

## MV-22 Osprey

### Executive Summary

- The Navy's OT&E Force/Marine VMX-22 Tiltrotor Test Squadron conducted an FOT&E (OT-IIIIG) from August 12 to November 8, 2011. This dedicated test was preceded by two years of integrated developmental/operational testing (IT-IIID) from May 1, 2009, to May 31, 2011. The purpose of OT-IIIIG was to evaluate the effectiveness and suitability of new software version B4.01, Blue Force Tracker, Netted Weather, and the defensive weapon systems.
- New software performed largely as expected, thus maintaining all the previous capabilities of the MV-22 aircraft fleet. Software enhancements were modest, but provided new piloting options and power margins, thus increasing safety and reducing pilot workload.
- OT-IIIIG demonstrated the utility of Netted Weather and Blue Force Tracker.
- OT-IIIIG illustrated the limited utility of the Interim Defensive Weapon System (IDWS).
- Crews operating the Ramp-Mounted Weapon System demonstrated the ability to place suppressive .50 caliber fire on targets to the rear of the aircraft and imposed no significant limitations on troop or cargo missions.
- Reliability, availability, and maintainability data were not available in time for this report.

### System

- The MV-22 is a tilt-rotor aircraft capable of conventional wing-borne flight and vertical take-off and landing.
- The Marines are replacing the aging CH-46 and CH-53D helicopters with MV-22s.
- 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.
- It can self-deploy 2,267 nautical miles with a single aerial refueling.



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

### Activity

- The Navy's OT&E Force/Marine Tiltrotor Test Squadron VMX-22 conducted an FOT&E (OT-IIIIG) from August 12 to November 8, 2011. This dedicated test was preceded by two years of integrated developmental/operational testing (IT-IIID) from May 1, 2009, to May 31, 2011. During IT-IIID, MV-22s accumulated 419 flight hours and during OT-IIIIG, aircraft accumulated approximately 100 flight hours. We expect to receive all the data and complete the analysis by December 2011.
- OT-IIIIG was conducted in accordance with the DOT&E-approved Test and Evaluation Master Plan and operational test plan.
- The purpose of OT-IIIIG was to evaluate the effectiveness and suitability of new software version B4.01, Blue Force Tracker, Netted Weather, and the defensive weapon systems. This software suite includes modest enhancements in aircraft performance, correction of existing deficiencies, and reliability improvements. Blue Force Tracker provides cockpit and cabin connectivity to a world-wide digital network of joint forces enabling digital messaging and near-real-time sharing of friendly and enemy unit locations. Netted Weather provides map-based overlays to the pilots and embarked troops on

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the location of significant weather (clouds, winds, rain, and thunderstorms).

- VMX-22 deployed three production-representative aircraft from Marine Corps Air Station New River, North Carolina, to Cannon Air Force Base, New Mexico, where the majority of OT-IIIIG missions were performed. Due in part to a hurricane on the East Coast, VMX-22 returned to New River earlier than planned and completed the final missions in North Carolina. DOT&E observed as passengers on most of the OT-IIIIG missions.

## Assessment

- The new software version B4.01 performed largely as expected, thus maintaining all the previous capabilities of the MV-22 aircraft fleet. Software enhancements were modest, but provide meaningful new piloting options and power margins, thus increasing safety and reducing pilot workload. Among the new capabilities are:
  - Increased Interim Power – maximum power setting is now 117 percent versus 109 percent in low-speed flight regimes. This permits faster airfield departure and/or increased payload.
  - Directional Trim Backdrive – commands pedal position to enhance heading hold in hover and turn coordination in forward flight. This reduces pilot workload and improves handling qualities.
  - Opposed Lateral Cyclic – 4 degrees of inboard lateral cyclic provides additional hover payload (up to 400 pounds) by alleviating download on the wing.
  - Increased Flight Director Coupled Mode capabilities – allows additional flight profiles on tactical approaches and corrects minor deficiencies from previous testing.
  - Mission Management – Improvements to the performance and mission management calculators reduces crew workload.
  - Feed Tank Autoboot – Restores active fuel feed tank control and reduces crew workload.
- OT-IIIIG demonstrated the utility of Netted Weather and Blue Force Tracker. The Netted Weather system provided accurate and current overlays of rain and thunderstorm activity, allowing MV-22 crews to avoid these weather systems during self-deployment to and from New Mexico. The Blue Force Tracker provided connectivity to the joint digital data network, allowing crews and embarked troops to see the location of ground units, each MV-22 aircraft, and the VMX-22 tactical

operation center on a map. The Blue Force Tracker provided own-ship location on a map, enabling embarked troops to be informed throughout the flight of their own location and time of arrival on the planned mission objective. The Blue Force Tracker enabled crews and embarked troops to send and receive digital text messages to/from other entities on the Blue Force Tracker network.

- OT-IIIIG illustrated the limited utility of the IDWS. The IDWS worked as designed, but has a limited field of fire during aircraft approach to landing. Employment of the IDWS requires extensive verbal coordination between copilot and gunner to confirm target location while both pilots are engaged in other piloting duties during the final seconds prior to landing. Against the few targets the IDWS could safely engage, its firepower was accurate and effective. Installation of the IDWS reduces the capability of the MV-22 to carry troops and cargo.
- Crews operating the Ramp-Mounted Weapon System demonstrated the ability to place suppressive .50 caliber fire on targets to the rear of the aircraft and imposed no significant limitations on troop or cargo missions.
- Reliability, availability, and maintainability data were not available in time for this report.
- During OT-IIIIG, aircraft were generally available for planned missions but exhibited the reliability and maintainability challenges evident in the fielded MV-22 fleet. Across the fleet, the MV-22 generally meets reliability and maintainability requirements, but the average mission capable rate of 53 percent (from June 2007 to May 2010) is below the required rate of 82 percent.

## Recommendations

- Status of Previous Recommendations. The Navy has satisfactorily addressed earlier recommendations to provide current weather overlays to the cockpit. The program has addressed some of the known reliability, maintainability, and parts availability challenges, but more work is needed to improve mission capable rates.
- FY11 Recommendation.
  1. The Navy should continue development and testing to improve overall MV-22 reliability and availability with particular emphasis on the ice protection system, engine air particulate system, nacelle, and drive-train subsystems.