Flying Denali
LANDING UPHILL, ON ICE p. 70

Heavyweight
WRESTLING THE HUMBLING HOWARD p. 56

P-51 Engine-Out
INSIDE A MUSTANG EMERGENCY p. 47

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Not What It Seems
COULD A CHECKLIST HAVE SAVED THIS CREW? p. T-7

All Hands
THE NEW AIRLINE HIRING SPREE p. 78

Textron Scorpion

Sting Operation

BIZJET BACKGROUND, BATTLEFIELD AMBITIONS p. T-10

SPECIAL OP

Textron's Scorpion brings GA know-how to the military space

BY THOMAS B. HAINES
PHOTOGRAPHY BY MIKE FIZER

THE PICKUP TRUCK pulls surreptitiously out of the parking lot and heads toward the interstate, attempting to fit in with the rest of the traffic. From our perch at 12,500 feet, we are practically invisible from the ground, and silent. The driver has no idea we are monitoring his every move, the L3 Wescam MX-15 camera in the nose turret is providing a high-definition image on the big Garmin display in front of me. With the touch of a button I can share that hi-def video and other sensor data with anyone else in the "combat cloud." Cleared to engage, I use my middle finger on the back of the button-festooned joystick to slew an icon over the truck, the system now tracking it as a target. I choose a laser-guided rocket from one of the hard points on the right wing and send it on its way, the truck disappearing in a flash a few seconds later.


N532TX

OK,

I didn't really blow up a truck, or even launch a rocket, but the rest of the scenario played out over the El Dorado Lake area just outside Wichita, where the Textron Scorpion I was flying was built. With the flip of a switch, the camera turret was sucked up into the nose compartment and we dashed away, ready for our next mission. Wracking the stick to the left into a steep turn, I felt the G suit squeeze my legs and torso just a bit. Despite that unusual sensation, I couldn't help but notice how much the tandem-seat, twin-engine demonstrator handled like a Cessna Citation, which shouldn't be surprising given the lineage to the storied business jet. The engines; avionics; wing aerodynamics; and parts of the flight control, hydraulic, pressurization, and braking systems all stem from the most popular line of business jets ever designed.

So how does a Citation find its way from Billings to Baghdad? In a circuitous kind of way, as it turns out.

Bill Harris, vice president of Scorpion sales, tells it like this: In 2011 or so, a group of defense experts gathered in Washington, D.C., to contemplate the future of light attack and intelligence, surveillance, and reconnaissance (ISR) systems as the current fleet of such aircraft ages out and becomes ever more expensive to maintain. Meanwhile, fourth- and fifth-generation fighters have been tapped to fill some of those roles—an expensive solution and waste of resources. Using an F–16 or F–22 to monitor a suspicious pickup truck is like using a backhoe to plant a tulip bulb. A hand trowel will work just fine. The Scorpion can be that hand trowel.

Or, as the Textron Aviation Defense team likes to put it, the Scorpion is the empty Ford F-150 waiting to be filled.

The group in Washington came to Textron in 2012 with some ideas about what was needed, leading Textron CEO Scott Donnelly to put together an entrepreneurial team to design, build, and fly an airplane in 24 months. "We did it in 23 months," says Harris. Among the design goals were flyability, reliability, and maintainability—the sort of attributes a Citation customer demands every day, but not necessarily attributes you find in a complex military airplane. Textron has four flying Scorpions, all built with the company's money.

No government funds were used at all, stresses Senior Flight Test and Demonstration Pilot Brett Pierson. He was so intrigued by the boldness of the Textron project that he came out of retirement after an illustrious Navy career to work on it. Pierson, Flight Test and Demonstration Pilot Matt Hall, and a small team of technicians have paraded the airplanes all over the world, demonstrating the ISR and light attack capabilities to nine militaries in the Middle East in six days with nary a squawk. A planned two-week testing of the bomb and rocket release systems from the wing-mounted pylons was completed in just a week last summer at Naval Air Station Patuxent River, allowing the crew to return home four days early. "It just doesn't break," explains Hall. "The military staff we met with couldn't believe how small our support team is."

