SPOTLIGHTS
The rotorless external configuration renders MULE capable of landing and offloading supplies with much greater speed and accuracy compared to conventional aircraft, company executives hope. Once deployed, each MULE can evacuate two wounded on its return flight to forward or rear bases.

"Everything inside the body of the aircraft; there are no exposed resources, and that opens up a world of operational possibilities for military and civil use," said UAS expert John Yoon. According to Yoon, the unmanned MULE, as well as the company's X-Hawk, a larger, twin-rotor, 11-passenger unmanned demonstrator now in development, are designed to fly with precision and relative stealth in urban, forested, and other areas now off-limits to conventional tactical aircraft.

"The tips of the rotors are protected inside the ducts, and deliber- ately tuned to a specific frequency, so the MULE will be very stealthy," Yoon said. He noted that the current airframe and radar signatures have not been kept very low to ensure survivability.

In an interview with UrbanAero's headquarters foreman, Yoon noted that the basic concept driving the firm's internal rotor Fancraft design has been around for decades, yet never proven due to inherent instability and aerodynamic inefficiencies. However, thanks to new lightweight composite materials, high-thrust engines, powerful microprocessors, and quadcopter flight controls and computer-aided aerodynamic simulations, "what was once a mere design curiosity is now real," he said.

Yoon said MULE relies on existing technology, including AESA radars, AI, and software, which has experienced an upsurge in demand, and has garnered as a U.S. Navy-funded risk reduction and safety assessment program conducted jointly with BELL Helicopter and Penn State University.

"We're building an air vehicle that is as safe as a fighter jet," said Yoon.

Hand-Crafted on the Cheap
Ovidiu Harari, a nationally recognized aerospace engineer who agreed to serve as UrbanAero's chairman after nearly 40 years at state-owned Israeli Aerospace Industries, credited Yoon for designing the prototype and assembling the unmanned PANDA -- a tactical surveillance system that does double duty as a flying test bed -- in a fraction of the time and cost required of conventional aerospace firms.

"We've done wind-tunnel tests of the high-speed variant and have gotten excellent results, and our existing MULE demonstrator can be adapted quite easily to hold up to four people," the firm's CEO said.

First flights will be very brief, low-altitude, and conducted with the MULE vehicle tethered to the ground. By late summer, the firm plans to transition to high-altitude, unpowered flight, after which the MULE vehicle will be ready for demonstration flights for prospective customers, company officials said.

DATA PAVE PROMISING
Data culled from flight testing of the firm's scaled-down, 30-pound Pandas and ground subsystem tests indicate that the 2,400-pound MULE demonstrator will be highly capable, enduring at least 300 knots and able to withstand gusts of up to 70 knots. Yoon attributed performance breakthroughs mostly to the company's Vane Control System, a row of vanes on the inlet and outlet of the fan ducts that provide maximum maneuverability without having to tilt the body of the aircraft.

"Vanes mounted at the outlet of the ducts are an old idea, but for some reason, nobody ever put vanes on the inlet side. But we found they are as effective as the lower set of vanes and when all are moved in coordination, they act as a sum of 10s of individual lifting surfaces, capable of generating a multitude of overall force and moment combinations," explained Janina Franek-Yoon, UrbanAero's vice president for marketing.

"For the first time, we have a vehicle that can move sideways, add lift on the side instead of the out the nose, and vice versa," Franek-Yoon said.

She added that aerodynamic tailoring between the lift rotors and fuselage allows the platform to provide at least 20 percent of lift at 350 knots and has passed a U.S. Navy-funded risk reduction and safety assessment program conducted jointly with Bell Helicopter and Penn State University.

"We're building an air vehicle that is as safe as a fighter jet," she said.