

APL Technology Helping to Make Hydrogen-Powered Vehicles a Reality

Leveraging technology developed in the 1990s, APL engineers and technicians have been working with a U.S. automaker to develop a "technology demonstration" hydrogen-powered sport utility vehicle (SUV). The Lab was tasked with modifying two production SUVs for hydrogen storage, and on Nov. 15 the first vehicle was transported by **Keith Pickett** of APL's Transportation Section, to Detroit. The second SUV hydrogen storage conversion vehicle is scheduled to be completed by mid-January.

"This project represents a transition for the hydrogen gas Integrated Storage System [ISS] that APL co-developed with Lincoln Composites in Lincoln, Neb., under a Department of Energy (DOE) cooperative agreement during the 2001 to 2004 timeframe," says Project Manager **John Wozniak**, of the Air and Missile Defense Department.

That project was funded, in part, by a grant from APL's Office of Technology Transfer, which is working to transfer the patented ISS technology to the commercial market. The technology incorporates lightweight carbon fiber composite tanks, encapsulated with impact-protection foam, within a shell shaped like a conventional automotive gasoline tank.

Packaging Challenges

Gaseous fuels like natural gas or



Two APL-patented Integrated Storage Systems are shown installed on the undercarriage of a technology demonstration vehicle.

hydrogen produce less energy than a similar volume of gasoline or diesel would. At a pressure of 5,000 pounds per square inch, a hydrogen fuel tank must be eight times larger than a gasoline tank to hold the same energy content. This posed a vehicle packaging dilemma for the APL team that was solved, in part, by the ISS design.

A creative vehicle chassis arrangement was then engineered to complete the packaging solution. It involved incorporating the largest possible ISS into the underbody

without compromising vehicle handling, ground clearance or collision safety. "We worked closely with Craig Naff, Inc., based in Woodstock, Va., to develop the chassis packaging arrangement, and the custom metal fabricator very skillfully implemented it," Wozniak says.

Parallel Efforts

While APL engineers addressed the hydrogen storage challenge, engineers in Detroit have been developing the powerplant. Once these two technologies are combined, the technology demonstration SUVs will be tested under a variety of driving conditions.

Wozniak says that the ISS development work and current vehicle application task are a direct result of the successful Advanced Natural Gas Vehicle (ANGV) project run by the Lab from 1993 to 1999 and funded by DOE.

"The staff who worked ANGV and the Hydrogen ISS, believe strongly in using our talents to help solve the growing worldwide transportation energy problem," he says. ■



APL staff who supported the hydrogen storage technology demonstration project are: (standing, from left) Bob Harter, Richard Hildebrand, Kurt Ruckelshaus, Paul Biermann, Paul Wienhold, Randall Slagle, Mike Boyle, Conrad Grant, and Ron Prietz; and (kneeling, from left) John Wozniak and Gary Peck.