

'Flying Humvee' designed to autonomously deliver supplies

Unmanned aircraft can hover, land like a helicopter; not meant to fight in war zones

BY RYAN DIONNE

Staff Writer

BROOMFIELD — It's expected to have the functionality of a helicopter but be much faster, making Frontline Aerospace's "flying Humvee" the next wave of unmanned aircraft.

"It's very quick and very quiet," said Ryan Wood, Frontline Aerospace Inc.'s chief executive.

The private Broomfield-based company was formed in September 2007 and is in the midst of producing its V-TOL (vertical takeoff and landing) Swift Tactical Aerial Resource in addition to working on its other major product, the MicroFire.

Dubbed the V-STAR, or flying Humvee, the tactical resource uses Frontline's MicroFire technology to increase its fuel efficiency by mixing hot exhaust air with compressed air before combustion. By doing that, the engine requires less fuel to heat the cooler, fresh air before it's fired.

"The key trick that we accomplished is we made it small and light and effective," Wood said.

The device can be retrofitted on a Rolls-Royce model 250 engine, which is common in small utility helicopters, and



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Ryan Wood, chief executive of Broomfield-based Frontline Aerospace Inc., shows off a miniature model of his company's V-STAR, which he calls a "flying Humvee." The vehicle can be used to deliver supplies to troops in war zones. The supplies will be loaded onto the V-STAR and autonomously flown to the GPS coordinates the soldier provided.

will be used by Frontline's V-STAR.

Though still in the design phase, the "flying Humvee," as Wood calls it, is primarily designed to carry supplies to combat troops in war zones though it could

be used for humanitarian missions, such as carrying construction material through mountainous areas without roads.

By using an enclosed horizontal rotor in the middle of the aircraft and another

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Primary service: aerospace technologies

Founded: 2007

enclosed vertical rotor in the rear, the V-STAR can take off, land and hover like a helicopter but still fly and maneuver like an airplane.

The roughly \$5 million aircraft uses the mid-mounted, counter-rotating fan and one of its two engines to lift from the ground. Then as it lifts, power is transferred to the rear rotor that it uses to fly.

"In under a minute or a minute and a half you'll be up to speed and on your way," Wood said. "So it happens pretty quick."

That means troops can place supply orders from the field. The supplies will be loaded onto the V-STAR and autonomously flown to the GPS coordinates the soldier provided.

The aircraft is designed to carry 400 pounds, Wood said.

At 288 knots, or about 331 mph, the aircraft can fly about 500 miles. At 160 knots, or 184 mph, it's expected to travel about 3,000 miles, he said.

Using a fast, quiet, unmanned aircraft

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HUMVEE from GA

eliminates the possibility of having pilots shot down during wartime supply missions and provides ground troops with crucial supplies faster than via helicopter.

The V-STAR, however, isn't made to fight.

"Its primary mission is logistics resupply," Wood said. "That's its number one goal."

It can be fitted with weapons and Kevlar to use on a limited basis in combat. By using an optical high-definition infrared video camera permanently mounted on the aircraft, it could be manually flown into a combat zone via computer.

That same manual mode can be used to precisely position the V-STAR where a military unit needs supplies rather than solely following a GPS coordinate.

Darold Cummings, Frontline's chief engineer and V-STAR design team leader, said the military was looking five or six years ago for an autonomous aircraft to deliver supplies, but nobody could design and build one.

So the aerospace company revisited the idea and sought to create an aircraft without exposed rotors – just what the U.S. Department of Defense' Defense Advanced Research Projects Agency, or DARPA, wanted, Cummings said.

"Within three months we were ready to present to DARPA," he said. But the advanced research agency told them the design was too far along to receive funding, he and Wood said.

Though the final material makeup

is undetermined, Cummings and his team designed a small aircraft (21.5-feet long with a wingspan of 16.5 to 26.5 feet depending on model), with a wing structure that, from the top, forms a diamond.

The wing design, appropriately named the "diamond box wing structure" connects the 19-inch wide wings, which are slightly forward of center, with 10-inch wide sections that angle back to the tail.

With a traditional wing that's in front of the center rotor, turbulence caused by the fan doesn't affect the aircraft's lift or controllability, Cummings said. Depending on the model, the tips of the aircraft's main wings tilt up and down as needed to help with stability or speed.

The enclosed fans make the aircraft safer than a helicopter with exposed rotors, and it also has potential for less maintenance, Cummings said.

"The best part about it: It's very robust," he said. If the V-STAR flips over, the rotors aren't destroyed, and the aircraft would likely have minimal damage compared to a normal helicopter.

While neither Wood nor Cummings would disclose whom, the company has at least one potential client and plans to build a quarter-scale version of the "flying Humvee" for that customer.

"We're going to fly a subscale probably this year, and if we get some funding or a customer we'll probably design the full-size version in '09 and fly it in '10," Wood said.