

# TARDEC TECHNOLOGIES: SPEARHEADING THE TRANSFORMATION

*“The Soldier Is The Focus Of Everything We Do”*

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## Introduction

“These are exciting times at the U.S. Army Tank-Automotive Research, Development and Engineering Center (TARDEC). As part of the new Research, Development and Engineering Command (RDECOM), TARDEC is leading the Army in developing cutting-edge vehicle and vehicle support system technologies for the Objective Force by working with partners in industry, academia, and other Army research centers,” said TARDEC Director Dr. Richard E. McClelland. Echoing Dr. McClelland’s statement, the 1,100 associates at TARDEC are working on programs that are propelling the Army into the Objective Force.

## TARDEC’s Mission

Born out of a World War II need for military collaboration with the automotive industry and academia, TARDEC researches, develops, engineers, leverages, and provides advanced technology integration for ground systems and support equipment throughout the life cycle. Collaboration, a key objective of RDECOM, has been a TARDEC strong suit for many years. Headquartered in the heart of the world’s automotive industry at the Detroit Arsenal in Warren, MI, TARDEC is at the forefront of applying new ideas, methods, and technologies to Army business practices.

TARDEC takes the RDECOM objective to “integrate research, development, and engineering across all areas of the Army, the other Services, universities, and other sources” to heart. In fact, its Advanced Collaborative Environments (ACE) Lab is a lightning rod for the Army and DOD science, technology, and acquisition communities. ACE is redefining many Army business practices by applying collaborative virtual environments and Internet-based technologies to the vehicle development process.

## Advanced Collaborative Environments Lab

Using ACE laboratories, tools, and services, warfighters and subject matter experts join product managers and contractors in system design reviews to ensure vehicle function and acceptability. ACE’s immersive virtual reality and Web-based information technologies support collaborative interaction and link the development and support processes.

A first of its kind in the Army materiel development community, ACE offers materiel and combat developers marked advantages over traditional vehicle development methods. Stakeholders need not wait for hardware to take an active role in development—they are an integral part of the process from the outset.

Warfighters take a direct, active role in fielding a quality system, thereby maximizing operational effectiveness. Stakeholders form a consensus more quickly, clearly pinpointing issues that must be resolved before production. Subject matter expert involvement (safety, training, test and evaluation, maintenance, transportation, etc.) is exponentially increased for those who might only have PowerPoint-briefing access to information until hardware prototypes are built. ACE transcends stovepipes to identify and resolve system issues early and, in so doing, the Army decreases development timelines and life-cycle costs.

## TARDEC’s Transformation Role

TARDEC is spearheading many Army transformation initiatives. TARDEC’s skilled staff helps develop vehicle systems for all U.S. Armed Forces, many federal agencies, and more than 60 foreign countries, but its responsibilities stretch well beyond vehicle design. TARDEC engineers and scientists use technology from many sources to create solutions to challenges in vehicle survivability, mobility, water purification, petroleum, robotics, vehicle electronics, and logistics equipment. Some of the sources they use include one of DOD’s largest high-performance computing centers, state-of-the-art chemistry laborato-



**TARDEC's immersive collaboration tools allow program managers to gather input from various subject matter areas, thereby optimizing vehicle designs before hardware is built.**

ries, battlefield survivability simulators, customer-driven virtual prototyping, and motion-based simulators.

Today, TARDEC's top priority programs are focused on the development of Objective Force systems. McClelland said that more than 40 TARDEC engineers are working with or for the Program Manager, Objective Force. He added that TARDEC's foremost efforts are concentrated on technologies being developed for Increment I of the Future Combat Systems (FCS). Some of these Increment I programs include autonomous land navigation, vehicle active protection and lightweight armor, reduction of combat vehicle crew size, advances in engine and electric drive capabilities, and lightweight tactical bridging.

The reduction of crew size in Objective Force vehicles is a crucial

Increment I matter. TARDEC's Vehicle Electronics Center (VETRONICS) is focused on intelligent vehicle system technologies that will make a two-man combat vehicle crew a reality. VETRONICS developed and is testing a state-of-the-art two-man crew station in a surrogate Stryker vehicle to prove the viability of crew reduction. Other VETRONICS efforts include a partnership with the Army Research Laboratory to demonstrate an appropriate level of autonomous land navigation (robotics) for FCS Increment I.

