Military wants a few good innovators

Troops, toiling in extreme temperatures day and night, need a ready supply of goods to perform their job, and making sure the goods are provided is the job of the **U.S. Army** Materiel Command.

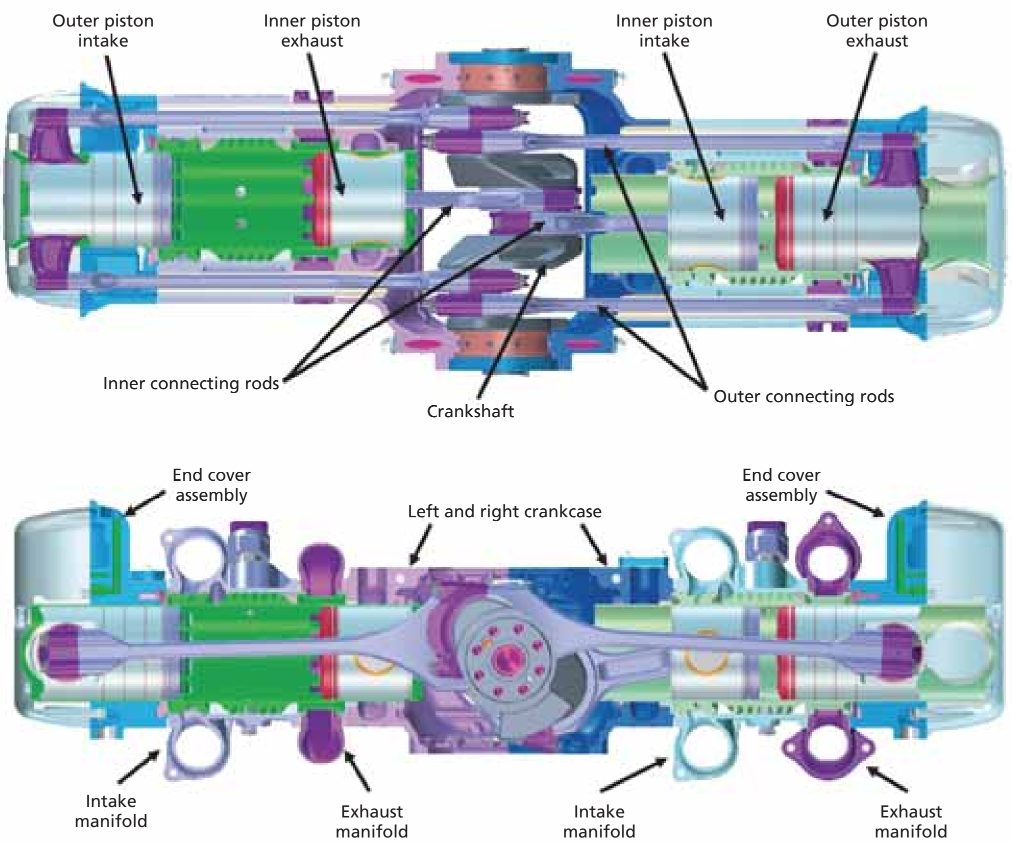
"As we like to say, if a soldier shoots it, drives it, flies it, wears it, or eats it, the Army Materiel Command provides it," General Benjamin Griffin, Commanding General of the U.S. Army Materiel Command, said during a keynote speech on the final day of activities at the **SAE** 2005 World Congress in Detroit.

Typical components like the cylinder head, valves, and camshafts are eliminated in the OPOC engine design for enhanced scalability, whereby the addition of a self-contained module can increase peak power and torque.

Helping the Army develop and refine manned and unmanned vehicles are engineers, usually industry professionals with a long military association. "In 1917, SAE members helped develop a Class B five-ton truck in 69 days," Griffin said. In the 21st century, the need to keep the military in a state of technical readiness is just as important as it was in the 20th century.

