

# OFF-ROAD WARRIOR







## Phantom Works develops versatile combat support vehicle for the V-22

*By Garrett Kasper and photos by Sally Aristei*

Uneven, rocky terrain is no match for its knobby 35-inch (90-centimeter) tires. Muddy, fender-deep creek water and roller-coaster-sized hills are no challenge for its 240-horsepower multi-fuel engine and four-wheel drive. It can roll over a pile of logs thicker than telephone poles, even with 3,300 pounds (1,500 kilograms) of payload strapped to its back. With all-wheel steering, it can pivot with ease and still reach 80 mph (130 kilometers per hour) on the open road.

Phantom Badger—a combat support vehicle designed to be transported in a V-22 Osprey—is Boeing's answer to a perplexing problem for today's U.S. Special Forces: how to quickly deploy from a tilt-rotor aircraft a tough, versatile combat vehicle that can adapt to any environment and meet the most challenging combat missions.

To rapidly develop the prototype, Boeing teamed with a company that has historically built race cars.

"Phantom Badger is not an ATV [all-terrain vehicle] on steroids," said John Chicoli, Boeing program manager for the V-22 Internally Transportable Vehicle program.

"It addresses a gap for a vehicle that can be internally transported in a V-22, but it also allows increased payload and speed while providing more ride comfort than a smaller ATV."

Developed by the Special Pursuits Cell at Boeing Phantom Works, the Phantom Badger is Boeing's response to a U.S. Special Operations Command operational requirement

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**PHOTOS:** (Left) Lead mechanic Wyatt Montgomery (passenger) and design engineer, Andrew Wizorek, from Boeing project partner MSI Defense Solutions, donned combat fatigues to make Phantom Badger vehicle durability, compatibility and comfort testing more authentic. (Above) Phantom Badger can exit a V-22 Osprey within seconds—a critical design requirement for special operations.



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The V-22, built by Boeing and partner Bell, has a unique tilt-rotor configuration that gives it the capability to cruise like a fixed-wing aircraft but take off and land vertically like a helicopter. It is currently operated by the U.S. Marine Corps and U.S. Air Force Special Operations, and has been widely used for many types of missions in Afghanistan.

"We listened very closely to the customer, and every single element on Phantom Badger was added or removed based on specific input of actual special operators," Chicoli said. "We intentionally designed it to be rugged—yet affordable—because we want warfighters to trust that it will live a long life inside the demanding and unpredictable world of special operations."

With its powerful hydraulic and suspension systems, he added, Phantom Badger protects warfighters from being buffeted in rougher terrain, alleviating physical exhaustion and keeping them fresh and focused for the fight.

Aside from its power and rugged capabilities, one key feature of Phantom Badger is its interchangeable back end for specialized mission modules. The modules are customizable to support a variety of critical missions such as reconnaissance, explosive ordnance disposal, mounted weaponry, combat search and rescue, and transport of injured warfighters.

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— Wyatt Montgomery, lead mechanic for MSI Defense Solutions

In tandem with Phantom Works' rapid prototyping capabilities, Boeing teamed with MSI Defense Solutions to build the Phantom Badger for the Osprey and other cargo aircraft. The North Carolina-based company boasts a rich history with NASCAR and has significant experience in building tactical vehicles. Over the past year, Boeing and MSI designed, built, tested and modified Phantom Badger. The team has conducted hands-on Phantom Badger demonstrations with multiple U.S. customers and has received significant interest internationally as well.

"The engineers and technicians at MSI complement Boeing nicely because we can quickly respond to customer input and build small batches of vehicles very economically," said David Holden, president of MSI Defense Solutions. "With our history on





NASCAR auto racing teams, MSI's world-class technicians can build, test and deliver these machines for the warfighter immediately, to fill this gap in the special operations community."

In June, MSI moved to a larger facility in Mooresville, N.C., where Phantom Badger will be produced. Assembly of commercial components such as the engine, transmission and differentials will be performed there, as well as fabrication of the mission modules.

"It's mind-boggling to think that this vehicle was just a drawing on a computer screen six months ago," said Wyatt Montgomery, lead mechanic for MSI Defense Solutions. "Boeing's vision of Phantom Badger got this thing rolling, and our team of engineers, fabricators, mechanics and suppliers bent over backward to make it happen. Our nation's most elite forces had great ideas and suggestions for creature comforts, which we've also incorporated."

Andrew Wizorek, MSI's design engineer and program manager for Phantom Badger, said his career in NASCAR engineering has paid big dividends when it comes to fine-tuning Phantom Badger and meeting the tight requirements for cramming so much capability into the 5-foot-wide (1.5-meter) cargo hold of a V-22.

"My experiences at Joe Gibbs Racing provided me the knowledge and skills for suspension tuning that I use today on Phantom Badger," Wizorek said. "To fit in the V-22, we have very little room to package all of the subsystems. Even more challenging, we had to design each individual component for commonality and easy maintenance."

Montgomery, too, has years of experience working in a variety of jobs for many of the top teams in NASCAR.

"This project has no victory lane at the end," he said of Phantom Badger. "It will be a silent win because I'm confident that in some god-awful place in this world, there will be a team of special operations forces relying on Phantom Badger to pull them through." ■

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**PHOTOS:** (Clockwise from far left) From MSI Defense Solutions: Andrew Wizorek demonstrates how Phantom Badger's litter module allows a medic easy access to wounded warfighters; lead mechanic Wyatt Montgomery, left, and Wizorek fine-tune a turbocharger, which allows the Phantom Badger to reach high speeds; mechanics Linden Barnicle, from left; Paul Silvestri and Montgomery assemble a turret mount on one of Phantom Badger's various mission modules; Montgomery, left, and Wizorek demonstrate Phantom Badger's four-wheel-drive capability; Silvestri works on the vehicle's engine.