

# Innovative Simulation Architecture Linked To Reduced Training Costs For Lockheed Martin JSF

PRNewswire  
FORT WORTH, Texas

A new advance in simulation architecture is promising lower training expenses for the Lockheed Martin Joint Strike Fighter (JSF) program.

Dutch industrial and scientific research groups, working in cooperation with the Lockheed Martin JSF team, successfully demonstrated the new simulation-architecture approach that enhances the ability to use existing models in complex distributed training simulations.

The JSF Simulation Architecture (JSA) offers the potential to reduce JSF training system costs while enhancing the ability of the design team and future JSF customers to conduct more comprehensive JSF simulations over a world-wide network.

"High-fidelity simulators are an essential part of the training process for fighter pilots," said Frank J. Cappuccio, vice president and program manager for the Lockheed Martin JSF. "JSA has demonstrated that we can incorporate existing tools into 21st century simulators for JSF, making the simulation more effective while avoiding the expense of developing new models."

The Lockheed Martin JSF team, in partnership with Fokker Space, the Netherlands Organization for Applied Scientific Research (TNO) and the Dutch National Aerospace Laboratory-NLR, conducted a proof-of-concept demonstration at the TNO Physics and Electronics Laboratory (TNO-FEL) in The Hague. U.S. and Dutch government representatives attended the demonstration.

JSA allows existing, or "legacy," models to be linked together using the new High-Level Architecture (HLA) communication standard developed by the U.S. Department of Defense for distributed simulations. Many legacy models, although still effective for their intended use, are not HLA-compliant, restricting their ability to be "re-used" in new JSF simulators and other training devices.

"In addition to the ability to re-use legacy models, the architecture also enables the rapid development of new simulation applications based on the HLA standard," said Dr. Hans Jense, TNO's JSA Program manager. "This meets the JSF Program requirements of interoperability, affordability, readiness and concurrency."

The demonstration consisted of a JSF air-to-ground training scenario combining both virtual (human-in-the-loop) and constructive (war-gaming) simulation models. Using the HLA protocol, 10 different models were linked into a single distributed simulation, similar to what is envisioned for future JSF pilot training.

The Netherlands government, the Dutch organizations and Lockheed Martin jointly funded the demonstration. JSA is one of several cooperative JSF research and development projects the Lockheed Martin JSF team and Dutch industry are conducting.

"Lockheed Martin appreciates the Dutch government's support of these research efforts," said Mike Kelley, manager of International Programs for the Lockheed Martin JSF. "Cooperative projects such as JSA have enabled us to identify world-class Dutch industry capabilities for potential application to JSF."

The Dutch government is considering the JSF as a candidate to replace its 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 phase set for 2001.

Fokker Space is headquartered in Leiden, 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.

TNO, in particular TNO-FEL in The Hague, has a long history of research and development, applications and integration of new defense technologies. TNO participates in both Dutch and international defense programs, and

works in close cooperation with other technological institutes, industry and universities both inside and outside the Netherlands.

The National Aerospace Laboratory 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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