Bell Designs Innovative Compound Helicopter Concept For Lockheed Martin UCAR Program

Bell Helicopter, a key member of the Lockheed Martin Unmanned Combat Armed Rotorcraft (UCAR) team, has successfully completed preliminary design of a novel air vehicle to conduct reconnaissance and combat missions without sending aircrews into harm's way.

During a two-year, multimillion dollar effort funded by the Defense Advanced Research Projects Agency (DARPA) for the U.S. Army, Bell analyzed 13 concepts from advanced, slowed rotor helicopters through very high-speed vertical takeoff and landing (VTOL) fan-in-wing configurations. Bell chose a heavy fuel advanced compound helicopter concept to obtain efficient vertical lift and speed capabilities in excess of 170 knots. The 5,500 pound gross weight aircraft is designed to meet emerging Army hot-day performance requirements of 6,000 feet altitude on a 95 degree-day Fahrenheit and still maintain a capability to climb at 500 feet per minute and an altitude ceiling of 18,600 feet. This was accomplished while staying inside the structural limits normally associated with all types of rotorcraft and using turbine engine fuel available on the battlefield such as JP-5, JP-8 and diesel.

"We are delighted with the advanced technical achievements of this design. It will revolutionize the helicopter industry for years to come," said Mike Redenbaugh, chief executive officer of Bell Helicopter in Fort Worth, TX. "In today's world, protection of U.S. interests at home and abroad are paramount and this system fills a gap in our strategic and tactical systems. It is an honor to serve the U.S. Army in this way," Redenbaugh added.

The main rotor concept is an advanced rotor with cambered blades, a product of Bell's 60 years experience in producing high performance, safe rotor systems. The Propulsive Anti-Torque System (PATS) is a technically advanced, high-bypass propulsion system within the tail cone that provides an anti-torque capability comparable to modern helicopter designs, with the added synergistic benefit of forward propulsive thrust. This provides the benefit of compounding without the weight penalties normally associated with compound helicopters.

The concept also provides high levels of safety, as there is no exposed rotating tail rotor. Absence of a tail rotor and slowed main rotor contribute to achieving significantly lower noise levels and vastly improved survivability attributes over standard helicopters. Bell considered using a turbocharged internal combustion engine to achieve an even greater endurance than the maximum nine hours, but found that the empty weight penalties associated with these concepts outweighed the advantages.

"Our design simplicity, use of man-rated helicopter components and specifications, combined with our fully integrated redundant flight control system provides a significant improvement in performance, safety and reliability compared to standard UAV systems with single thread or nonintegrated dual redundant flight control systems," said Charles H. Jacobus, director of Advanced Technology Programs for Bell.

The Lockheed Martin UCAR team includes Lockheed Martin Systems Integration - Owego, Lockheed Martin Aeronautics Company Advanced Development Programs, Lockheed Martin Advanced Technology Laboratories, Lockheed Martin Simulation and Training Systems, Lockheed Martin Missiles and Fire Control, Bell Helicopter, a Textron company, Raytheon Company, the Charles Stark Draper Laboratory, Whitney, Bradley & Brown, L-3 Communications, DRS Technologies and Harris Corporation.

Headquartered in Bethesda, MD, Lockheed Martin employs about 130,000 people worldwide and is principally engaged in the research, design, development, manufacture and integration of advanced technology systems, products and services.

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