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X-Hawk city dweller packs serious firepower

By Thierry Dubois

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Aircraft

Bell Helicopter has initiated an engineering study with a number of partners for a rather unconventional aircraft that designers say would be especially well suited to urban operations. The Bell X-Hawk would feature two shrouded main rotors in tandem configuration, fore and aft, and two smaller shrouded rotors acting as thrusters. Although Bell is targeting military applications, a civil variant is under consideration by its partners. A full-size demonstrator should fly in 2009.

But first, a smaller UAV variant is scheduled to be built and test flown sometime next year. The single-engine Mule will be able to ferry equipment to disaster areas or battlefields as well as extract wounded soldiers, according to Rafi Yoeli, president and CEO of Urban Aeronautics, an Israeli company that has partnered with Bell on the military project and is pursuing development of a civil version on its own.

The Mule will be able to carry 500 pounds of useful load with enough fuel for two hours of flight. Some major tooling is ready for the production of the full-size aircraft, Yoeli said. Transmission and rotors are being produced by subcontractors Purdy and ACI, respectively, both based in Hartford, Conn. Negotiations are said to be under way with engine makers, and evaluations have been performed using the Rolls-Royce/Honeywell LHTEC CTS800-4N and Turbomeca/Rolls-Royce MTR 390 turbine engines.

In Yavne, Israel, where Urban Aeronautics is based, a full-flight simulator has been built to validate handling and flight characteristics of the X-Hawk design, including the control physics of its fly-by-wire system.

The unusual aircraft was inspired by the Piasecki flying Jeep of the 1960s. Its architecture, with its protected rotors, enables it to perform as a city dweller without the usual dangers associated with running into obstacles. The main drawback to the X-Hawk design is its fuel burn, which is much higher than that of a conventional helicopter.

The 8.2-foot-diameter main rotors rotate at 1800 rpm. Each of two engines can drive all four rotors for lift and propulsion, in a conventional redundant architecture. An all-electric system will be used for de-icing the rotors, vanes and engines, Yoeli said. Fuel is tanked in the center fuselage, below the cabin floor.

The civil version will have a less cramped cabin, compared to the military variant. The civil X-Hawk has room for eight passengers and one pilot, versus 11 plus the pilots for the military version. Pricing would be around that of similarly sized helicopters, or about \$6 million.

A major improvement over the early shrouded-fan vehicle concepts is the addition of a vane control system in the X-Hawk. The combination of two vane cascades, respectively at the inlet and the outlet of the duct, give the aircraft extremely good maneuverability. The vane cascades are situated equidistant from the aircraft's center of gravity. They generate pure lateral forces that allow the X-Hawk to move sideways without rolling. This vane system also generates control power with sufficient force to counter strong wind gusts.

Another unique feature is the louvers at the front of the forward duct and at the rear of the aft duct. They allow the X-Hawk to benefit from the ducts only when required—in hover. The louvers then render the ducts "transparent" when they would otherwise become a hindrance—in forward flight. Wind tunnels tests indicated a maximum airspeed of 140 knots.

Urban Aeronautics and Bell are jointly conducting some risk-reduction research, Yoeli said. Bell is involved in the full-size military version only. Last year, Bell was understood to be committed to building an X-Hawk demonstrator. However, no one at the company responded to HAI Convention News inquiries for an update.

Last month, Yoeli said his company had raised most of the \$10 million it needs to develop the aircraft. Investors from several countries are involved, mainly in the UK, the U.S. and Israel. "The remaining \$2.5 million should be secured by early this month," he said.

So when will we see the X-Hawk at Heli-Expo? "Not until we have a civil version in the certification phase," Yoeli said.

In 2003, Yoeli flew a smaller, two-person aircraft based on the same concept and dubbed the CityHawk.

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