Bell Boeing Tiltrotor Team's
OSPREY FACTS
Vol. 13; Issue 8
Oct./Nov. 2002

First production V-22 joins flight test program

By Gidge Dady
NAVAIR V-22 Public Affairs

As part of the gradual ramp-up to seven MV-22 Ospreys that will comprise the developmental flight test program at NAS Patuxent River, Md., over the next year, the V-22 Integrated Test Team has added two more MV-22s to its flight test program.

The addition of two more aircraft—a low rate initial production (LRIP) MV-22 and a second Engineering and Manufacturing, Development (EMD) aircraft—will give added flexibility to the testing efforts which, until October, were carried out by EMD aircraft number 10, the first aircraft to fly with an enhanced hydraulic system and flight control software.

The first LRIP aircraft (number 21) to be used for developmental flight testing arrived Oct. 12, a week ahead of schedule. Flown by Marine test pilots Majors Shawn Healy and Paul Hagar and flight test crew chief Staff Sgt. "Ollie" Oliverio, the flight originated from the Bell Boeing final assembly plant in Amarillo, Texas. During the five-hour, cross-country flight, the aircraft reached altitudes of 15,000 feet and an airspeed of 300 knots. The crew said the aircraft flew exceptionally well and arrived without any hitches.

Aircraft 21 is fleet representative and will be instrumented for the aerial delivery of people and cargo in the months ahead and will be used to expand the internal cargo envelope to include parachute delivery of the cargo. "As part of this testing to further expand the Osprey's capabilities, static line parachutes will be used to deploy paratroopers," said Lt. Col. Kevin Gross, V-22 government flight test director.

The second EMD aircraft (Number 8) returned to flight on Oct. 19 and will be dedi-

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Shortly before it was taken to a flight test hangar at Patuxent River, Low Rate Initial Production MV-22 aircraft No. 21 folded its blades and stowed its wings—a maneuver that takes 90 seconds.

V-22 surpasses 100-flight hour mark

By Ward Carroll
NAVAIR V-22 Public Affairs

The V-22 Integrated Test Team recently surpassed 100 hours flown since the program's return to flight in late May of this year.

The milestone was reached by Osprey No. 10 on a three-hour test flight crewed by Maj. Shawn Healy, Maj. Paul Ryan and Staff Sgt. Michael Snyder.

"It's a great feeling," said Healy. "All test points were met on our flight, which is representative of how things have gone. We've done a lot to get the program where it is."

"The integrated test team has gelled," Fred Madenwald, Integrated Test Team (ITT) contract flight test director, said. He credits the ITT concept with moving the Osprey program effectively forward.

"The Marines, Air Force, Dyncorp and Rolls-Royce have all come together to make things happen," he said. "Like all test programs, we've had some unplanned problems, but the way we're configured allows us to solve them quickly."

While justifiably proud of reaching the 100-hour milestone, the V-22 program isn't about to lose its intensity.

In the coming months, the ITT will be executing the high rate of descent test plan, as well as accepting their fifth aircraft from the Bell Boeing plant in Amarillo, Texas.

"Passing the 100-hour mark is a big step toward proving the V-22 ," Madenwald said, "but it's just one step. We're not going to let up until the Osprey is supporting the fleet, and even then we'll still be around to help it realize its full potential. The V-22 is an amazing airplane."

Built by Bell Helicopter in Ft. Worth, Texas, the **Airframe and Mechanical Part Task Trainers** are designed to train V-22 maintainers how to remove and repair system components in the wing and nacelle areas. The trainers, built mostly from previously used aircraft components, can support 32 trainable tasks on each training device. Both units were delivered in June 2002, four months ahead of schedule.

Maintenance trainers to benefit V-22

By Doug Holmes
Boeing Communications

A team of training specialists—comprised of Bell, Boeing and Government training experts, engineers, machinists and mechanics—has delivered four state-of-the-art V-22 maintenance Part Task Trainers, or PTTs, to the United States Marine Corps.

In keeping with the Integrated Training Systems approach, the PTTs will be used in concert with other state-of-the-art training systems currently under development to train Marine Corps and Air Force V-22 maintenance technicians.

"The part task trainers also supplement Interactive Multimedia Instruction and other effective training tools," said Lt. Col. Fancher, V-22 Training program manager. "The combination of hands-on work and interactive computer software training ultimately will help us field a more successful aircraft."

The trainers, which have been in development for more than two years to meet the October 2002 "Ready for Training" date, will allow maintenance students to accrue valuable hands-on experience servicing the Osprey in a controlled environment.