Objective Force development does not stop with vehicle systems. TARDEC's petroleum and water business area is responsible for researching Army petroleum products including durability testing of biodegradable hydraulic fluids and grease as well as for advances in water purification and generation methods. TARDEC's water labs, working with

industry partners, are exploring water-generation methods from non-traditional sources. Currently in testing is a revolutionary system that generates and purifies potable drinking water derived from vehicle exhaust. For the individual soldier, the lab is overseeing field trials of a small penlike water purification system that generates mixed oxidant disinfectant, which can purify between 150 and 300 liters of water. A soldier will be able to carry this technology, allowing water purification from a local source. Commenting on the importance of these initiatives McClelland stated, "These types of programs, during which TARDEC partners with industry, often using off-the-shelf technology, give us the ability to get products to our warfighters faster. They also have direct bearing on the sustainability of

the Objective Force Warrior. Both are chief concerns of the RDECOM.”

In light of exciting technological advancements, it is easy to overlook that two-thirds of TARDEC supports program executive offices (PEOs) and sustains the Legacy and Interim Forces. About one-third of TARDEC engineers are located with either PEO, Ground Combat Systems or PEO, Combat Support and Combat Service Support. The balance supports U.S. Army Tank-automotive and Armaments Command’s (TACOM) operations and maintenance accounts. TARDEC engineers are responsible for upgrading Legacy systems including the M113 family, the M1 family of main battle tanks, Bradley Fighting Vehicle System, specialized trucks and trailers, and a variety of logistics, bridging, and countermine equipment. Technology insertion gains combat capabilities that could otherwise be achieved only through the production of new systems. TARDEC engineers maintain the technical data on all TACOM-managed ground equipment. As a life-cycle engineering organization, TARDEC associates provide technical expertise for all TACOM-managed Army and Marine ground systems.

Partnerships advancing TARDEC’s current and future capabilities and quickly taking advantage of technological opportunities require a strong working relationship with the private sector, especially the automotive industry. In 1992, DOD founded TARDEC’s National Automotive Center (NAC) to act as a conduit between the Army, industry, academia, and other federal agencies. NAC identifies dual-use technologies that can benefit both Defense and commercial industries and structures cooperative agreements that deliver results. A recent NAC partnership aimed at getting products to the soldier faster is an agreement with Automation Alley, an Oakland County, MI-based consortium of high-tech corporations. According to

*To help reduce reliance on foreign fuel sources and enhance fuel economy, TARDEC associates, partnered with automotive industry leaders, are testing the feasibility of placing hydrogen fuel cells into military vehicles.*

NAC Director Dennis J. Wend, “Through this partnership the Army can leverage the tremendous resources and expertise of Automation Alley members, many of which are the country’s leading automotive and technological firms. TARDEC can quickly move technology forward and put the best possible equipment in the hands of soldiers.”

Getting technologically advanced products to the soldier quickly is what TARDEC is all about. From fuel cell research and hybrid-electric drive technology to our Mobile Parts Hospital (MPH), TARDEC ensures that Legacy, Interim, and Objective Force ground systems will have the latest technology. To help reduce reliance on foreign fuel sources and enhance fuel economy, TARDEC associates, partnered with automotive industry leaders, are testing the feasibility of placing hydrogen fuel cells into military vehicles. Additionally, engineers are researching a variety of hybrid-electric drive systems. Hybrid-electric systems will reduce fuel consumption by 25 to 50 percent while providing self-contained onboard power.

If a vehicle crew in the field requires new vehicle parts, MPH can answer the call. The MPH can be

likened to a Mobile Army Surgical Hospital that is used to stabilize soldiers before sending them out of theater. Housed in two militarized International Organization for Standards (ISO) mobile shipping containers and using a mix of computer technology and shop machines, the MPH can quickly manufacture small, on-demand parts for a range of military vehicles on the battlefield. Using real-time manufacturing data, MPH can provide critical parts in hours, putting vehicles and equipment back in service.

## Conclusion

From using Advanced Collaborative Environments to developing solutions in water purification, TARDEC’s capabilities are vast and varied. Its engineers and scientists have made TARDEC a standout not only within the Army, but also within the DOD, automotive, academic, and engineering communities. Its able associates are eager to work with Army laboratories and research, development and engineering centers to help the Army achieve its goal of a lighter, more lethal, and more survivable force. As the Army prepares for the future, TARDEC will be there—developing, upgrading, and maintaining war materiel—just as it has for more than half a century.

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