

## V-22 Osprey Joint Advanced Vertical Lift Aircraft

### Executive Summary

- There are two variants of the V-22: the U.S. Marine Corps MV-22 and the Air Force/U.S. Special Operations Command (USSOCOM) CV-22.
- MV-22 Block B integrated testing took place throughout 2007 and culminated with a dedicated operational test period including realistic end-to-end missions. The Block B aircraft demonstrated that it is operationally capable of supporting the required Marine Corps missions, but deficiencies with its radar signal detecting set (APR-39A(V)2), ice protection system, and fuel system should be addressed as soon as possible.
- The Marine Corps declared initial operational capability for the MV-22 in June 2007. The MV-22 Block B deployed to Iraq in the fall of 2007 with Marine Medium Tiltrotor Squadron (VMM)-263.
- CV-22 integrated testing this year included electronic warfare integrated assessments, special operations tactics development, and shipboard interoperability.
- The CV-22 IOT&E planned for FY08 will address USSOCOM missions with a phased approach to electronic countermeasures. The first phase includes the full capability of the radar warning receiver and infrared countermeasures and partial capability of the radio frequency jammer. The second phase of operational testing will follow installation of a new high power jammer and will evaluate the remaining threat systems.

### System

- The MV-22 is the replacement for aging medium-lift CH-46E and CH-53D helicopters.
- It is a tilt-rotor aircraft capable of conventional fixed-wing flight and vertical takeoff and landing.
- It operates from shipboard or shore bases.
- It can carry 24 combat-ready Marines 228 nautical miles (nm) and return.
- It can carry a 10,000-pound external load 40 nm ship-to-shore and return.

### Activity

- All MV-22 and CV-22 testing has been in accordance with the DOT&E-approved Test and Evaluation Master Plan.
- MV-22 Block B Integrated Testing (IT/OT-III A) took place throughout 2007 to assess the operational effectiveness and suitability of the Block B aircraft and to support the initial operational capability decision. This testing also evaluated the correction of MV-22 Block A deficiencies identified in the



- The V-22 can self-deploy up to 2,267 nm with one aerial refueling.
- The CV-22 variant will augment Air Force Special Operations MC-130 aircraft. It has terrain-following, terrain-avoidance radar, and a more robust electronic defense suite.
- Incremental upgrades include several unrelated airframe changes, a ramp-mounted weapon system, a retractable aerial refueling probe, and a personnel hoist.

### Mission

- Squadrons equipped with the MV-22 will provide medium lift of Marines and equipment in support of:
  - Ship-to-Objective Maneuver
  - Sustained Operations Ashore
  - Tactical recovery of aircraft and personnel
  - Self-deployment
  - Amphibious evacuation
- Air Force squadrons equipped with the CV-22 will provide high-speed, long-range insertion and extraction of special operations forces to and from high-threat objectives.

2005 IOT&E. A total of 551.1 MV-22 Block B flight hours were flown during IT/OT-III A.

- The Integrated Testing culminated with a dedicated operational test period (OT-III A), which VMX-22 conducted in February to March 2007. Operationally realistic end-to-end missions were conducted in day and night conditions including fast rope, hoist, aerial refueling, external load, and remote desert

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operations. The test encompassed 95.3 Block B flight hours in 22 flight events over an 18-day period at Naval Air Facility El Centro, California.

- Air Force Operational Test and Evaluation Center (AFOTEC) started the CV-22 IOT&E (OT-IIIC) in October 2007. AFOTEC will conduct USSOCOM missions with the CV-22-unique radar and defensive electronic countermeasures systems. Survivability testing will be at Nellis AFB, Nevada; China Lake, California; and Eglin Range Complexes, Florida. Cold weather testing is scheduled to be conducted in Alaska, and an outside the continental United States deployment is planned. The 18th Flight Test Squadron (FLTS) is the Air Force Special Operations Command Operational Test Unit for the CV-22.
- The planned CV-22 cold weather evaluation in Alaska was delayed until the IOT&E. AFOTEC participated in two test events in preparation for IOT&E. The 18th FLTS assessed the ability of the CV platform to support development of swimmer insertion techniques for special operations forces teams and the ability of the aircraft to hoist swimmers. In August, one CV-22 deployed to the USS *Bataan* to demonstrate that the CV-22 can operate in the same shipboard environment as the MV-22.
- The Navy and Air Force conducted a 12-hour Electronic Warfare Integrated Assessment during FY07. The objective of these tests was to perform a limited demonstration of the susceptibility of the CV-22 as a platform in a radio frequency threat environment using a combination of the capabilities provided by the Suite of Integrated Radio Frequency Countermeasures (SIRFC) radar warning, electronic jamming, expendable chaff, and tactics.

## Assessment

- The MV-22 Block B aircraft demonstrated significant improvements over the Block A aircraft and is operationally capable of supporting the required Marine Medium Tiltrotor Squadron (VMM) missions. The V-22 demonstrates improvements in survivability over conventional helicopters, but the current MV-22 radar signal detecting set (APR-39A(V)2) does not adequately address the fixed wing aspect of the MV-22's envelope. The Ice Protection System has reliability problems, and the increased capacity fuel system is cumbersome and workload intensive, requiring significant in-flight attention to manage fuel distribution.
- In December 2006, an MV-22 experienced a post-landing fire in the left nacelle. No one was hurt but high repair costs drove the incident to be a major mishap. The final report on

this incident was released in February 2007 and revealed a degraded fan system within the engine, which caused pressure spikes beyond the capability of the Titanium tubing. The program developed corrective actions.

- In February 2007, the entire fleet of V-22s was grounded for a technical problem with their flight control computer chips. Testing found that in extreme cold temperatures the chip could fail. Every aircraft was inspected and the faulty chips were replaced. The V-22 fleet returned to flight within a week.
- The ability of the CV-22 to perform special operations missions from a ship will be limited. Gross takeoff weight restrictions will limit its ability to perform long-range missions. Radar and SIRFC sensor restrictions in the vicinity of the ship will limit overwater missions (such as search and seizure events). The missile warning sensor was found to have electromagnetic compatibility problems with the shipboard environment and must be reconfigured to operate at the ship. This issue is under investigation.
- A full analysis of the data from the Electronic Warfare Integrated Assessment flight tests is not yet available. Preliminary results indicate that the SIRFC radar warning receiver is mature and ready for IOT&E.
- The electronic warfare defensive suite is still facing challenges. Flight testing in Nova Scotia during FY05 showed that the SIRFC antenna accumulates ice when the aircraft is flown in icing conditions. A redesign to correct the problem has still not been identified. The interim solution is to install a flat plate in place of the radome during a portion of the CV-22 IOT&E.

## Recommendations

- Status of Previous Recommendations. The program has taken effective action on three of the four FY06 and the two FY05 recommendations in DOT&E's FY06 annual report. The following recommendations remain valid:
  - Correct aircraft deficiencies noted in the CV-22 Operational Utility Evaluation report prior to IOT&E in FY08
  - Determine effectiveness of the engine bay fire extinguishing system against actual threat induced fires
  - Devise/improve cabin wall battle damage repair methods and procedures
- FY07 Recommendations. The program should:
  1. Address MV-22 deficiencies with the APR-39, Ice Protection System, and fuel management system.
  2. Work to ensure that the CV-22 defensive suite problems are fully corrected before the aircraft reaches Initial Operating Capability.