But sales of the unique aircraft so far: zero.

Harris says he is not surprised. "These military deals take a long time. People want to buy the latest and greatest. They want a Bentley but can't always afford it. It takes a while to bring them around." The Scorpion is competing in several exercises for light attack and soon in a light ISR experiment. Everyone agrees that if the U.S. military buys the airplane, other countries will follow.

The Scorpion's business jet genesis does give it an amazing economic appeal compared to purpose-built military airplanes. The number of off-the-shelf parts and systems in the new model makes it easy to build and maintain, especially when combined with Textron's global maintenance

EVER-PATIENT DEMO PILOT Matt Hall helps the neophyte jet jock author with a helmet fitting (above). Hall and Brett Pierson (far right) get to demo the unique Textron Scorpion for militaries around the world. With some systems similarities to Citations, the Scorpion is about 50 percent composite by weight. The high, straight wing is all composite.


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EXPERIMENTAL


FLIGHT TEST

TWO LARGE BELLY BAYS can handle any number of sensors or fuel tanks (top left). The six wing-mounted pylons (above) can carry various sensors, fuel tanks, or weapons, including laser-guided missiles and rockets, GPS-guided bombs, and .50-caliber machine guns spewing 1,100 rounds per minute. Need more range? Hellfire missiles work, too. This Scorpion can sting! The red trigger button on the back of the control stick unleashes the weapons (left). The HOTAS stick, thrust levers, HUD, and yellow-and-black-looped ejection seat handle (opposite, top) give the cockpit a military look. But the big Garmin display and dual touchscreens show the civilian side of Scorpion. The backseater's big display primarily shows sensor data (opposite, bottom).

BOTTOM: COURTESY TEXTRON

and parts network. And it's hard to argue with the economics. The Scorpion's two Honeywell TFE-731 engines, capable of 4,000 pounds of thrust each, burn just 10 to 12 percent of the fuel of an F–15E and less than 20 percent of the fuel of an F–16. The Scorpion's base price is $20 million (closer to $25 million if you want the pylons and systems to missionize it, and the training package). Harris' estimate for an F–16 is $60 million. Your average F–35 is somewhere between $89 million and $104 million; extra for white walls.

The Scorpion's maximum takeoff weight is 22,000 pounds; a Citation CJ4's is just over 17,000 pounds.

The mission is versatility, according to Hall. "We put in a hole and built an aircraft around it," he explains. The literal "hole" is three bays totaling 85 cubic feet—two large ones behind the pressurized cockpit and one in the nose that typically holds a turret with something like the MX-15 camera. The larger bays can hold a larger camera, such as the Wescam MX-25—a higher-resolution system—or any number of sensors for military, humanitarian, environmental, or agricultural use. Harris envisions National Guard roles where the Scorpion can do reconnaissance over disaster areas or even act as a 4G LTE hotspot, providing temporary cellular telephone service while ground infrastructure is repaired after a hurricane, for example. Crop and forestry monitoring and border and maritime patrols are other potential uses, he suggests. And while some might argue those are good uses for a drone, Harris says the Scorpion is more economical to operate than large military drones, such as a Reaper. And it is faster, too, able to dash to a scene at 450 knots and 41,000 feet and then loiter at 15,000 feet for more than four hours at 150 knots on its stock 6,000 pounds of fuel. Another 1,200 pounds of fuel can be carried in the nose bay and even more in pylon tanks, although that feature is not yet available.

It's basically a jet airframe with a Garmin avionics system. Those operate almost independently from whatever a customer wants to put into the bays. The bays have lots of electrical power available to run whatever might show up. The idea is to be able to easily and quickly swap sensor packages. And since the sensors are not integrated into the airplane, the installation of new packages can be quick and painless. In a more traditional ISR airplane, the sensor systems are highly integrated into the airframe. Upgrades or replacements often take years of work and many flight hours of testing. The Scorpion is more of a plug-and-play alternative.

