Third Boeing Full-Mission Simulation Reduces JSF Program Risks

Boeing has successfully completed the third in a series of four full-mission simulations of its operational concept for the Joint Strike Fighter (JSF). Pilots from the U.S. Air Force, Navy and Marine Corps, and the British Royal Navy and Air Force, were on site to evaluate the integration of Boeing JSF avionics, mission-system software and the pilot-vehicle interface (PVI).

"We demonstrated how our overall JSF weapon system will perform in a variety of threat environments and combat situations," said Dennis Muilenburg, director of the JSF weapon system. "This was the ultimate simulation of our preferred weapon system concept. It reduces JSF program risk by combining avionics, cockpit, weapons, aero-propulsion, signature and supportability technologies in an integrated demonstration."

Muilenburg said the high-fidelity and modular approach of the Boeing simulations will allow it to test the design in all phases of the program, from requirements definition and concept design through developmental and operational testing, manufacturing, training and fielding.

"This means reduced costs for our customers at every stage," he said.

U.S. Defense Department officials have encouraged the use of simulation-based acquisition to reduce the time, resources and risk associated with the acquisition process.

"The simulations allow us to involve the real warfighters," said Cdr. Ron Unterreiner, U.S. Navy Operational Requirements Officer. Unterreiner coordinates pilot participation in the demonstrations for the Department of Defense.

Capt. Dave Youtsey, an F-16 pilot with the U.S. Air Force, was a participant in the latest demonstration.

"Aircraft can do so much now," he said. "I don't know how you can design without simulations. They allow you to do design iterations quickly and less expensively."

Pilots flew approximately 40 missions over a four-day period. Pilots from Denmark, Norway, Italy and The Netherlands also flew simulations in a separate demonstration.

The full-mission simulations integrated other Boeing JSF development activities by combining mission software, aircraft performance data and PVI techniques from cockpit development.

The simulations provided full pilot-in-the-loop functionality. Using operational mission scenarios, Boeing demonstrated new functions for two-ship operations, its intra-flight data link and its off-board data information concept. Boeing also demonstrated improved capability for features simulated in the first two demonstrations: air-to-ground and air-to-air weapons deployment, sensor management, sensor fusion, radar and PVI.

"We achieved a very successful, high-fidelity evaluation by using advanced simulation technologies, such as automatic code generating tools, that allowed us to make simulation changes the same day," said Stan Kasprzyk, Boeing JSF cockpit manager.

JSF mission systems are fully integrated. Advanced avionics technologies allow the JSF sensors to gather, integrate and display essential information in the most useful format to the pilot. "The Boeing JSF design puts the focus on making the pilot an airborne tactician, not just a sensor operator," Kasprzyk said.

Conventional avionics are composed of independent systems operating on separate processors. This requires pilots to closely monitor and analyze a wide array of data that isn't always directly relevant to the mission at hand. The integrated and highly advanced avionics on the Boeing JSF will perform much of this "housekeeping."

The first full-mission simulation demonstration was held in November 1997; the second in September 1998.

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