Lockheed Martin Receives Prestigious Aviation Award For Joint Strike Fighter Technology

'Power By Wire' Flight Controls Will Reduce Life Cycle Costs and Improve Performance, Safety and Survivability

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A team led by Lockheed Martin Aeronautics company has received Flight International magazine's 2000 Aerospace Industry Award for Engineering, Maintenance and Modification. The award was presented in ceremonies on June 18 during the Paris Air Show.

"This flight demonstration was the culmination of years of technology maturation development work, and we have successfully reduced electric actuation to low risk," said Paul Bavitz, executive vice president of Systems, Technology and Strategy Development at Lockheed Martin Aeronautics, Fort Worth, Texas. "Based on the payoff potential and the feasibility demonstrated in the flight test program, electric actuation technology is a strong candidate for inclusion in future aircraft."

Studies have shown that integrated subsystems (which an electric flight control actuation system is a major player) are more reliable, maintainable, and affordable, and can result in a 13 percent reduction in life-cycle costs. Integrated subsystems can reduce gross takeoff weight by as much as six percent, improving range and maneuver performance and reducing fuel costs. Finally, elimination of critical hydraulic pumps, as well as the plumbing that transports highly flammable hydraulic fluid, reduces the aircraft vulnerable area by 15 percent, thus improving safety and combat survivability.

The program was part of the Joint Strike Fighter/Integrated Subsystems Technology (J/IST) program. This government-sponsored program was formed to reduce the risk of selected high-payoff technology candidates for the JSF program. The multirole JSF family is projected to be the largest military program of the jet age, with potential worldwide sales of 5,000 aircraft.

The flight test bed is also known as the Advanced Fighter Technology Integration (AFTI)/F-16, which has been involved in major flight testing of advanced fighter technologies for the F-16 and other aircraft during its 22-year tenure. In January of 2001, the aircraft was ferried to Wright- Patterson AFB, Ohio, where it was retired and will be inducted into the U.S. Air Force Museum there.

The nearly flawless flight test program consisted of seven flights conducted from Oct 24 through Nov 29, 2000, from Lockheed Martin Aeronautics' facilities at Fort Worth, Texas. All flight test objectives were achieved, including testing at 500 knots at low altitude and Mach 1.3 at 30,000 feet.

The F-16 flight test bed was extensively modified from 1997 through mid 2000. The existing integrated servo actuators for the flaperons, horizontal tails, and rudder were replaced with electro-hydrostatic actuators. The aircraft was modified with a new power generation and distribution system to provide 270-VDC electrical power required by the electric actuation system. Also, the aircraft instrumentation system was modified to record and transmit test data from the new systems.

The new systems performed flawlessly, a rare occurrence for advanced flight systems on maiden flights. This system reliability was due to extensive supplier testing on the ground -- more than 200 hours of electric actuator integration testing and 800 hours of endurance testing. The electric actuators proved to be more efficient in power usage than projected for both steady state and peak demands, thereby increasing the potential benefits of the system.

Testing included evaluation of handling qualities at many points in the flight envelope. F-16 test pilots who flew the aircraft said the aircraft flew exactly the same as a regular F-16 with hydraulic actuators.

This program accomplished an aviation first. It was the first manned aircraft of any type to fly with a total electric actuation system, i.e., no hydraulic or mechanical backups.

The organizations and companies involved in this achievement, and their responsibilities were as follows:

-- U.S. Air Force Research Laboratory, Wright-Patterson AFB, Ohio -- primary funding and government oversight
-- Lockheed Martin Aeronautics Company, Fort Worth, Texas -- prime contractor, integration of the electric actuation system and the

270-VDC electric power system, modification of the AFTI/F-16 aircraft, and conduct of flight tests at own facilities
-- Parker Aerospace, Irvine, Calif. -- principle subcontractor and developer of the electro-hydrostatic actuation system
-- Hamilton Standard, Rockford, Ill. -- principle subcontractor and developer of the 270-VDC switched reluctance starter/generator system
-- Honeywell Engines and Systems, Torrance, Calif. -- principle subcontractor and integrator of the emergency power unit and oil cooling system
-- TRW Aeronautical Systems -- Lucas Aerospace, Aurora, Ohio -- principle subcontractor for the development of the 270-VDC emergency generator
-- Eagle Picher, Joplin, Mo. -- principle subcontractor and developer of the 270-VDC battery
-- BAE SYSTEMS, Santa Monica, Calif. -- subcontractor and developer of the control electronics for the electro-hydrostatic actuation system

Lockheed Martin Aeronautics Company is a leader in the design, development, systems integration, production and support of advanced military aircraft and related technologies. Its customers include the military services of the United States and allied countries throughout the world. Products include the F-22, F-16, F-117, C-5, C-27J, C-130, P-3 and U-2. The company leads a team competing for the development and production of the Joint Strike Fighter.

LM Aeronautics is a unit of Lockheed Martin Corp., headquartered in Bethesda, Md. Lockheed Martin is a global enterprise principally engaged in the research, design, development, manufacture and integration of advanced-technology systems, products and services. The corporation's core businesses are systems integration, space, aeronautics and technology services.

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