While the Scorpion may not have the cachet of an F–16, it does have some pretty amazing technology. A head-up display (HUD) for the front-seater gives the pilot plenty of options for tracking targets while keeping eyes outside. A helmet-mounted cueing system (HMCS) tracks the pilot's head movement, and, when combined with a helmet-mounted monocle, allows the pilot to select a target simply by looking at it—and to also share the image he or she is seeing with the backseater. The Garmin G3000 cockpit, which has become common on business jets, brings a level of navigation and situational awareness unparalleled in similar military airplanes. Hall said military pilots are blown away by the Garmin's capabilities. Among the differences in this installation is that the Garmin displays are night-vision-goggle (NVG) compatible and the touch screens

can be accessed using gloves. Unlike most modern business jets, though, the Scorpion does not have full-authority digital engine controls (FADEC). Instead it uses a digital electronic engine control (DEEC), which is a simpler and somewhat less sophisticated engine control system.

While parts of the airplane will seem foreign to military pilots, other parts will be familiar, such as the G-suit integration; onboard oxygen generation system (OBOGS—they do love their abbreviations); and the Martin-Baker MK16 ejection seats, which can safely toss the crew even from a standstill.

All of these military systems provide yet another possible role for the Scorpion—as a systems trainer. With its relatively miserly cost and fuel burn, the Scorpion can get pilots used to G suits, HUDs, HMCSs, ejection seats, NVGs, and sensor and targeting systems, making their transition to mainline military airplanes that much more efficient.

As a civilian pilot, but one with a CJ type rating, I was coming at the Scorpion from the other side—feeling rather at home with the flight controls, the trailing link landing gear, the straight wing, stick shaker, the avionics, and the overall flight characteristics of the airplanes. Mysterious for me was the HOTAS (hands on throttle and stick)—the 10-button joystick for controlling most everything on the airplane, and pretty much everything listed above that has a set of initials, plus the ejection seat and G suit. Hall and Pierson spent several hours going over FAA Advisory Circular 91-87 with me, the required ejection seat training program—who knew? Plus lots of time in the cockpit putting on and taking off the harness and connecting/disconnecting the oxygen, G suit, and ejection seat straps and intercom lines—all in the name of emergency egress practice.

Fortunately, my actual flight was far less dramatic—in fact, other than the targeting system, it all felt pretty familiar, except for the nosegear steering, which is more like an F–18 than a Citation. Holding the high-gain switch on the HOTAS allows the airplane to spin around inside a wingspan, handy for carrier operations and for the short and narrow runways the Scorpion is at home on, unlike its land-based fighter counterparts.

The Citation-like straight wing makes for a highly stable sensor platform, especially at slow speeds. During our demo flight, I couldn't get the airplane to break in a stall—clean or dirty, even when pulling back through the stick shaker. Not surprisingly, visibility through the canopy is amazing. The wing is behind the cockpit, so downward visibility is excellent as well. Even my first touch-and-go and full-stop landings at storied Beech Factory Airport were well within the acceptable range—as in, we didn't shed any parts.

With its ability to carry a plethora of sensors, easily changed out without years of development work; economical acquisition and operating cost; predictable reliability; go-anywhere runway ability; and versatile payload systems, the Scorpion holds plenty of promise. The answer everyone wants to know, especially Textron CEO Scott Donnelly, is will militaries and other governmental organizations around the world recognize the value in such an airplane? In the future, will the Scorpion sting the bad guys or the hand that created it? **AOPA**

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THE CAMERA TURRET looks more like R2-D2 hanging below the nose (below). Dots on the canopy are part of the helmet-mounted cueing system. The three-segmented strip below the forward canopy is part of the night vision goggle system for night formation flying. The large panel below mid-canopy is the stowed egress ladder. With that and the tow bar stowed in a belly bay, Scorpion can operate without any special ground support equipment, further increasing its versatility over conventional military aircraft.