

# New Pilot-Training Concept Adds Realism, Subtracts Costs For Lockheed Martin JSF Program

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An American-Dutch industrial partnership today successfully demonstrated a new technology that will enable Lockheed Martin Joint Strike Fighter (JSF) pilots to conduct complex training simulations while flying their own aircraft.

Embedded Training (ET) promises more realism than ground-based simulations and erases the cost of supplying extra aircraft for training missions.

"When we look at the cost of the JSF program over its entire life, we see that embedded training offers a double advantage," said Frank J. Cappuccio, vice president and program manager for the Lockheed Martin JSF. "It reduces training expenses through the years while dramatically improving the training experience."

The Lockheed Martin JSF team, in partnership with Fokker Space and the Dutch National Aerospace Laboratory-NLR, conducted a proof-of-concept demonstration at the NLR's National Simulation Facility (NSF) in Amsterdam. U.S. and Dutch government representatives attended the demonstration.

The embedded training concept allows the pilot to engage a "training mode" during flight, presenting a training simulation on cockpit displays. Compared to ground-based training simulators, ET increases training fidelity since the pilot experiences the actual stresses and environment of flight maneuvers.

A safety module stands ready to terminate the simulation in case of flight hazards or equipment failure that could jeopardize the pilot, the aircraft or the surrounding environment.

"Embedded training on-board a fighter aircraft poses a significant technical challenge," said Anne Marie Schipper, NLR's Embedded Training Program manager. "Imposing a virtual world on the pilot in flight requires the addition of software to ensure flight safety, where the simulation is turned off automatically if hazardous situations occur. An embedded training session can be started only when all safety criteria are satisfied."

The demonstration consisted of several simulated air combat engagements in which a Royal Netherlands Air Force F-16 pilot detects and engages simulated targets using air-to-air missiles. During a simulated equipment failure, the safety module engaged and successfully terminated the training mode.

After the mission a debriefing function replayed the scenario, allowing a "post-flight" assessment of the pilot's performance and movement -- a feature that will reduce reliance on highly instrumented training ranges.

Embedded training enhances future JSF affordability because simulations replace real targets and aircraft. The concept lessens dependence on training ranges by enabling mission simulations to be conducted in any suitable airspace. Future helmet-mounted-display versions may include within-visual-range functionality, permitting a pilot to train for a low-altitude land attack mission while actually flying high over the sea, far from populated areas.

The Netherlands government, Fokker Space and Lockheed Martin jointly funded the development and demonstration of the embedded training concept. ET is but one example of high-technology research and development under way between the Lockheed Martin JSF team and the Netherlands.

"Lockheed Martin has a long history of successful cooperation with Dutch industry and NLR beginning with the F-16 program," said Mike Kelley, manager of International Programs for the Lockheed Martin JSF. "Working together on JSF-related projects such as embedded training is the

next logical step."

The Dutch government is considering the JSF as a candidate to replace the air force's existing F-16 fleet. Lockheed Martin received one of two JSF Concept Demonstration contracts awarded by the U.S. Department of Defense in November 1996. The Lockheed Martin JSF team includes Northrop Grumman and BAE SYSTEMS. Flight evaluation of the demonstrator aircraft is scheduled to take place in 2000, with government selection of a single contractor for the Engineering and Manufacturing Development (EMD) phase set for 2001.

Fokker Space is headquartered in Leiden, the Netherlands, and is the main Dutch player in the European space industry. Over the last 30 years Fokker Space has built up a comprehensive package of expertise, including real-time simulation, and engineering and training simulators.

The National Aerospace Laboratory (NLR) in Amsterdam is the central institute in the Netherlands for aeronautics and space research and technology-development activities. NLR maintains a wide range of expertise in a variety of disciplines to cover all requirements of the aerospace sector.

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