"The automotive engineering community represents a vast resource of knowledge and innovation that could develop innovative solutions to military needs," said Gary Rogers, President and CEO of **FEV Engine Technology** and President of **FEV Testing Systems**. Rogers was part of a Congress panel discussing the topic of doing business with the military.

A company's ability to develop robust and reliable technologies remains a valued attribute. But in the context of an ever-changing global scene, the ability to innovate quickly is equally important. "Just one world event could alter [the military's] planning cycle dramatically," said Chuck Heine, President of Technology Development and Diversified Products for **Dana**.



The opposed-piston, opposed-cylinder (OPOC) engine configuration being developed for military ground vehicles by FEV has all the forces acting on the crankshaft and not on the main bearings of the crankcase.

FEV Engine Technology President and CEO Gary Rogers (right) reviews the features of the FEV prototype OPOC engine with Michigan Governor Jennifer Granholm (left) and U.S. Army General Benjamin Griffin at the SAE World Congress.

Designed by Advanced Propulsion Technologies, this briefcase-size 5-kW generator has fives times the power density of a conventional generator. The portable auxiliary power unit is appropriate for delivering in-vehicle power as well as plug-in exportable power.

Product development speed—especially in terms of military applications—is more the norm than product "optimization over a protracted development period," said Michael Bolon, Senior Vice President of Engineering Design and Development for **General Dynamics** Land Systems.

The military environment presents a steady stream of challenges, including around-the-clock wear and tear on equipment, endless dust, and bad roads or no roads at all. "In the military, there are environmental and operational conditions that don't exist in the commercial vehicle world," said Bolon.

Consider just how different battlefield movements are in comparison to typical workday commutes. "Sustainability, mobility, safety, reliability, maintainability. These are the same words used throughout the industry on the commercial side, only they are used in a more severe environment [on the military side]," said Raymond Corbin, President of **AVL Powertrain Engineering**.

Getting information to the right source can be another challenge, as only a fraction of Army vehicles presently have prognosis/diagnostic capabilities. "We have it in some aircraft today, but we don't have it across the fleet. And we don't have it to the extent that we'll need it for the future," Griffin said.

While a laptop computer can be used to provide a diagnostic scan of a vehicle, Griffin said the military wants prognostic/diagnostics as an embedded technology because onboard vehicle prognostic/diagnostic information "will help streamline logistics operations."

In many instances, industry-to-military technology carryovers are possible. But not every solution is a ready-packaged commercially available innovation. "A total commercial-off-the-shelf approach may not be sufficient, yet the application of automotive technology is essential in reaching long-term goals," said Rogers. FEV engineers recently developed a concept diesel engine that can use diesel fuel or JP8, a military jet fuel. The OPOC (opposed-piston, opposed-cylinder) engine features two-stroke uniflow scavenging and asymmetric port timing.

Developed under a program sponsored by **DARPA** and the **Department of Defense**, the engine uses an electrically assisted turbocharger supplied by **Advanced Propulsion Technologies**. "Each module of this engine is self-contained," said Rogers.

The engine combines the features of an opposed-piston, two-crankshaft diesel aircraft engine and the opposed-cylinder boxer engine. Military targeted applications for the OPOC engine include unmanned aerial vehicles and unmanned ground vehicles. Because of fewer components, the engine is likely to have a lower production cost than a conventional internal-combustion engine.

In its basic configuration, the OPOC engine has a mass of 275 lb (125 kg). Lightweight vehicles positively affect fuel economy. And that fact hits another military target: better fuel economy. The Army's medium- and heavy-duty vehicles register a single-digit fuel economy average. "Fuel, water, and ammunitions are my three biggest weights," said Griffin.

With hundreds of companies providing a variety of technologies, the military is constantly searching for efficiency in its supply chain. But beyond the context of efficiency, the route to developing reliable, robust, and safety-orientated equipment is not done in isolation. "We need a lot of help from you," said Griffin. "I can replace a piece of equipment. I cannot replace a soldier."

Kami Buchholz