacuation
- Currently deployed squadrons are providing high-tempo battlefield transportation in Iraq and Afghanistan.

Major Contractors

Bell-Boeing Joint Venture:

- Bell Helicopter – Amarillo, Texas
- The Boeing Company – Ridley Township, Pennsylvania

Activity

- The Navy conducted FOT&E in June 2012 in accordance with the DOT&E-approved plan. This dedicated operational test was preceded by about 8 months of integrated testing in

which MV-22 aircraft accumulated 320 flight hours. During operational test, aircraft accumulated approximately 67 flight hours.

NAVY PROGRAMS

- Commander, Operational Test and Evaluation Force evaluated capabilities of the latest Block C enhancements: software version C1.01, upgraded ECS, ESFI, Color Weather Radar System, Day HUD, TAS, and Cabin Situational Awareness Device upgrades.
- VMX-22 conducted all operational test missions at or near the Marine Corps Air Station New River, North Carolina, using four production-representative aircraft (two Block C aircraft and two Block B aircraft). DOT&E observed as passengers on all of the operational test missions.

Assessment

- Except for minor functionality upgrades, software version C1.01 is identical to the existing Block B software. DOT&E noted no degradation in existing capability during testing.
- The upgraded ECS proved effective at cooling troops in the cabin. The adjustable nozzles allow troops to direct cool/warm air onto their head/neck. In surveyed responses, 78 percent of Marines in a cabin with upgraded ECS described their general comfort during missions as good or excellent versus 45 percent of those in a cabin without the upgraded ECS.
- The ESFI was well mechanized and integrated into the cockpit with over 75 percent of survey responses indicating adequate visibility of ESFI, and about 65 percent noting the ESFI was effective for management of flight profile during basic instrument maneuvering. Pilots noted a lag in the Vertical Velocity Indicator of about 1 to 5 seconds, which makes altitude management difficult.
- The Color Weather Radar provided accurate weather information to include precipitation intensity and storm cell turbulence. The system clearly defined terrain features along coastlines out to 20 nautical miles, and easily detected ships in sea search mode. The location and integration of the Color Weather Radar was not ideal. The radar display and controls are accessible only to the right seat pilot, and the pilot must dedicate one of two multi-functional displays to view the weather radar.
- The Day HUD enhances the pilot's situational awareness during tactical situations and reduced visibility conditions.
- Troop commanders said the Cabin Situational Awareness Display enhances situational awareness. Access to GPS updates for handheld devices, way points, flight

plans, location, and other mission information increased commanders' confidence in knowing their location on leaving the aircraft and their ability to navigate the terrain once disembarked.

- Testing demonstrated the lack of utility of the TAS. This system displays the top three traffic advisory priorities by calculating the bearing, range, and altitude of nearby aircraft. These top three priorities include other aircraft in formation, essentially rendering the advisory information useless in most MV-22 multi-aircraft missions.
- The Block C aircraft demonstrated improved reliability, availability, and maintainability relative to aircraft in previous operational tests and the MV-22 fleet, and met requirements for reliability, availability, and maintainability.
- An analysis of reliability data from 2008 to 2012 revealed that integrated wiring systems in engine nacelles have high failure rates from intrusion of sand and oil, causing internal chafing and deterioration of insulated coatings. PMA-275 has funded a program to redesign and replace 13 wiring bundles to improve wiring system reliability and repairability.
- No additional flight testing or engineering analysis have been done indicating a change would be appropriate to DOT&E's September 2005 assessment that the MV-22 cannot perform autorotation to a survivable landing.

Recommendations

- Status of Previous Recommendations. The Navy has made improvements and has plans to make other reliability improvements to the icing protection system, as recommended in FY11. The Navy should conduct operational testing in icing conditions when all icing protection system enhancements are completed.
- FY12 Recommendations. The Navy should:
 1. Continue development and testing to improve overall MV-22 reliability, availability, and maintainability with particular emphasis on the flight controls, integrated wiring, and drive train subsystems.
 2. Withhold fielding the TAS as implemented in FOT&E. Additional development is needed to address operational test findings and improve the utility of TAS for the MV-22 fleet.