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Boeing Unveils Radical Flight Test Reorganization

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By Guy Norris

Boeing is poised to start tests of the 777 Freighter using a redesigned, centralized flight test approach in preparation for an unprecedented surge of new and derivative models including the 787, 747-8 and 767-200 Special Freighter.

The flight operations, test and validation (FOT&V) organization incorporates a new control center to monitor the test fleet, replacing the traditional system in which teams were assigned to individual aircraft. Using procedures developed through "lean" processes, the center will ensure testing runs smoothly across the fleet by coordinating maintenance, repositioning pilots and spare parts and swapping schedules or equipment as issues arise. All this replaces a series of improvised legacy processes which Boeing says couldn't handle the upcoming surge of flight tests.

The 777F, which is set to enter flight tests in early July, will be the first major derivative to go through the revamped FOT&V organization. The big twin freighter will pave the way for the anticipated start of 787 flight tests early in the fourth quarter, as well as those of the 747-8 which are expected to begin around April 2009, shortly before the anticipated rescheduled certification target for the 787.

"We have really taken a step back and looked at how we do flight test at Boeing, and over the past 14 months we have completely redesigned how we do that," says FOT&V Vice President Dennis O'Donoghue. Plans for the revamp began when the schedule for the 787 test and certification program was drawn up.

"On the 787, we were asked to take six aircraft and get through the flight test program in six and a half months, in record time. To do that we really had to look carefully at our business," he adds. Boeing originally planned to complete 787 certification around April 2008.

Added to this pressure, FOT&V also faced the challenge of having to plan for flight testing the 777F, 767-300BCF and 767-200SF in 2008, and the 747-8 starting in 2009 and running into 2010, as well as other upgrade and

derivative projects. The organization also supports Boeing Integrated Defense Systems, which is gearing up for intense flight testing through 2010 on the 747-400 based airborne laser, Turkish and Australian 737 airborne early warning and control programs, U.S. Air Force TS-3 AWACS upgrade and U.S. Navy P-8A Poseidon maritime patrol aircraft.

The new test operations center (TOC) at the heart of the reorganization is a 32,000-sq.-ft. facility within the Boeing Field-headquartered Flight Test Center. The focus of the TOC is a 2,000-sq.-ft. control room, nicknamed the "bubble," with 6 X 16-ft. screens displaying the status of aircraft in the test fleet. The room also houses staff who will help coordinate engineering, flight operations and maintenance activities. The TOC will work 24/7, with flight tests during daylight hours, ground tests during second shift and maintenance taking place during the third, overnight, shift.

As well as Boeing flight-test engineers, the TOC will also house employees from suppliers and the FAA. "We want the FAA to be part of the team and we will talk to them about having a presence here in the TOC, so all the right people will be here eyeball-to-eyeball," says O'Donoghue. The 24-hr. operational cycle will also enable the TOC to assist with issues that might crop up on flight tests taking place in other time zones.

"Lean plus" tools used in the redesign included a value network analysis, which helped streamline TOC interactions within the flight-test organization as well as with aircraft engineering and the FAA. Flight-test engineers and planners also used a systems dynamic modeling tool to help develop the new business model concept. "We used that to model the test operations, and evaluated it using value network mapping. Once we understood the engineer's role in it, we ran simulations and ultimately redesigned the entire test operations," he adds.

As a result, the new organization is vastly different. "In the past, teams were assigned to an aircraft and their whole world was that aircraft," says O'Donoghue. For example, when individual test aircraft required maintenance support, "a lot of it was functional organizations running around and foraging for themselves. It was all a bit ad hoc," he says. Under the new centralized system, O'Donoghue says, maintenance "kits" with "any kind of maintenance item" will be ready for returning flight test aircraft as part of efforts to speed up the test cycle.

Planning for specific flight tests will be now streamlined using an automated software tool designed to help engineers optimize tests for various configurations. Another innovation is an onboard airplane analysis program that reduces flight data in real time. Collected data is downloaded onto disk for immediate post-flight analysis on the ground by engineering. O'Donoghue says Boeing's first attempt at this was with a 777 with specially

modified flight control computers used to test out 787 flight control laws.

Boeing has been able to beta test FOT&V improvements on two recent test programs that were originally expected to run alongside the 787, including the 767-300 Boeing Converted Freighter, and 737 carbon brake work. "We are pleased with the results," says O'Donoghue, adding that the 767-300BCF "finished five days ahead of schedule, and it could have been nine but for a maintenance item."

Recruiting of new staff is also underway in the run-up to 787 and 747-8 testing. Currently, Boeing has 22 engineering test pilots and more than 30 production test pilots, plus around 60 flight crew pilots for production flight tests. It also employs more than 500 flight test engineers, "of which the majority will be actively participating in the preparation of test planning," O'Donoghue says.