"Over the life of the aircraft, hundreds, if not thousands of Marines, will train on these devices," said Fancher. "So it's important we give them the most authentic and effective training systems available. It's absolutely critical that they learn how to safely and efficiently service the aircraft. Our pilots are going to have an extremely safe aircraft to fly thanks, in large, to proper maintenance."

The PTTs, which include airframe, mechanical, sponson and landing gear training devices, were delivered to the V-22 Maintenance Training Unit at Marine Corps Air Station, New River, N.C., months ahead of schedule *and* under budget.

"The successful delivery of the trainers is a direct result of the work done by our Integrated Product Team, Government, Industry and the user," explained Fancher.

Rajive Sondhi, Boeing V-22 Training manager, added, "The success of the trainers is a testimony to the leadership displayed at all levels of the program."

The "schoolhouse" will start training maintenance crews this year after a two-year hiatus. The Marine Corps plans to train 136 students a year over the next two years. The first students, notes Fancher, soon will arrive at the station to begin the rigorous training program.

"V-22 program leadership realizes the importance of training and has supported us accordingly," he added. "The required funding has been set aside for the program to ensure maintenance and pilot training systems meet or exceed user expectations."

The team used Full Scale Development, Engineering Manufacturing Development and modeled aircraft components to build the cost effective and realistic training devices. In addition, numerous components and structures have been developed using the latest computer design tools, such as CATIA, UniGraphics and sand casting.

"We've achieved considerable cost avoidance by using scrapped and damaged components to build the trainers," explained Dave Mullenix, Boeing IPT lead. "By using computers, we're able to design components

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Manufactured at Boeing's Mesa, Ariz., helicopter facility, the **Sponson Part Task Trainer** is designed to train V-22 maintenance personnel how to maintain various fuel system components. It was delivered in April 2002, six months ahead of schedule.

PM Perspective: Training remains vital to V-22 program

By Mike Tkach
Vice President, Program Director
V-22 Program Office, Pax River, Md.

The recent delivery of the second MV-22 Full Flight Simulator to VMMT-204 at MCAS, New River, N.C., marks the latest success for the V-22 Training Integrated Product Team.

As the article on the preceding page indicates, the V-22 program places great value on training. Time spent in the classroom, on maintenance trainers and in the simulators directly affects the success of our flight program. Our latest accomplishment demonstrates a tremendous effort by everyone involved, including Bell Boeing, Flight Safety International and our customers, Naval Air Systems Command and the U.S. Marine Corps.

The first Full Flight Simulator, delivered to MCAS New River in December 2000, soon will be upgraded to the Block A configuration.

The flight simulators at New River offer a low-cost alternative for training basic flying skills and keeping existing skills sharp. Osprey pilots will spend about half their flight hours in the simulator, so it's important that they have the best possible technology available. Once networked with other Marine aircraft simulators, V-22 pilots will be able to conduct missions with unprecedented interoperability. This synergy not only will benefit today's warfighter, it also will result in considerable cost savings.

The flight test program continues to roll along as expected. MV-22 aircraft No. 8 recently began the much-anticipated High Rate of Descent, or HROD, testing. Results from this testing phase are crucial to further exploring vortex ring state, an aerodynamic phenomena that affects all rotory-wing aircraft. We currently have four aircraft on flight status, including one CV-22 and three MV-22s. By January, we'll add two more Ospreys to the program.

Finally, I want to wish everyone involved with the V-22 program a happy and healthy holiday season. Best wishes!

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on the screen without the rigid limitations and time consuming processes of traditional drafting techniques. These processes save time *and* money."

The team also has incorporated a "model shop" environment and a V-22 Maintenance Training System Integrated Product Team (VMTS IPT) concept to develop the maintenance trainers.

"The VMTS IPT concept has empowered the training team to make design and schedule changes on the fly, without going through the normal review process," said Mike McCraw, Bell Helicopter IPT lead. "The process has saved us a lot of time, and is one reason why we're ahead of schedule. The manufacturing facilities' model shops allow us to edit and recalculate existing drawings and modify existing trainer components without going through the formal engineering process."

The PTTs have been painstakingly constructed to mirror the components on the actual aircraft. Maintaining realism in the classroom and during mechanical training exercises, explains Mullenix, will help reinforce the lessons and produce more capable V-22 maintainers.

As customer needs arise, the training team will investigate additional requirements, including CV-22-specific devices and PTTs equipped with future Block Upgrades, as outlined by Bell, Boeing and the customer in the V-22 Way Ahead Plan.

The **Landing Gear Part Task Trainers**, also built at Boeing Mesa, consist of two identical units constructed entirely from original components. They simulate the full mass of the aircraft on the main landing gear (15,000 pounds) by using pneumatic pressure. It was delivered in April 2002, six months ahead of schedule.


