Boeing F/A-18 with Active Aeroelastic Wing Completes First Flight

The Boeing Company [NYSE:BA] F/A-18A Active Aeroelastic Wing or AAW, test aircraft has successfully completed its first flight at the NASA Dryden Flight Research Center at Edwards Air Force Base, Calif.

The Active Aeroelastic Wing joint program involving Boeing Phantom Works, NASA and the U.S. Air Force, is designed to enhance aircraft maneuverability and performance by combining sophisticated new flight-control software with a highly modified wing that bends and twists.

Because this type of wing would require fewer moving parts for controlling flight, wings could be made thinner, lighter and more aerodynamically efficient than today's wings and allow for greater range, payloads and fuel efficiency.

The first AAW flight was conducted Nov. 15 and followed three years of modification and ground testing at the NASA facility. During the 68 minute flight, NASA research pilot Dana Purifoy put the modified F/A-18A through an extensive functional checkout of aircraft flight controls, avionics systems, engine operation and newly installed test instrumentation. He also began evaluation of its aerodynamic flutter limits and differential movement of the inboard and outboard leading-edge flaps used in AAW research.

"This first-flight milestone is one we've been waiting for, and it's only the beginning of a new chapter in the combination of aerodynamics, structures and flight controls into a single integrated system," said Bob Krieger, president of Boeing Phantom Works. "Our AAW teaming effort with NASA and the Air Force is unique, and everyone has worked very hard to reach this point. I look forward to the next few months when we will verify this concept with additional AAW flight tests."

The first phase of AAW flight testing will include about 30 to 40 parameter-identification flights at a rate of three or four per week. Boeing Phantom Works will then use this data to refine wing-effectiveness models and design the AAW flight-control software. The second phase of research flights, to demonstrate the AAW concept with effective control laws, is scheduled to begin in 2003.

"This flight was an historic milestone in the exploration of AAW technology," said Jim Guffey, Phantom Works program manager for AAW. "From this initial first-flight step we will move forward and demonstrate how to capture and exploit this technology for future applications."

AAW technology is essentially a 21st-century, high-tech update of the primitive wing-warping control system devised by the Wright brothers for their Wright Flyer, first flown Dec. 17, 1903. The results of the AAW flight tests will ultimately provide benchmark design criteria to guide the design of future aircraft.

"The project reflects both a return to aviation's beginnings, and a pathway to the future -- a future where aircraft will sense their environment, morph and adapt their shape to existing flight conditions," said Denis Bessette, AAW project manager at NASA Dryden.

The AAW F/A-18A has been modified with additional actuators, a split leading-edge flap actuation system and thinner wing skins that will allow the outer wing panels to twist up to five degrees. The traditional wing control surfaces -- trailing edge ailerons and the leading-and-trailing edge flaps -- are used to provide the aerodynamic force needed to twist or "warp" the wing. Project engineers hope to obtain almost equivalent roll performance of production F/A-18s at transonic and supersonic speeds without using the horizontal stabilators and with smaller control surface deflections.

As an advanced research and development unit, the Phantom Works serves as the catalyst of innovation for Boeing. By working together with all Boeing business units, it provides advanced system solutions and innovative, breakthrough technologies that reduce cycle time and cost while improving the quality and performance of aerospace products and services.

The Boeing Company, headquartered in Chicago, is the world's largest manufacturer of satellites, commercial jetliners and military aircraft. Total company revenues for 2001 were $58 billion.

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