



Brainstorm ■ Stuart F. Brown

# War-Wheel Drive

Designers roll out an armored **successor for the Humvee.**



JOHN F. WILLIAMS—U.S. NAVY

To help deflect bullets and blast, Ultra AP's crew compartment is shaped like a geodesic egg.

WE'VE ALL SEEN VIDEOS OF RACECAR CRASHES IN WHICH the vehicle disintegrates spectacularly into smoke and flame and flying, spinning debris—and the driver emerges miraculously unscathed. Those happy outcomes are the result of an engineering strategy that seats the driver in a strong, lightweight carbon-fiber “tub” in the middle of the vehicle, surrounded by a tubular-steel roll cage. Now that idea is being proposed for a new armored patrol vehicle that would afford more protection against the deadly mines and improvised explosive devices that are ravaging U.S. troops in Iraq.

The Ultra AP project got underway in 2004, when the chief of naval research awarded \$3 million to the Georgia Tech Research Institute to explore—on the double—ideas for a patrol vehicle to replace the Humvee. Not designed as an armored vehicle, the Humvee has turned Army and Marine fighters into sitting ducks. It gets seriously bogged down when equipped with heavy add-on shielding. The Navy wanted a transport that could go 60

miles an hour and protect its occupants better. Working furiously with a small cadre of veteran auto industry engineers, the Georgia Tech team completed its concept vehicle in less than a year by building it atop an off-the-shelf chassis for a Ford F-350 pickup truck.

Everything about the Ultra AP design puts the people first. The four occupants sit back to back so that they can see hazards from all directions. Their seats are enclosed in a tube-framed “blast bucket” shaped like a geodesic egg and shrouded in a new type of lightweight armor. “The whole idea is that the vehicle doesn't need to survive an attack, but the people do,” says principal research engineer Gary Caille. The faceted shape of the blast bucket is intended to present the minimum surface area in any direction, which helps deflect explosive blasts so that they do less damage to the crew capsule.

Another feature is placing the crew as far as possible from the vehicle's wheels, which often take the brunt of mine explosions.

While armor can help protect the driver and passengers against bullets and shrapnel, it can't save them from the spine-shattering shocks that typically come twice in a big explosion—once when the vehicle is blasted skyward and again when the wreckage hits the ground. Racecar features in the Ultra AP design, like multipoint safety harnesses and shock-absorbing seats, can make a big difference. The seats are mounted on a material called Skydex, which is used to cushion the outfield walls of baseball stadiums.

You can think of the Ultra AP as one of those exotic show cars that let engineers and designers try new ideas on the public. It won't be produced, but some of its crew-protection features will probably find their way into the joint Army and Marines Light Tactical Vehicle program that will develop a follow-on to the Humvee. **F**

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