Photo by Rob Bardua

CV-22 No. 9 exits the Benefield Anechoic Facility after nearly three months of electronic warfare testing. According to program officials, the successful tests could signal the end of such testing for the CV-22.

CV-22 completes electronic warfare testing, exits anechoic facility

By Rob Bardua
Air Force Flight Test Center Public Affairs

The Air Force's CV-22 tiltrotor recently completed electronic warfare testing in the Benefield Anechoic Facility, or BAF, at Edwards Air Force Base, Calif.

The purpose of the electronic warfare tests was to test the Suite of Integrated Radio Frequency Countermeasures, or SIRFC system, which is the Radar Warning Receiver and Electronic Countermeasures system for the CV-22.

"This last round of tests has basically verified that a lot of our design changes are giving us the type of performance that we're looking for," said Maj. Greg Weber, the CV-22 government flight test director at Edwards.

Throughout testing in the BAF, a building block approach was used to learn from past testing and implement necessary changes for future tests. The test team started testing inside the BAF with antenna pattern measurements.

"Whenever you install antennas on the airplane and begin testing them, there are things that don't exactly work the way some models say they will," said Weber.

After making adjustments to the antennas, the test team conducted more than eight weeks of electronic warfare testing, where they examined SIRFC's response to threat systems.

"In electronic warfare testing you get into some of the other performance-related items, such as the angle of arrival, the accuracy of the threat information and threat response time," said Weber.

According to Rex Wade, Bell Boeing's electronic warfare lead test engineer, some factors can't be tested effectively in the air, such as the interaction between the SIRFC system and the multi-mode radar system.

This type of testing is known as interoperability testing.

"Part of our testing is designed to find not only how well the SIRFC system works, but also seeing how well it works in conjunction with other aircraft systems," said Wade. "So we had to make sure the multi-mode radar system and SIRFC system didn't hinder each other's performance."

The next step will be for Bell Boeing to analyze the data from the BAF testing and make recommendations to the CV-22 program office. Once analysis is complete, the test team will take the airplane and fly it on the open-air ranges for testing.

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cated to performing high rate of descent (HROD) testing to further expand and more clearly define the boundaries of vortex ring state. The HROD testing will include approximately 160 flight hours over 13 months.

"The initial flight testing will pick up where we left off nearly two years ago with steady state low airspeeds and high sink rates to finish defining the steady boundary for V-22 vortex ring state (VRS), an aerodynamic phenomenon that can affect any rotorcraft that is flown well outside of its established flight parameters. Subsequent testing will exhaustively assess the effects on the VRS steady state boundary of aggressive maneuvering at low air speed and elevated sink rates," said Tom MacDonald, chief V-22 Integrated Test Team pilot.

"This latter phase of testing will confirm that ongoing development of cockpit crew alerting features, pilot training and awareness and operational envelopes provide adequate protection to future operational V-22's while verifying that mission effectiveness of the V-22 is in no way limited," he added.

The third aircraft, EMD number 10, is now flying with new flight control computer software and new mission computer software. After this software shakedown is complete, this aircraft will be used for roll-on-deck testing at Patuxent River and at sea on the USS Iwo Jima as early as January 2003.

This testing will confirm that the software modifications activate equipment on the aircraft to provide greater roll control, when the aircraft are parked, and thus allow for an adequate margin for roll perturbations caused by the wake of other aircraft.

By mid-summer 2003, seven MV-22s, including five LRIP and two EMD aircraft, will be in action at Patuxent River and two CV-22 EMD aircraft will be flying at Edwards Air Force Base. The first CV-22 returned to flight at Edwards in September. Currently, the four aircraft now flying, three at Patuxent River and one at Edwards, have logged more than 100 flight test hours (*see story on page 1*).

To date, a summary of accomplishments include testing and validating new flight control system software, new avionics systems software, pilot re-qualification and routine proficiency training maneuvers, and testing and calibration of a new ultrasonic low airspeed sensor that will be used during upcoming high rate of descent tests.

Osprey Facts is published monthly by The Boeing Company in Philadelphia and Bell Helicopter A Textron Company in Texas. Editor-in-chief, Paul Martin (E-mail, paul.w.martin2@boeing.com); Production Editor, Doug Holmes (william.d.holmes@boeing.com). Information contained herein is compiled from unclassified sources and does not represent an official position of either of the companies. Comments or suggestions should be forwarded to Paul Martin, V-22 Joint Program Office, PO Box 70, Patuxent River, MD, USA 20670. Tel (301) 866-2457. Back issues may be found, along with other V-22 data, at: http://www.boeing.com/rotorcraft/military/v22/