TARDEC Demos Key Vetronics ATDs

On March 13, 2003, the U.S. Army Tank Automotive Research, Development and Engineering Center's (TARDEC's) Vetronics Technology Area associates hosted the Vetronics Technology Integration (VTI) Program VIP Day at McGregor Range, Fort Bliss, TX.

Vetronics, or vehicle electronics, is the discipline of total ground vehicle electrical and electronics systems integration. TARDEC's Vetronics Technology Area conducts research in intelligent systems, robotic mobility, crew stations, embedded simulation, system architecture and telematics while leveraging advanced automotive technology. This provides soldiers with the world's most advanced ground vehicle systems and logistics support equipment.

The VTI Program encompasses the Army's Crew integration and Automation Test (CAT) bed and the Robotic Follower Advanced Technology Demonstration (ATD). ATDs are critical to the Army's transformation and the Objective Force, said TARDEC Executive Director for Research Dr. Grace M. Bochenek.

She added that ATDs are a vital part of the Army's science and technology (S&T) program because they help mature advanced technologies to upgrade existing systems and enable development of next-generation and future systems. Thus, personnel can experiment with technology-driven operational issues and be better informed when preparing requirements documents prior to milestone decisions.

The Army needs smaller, lighter combat vehicles with increased lethality, survivability, and mobility. In addition, the Army must assimilate and distribute more information to, from, and within its vehicles. A digital battlefield also requires marked increases in vehicle command, control, communication, and computer system performance. As such, future combat vehicles need highly integrated multimission-capable crew stations. The CAT ATD addresses this need.

Moreover, the Objective Force will be rapidly deployable, extremely lethal, and highly survivable. Extensive infusion of unmanned ground vehicle systems offers a viable path toward achieving those goals. The Robotic Follower ATD addresses a comparatively low-risk approach to unmanned ground vehicles than the more complex "out-front" robots.

VTI officials said the CAT ATD goal is to design an advanced two-man crew station for a system of less than 20 tons incorporating the Future Combat Systems (FCS) fight, carrier, reconnaissance, and command and control of unmanned systems. TARDEC Vetronics Technology Area Deputy Director Bruce Brendle said some of the key CAT requirements include vehicle crew stations, control of unmanned systems, speech recognition, 3-D audio, indirect vision driving, autopilot, robotic follower path generation, drive by wire, position navigation, and embedded simulation.

Brendle explained that the Robotic Follower ATD would develop, integrate, and demonstrate the technology required to achieve unmanned follower capabilities for future land combat vehicles. This technology will provide a core capability to conduct a wide variety of FCS and Objective Force applications such as ruck carrier, supply platoon, non-line-of-sight and below-line-of-sight fire, and rear security. It will also support manned combat, tactical, and other support vehicles.

The March 13 ATDs were key to bringing combat and materiel developers together with industry to explore the technical feasibility, affordability, and potential of technologies to support current and emerging warfighting concepts. ATDs investigate technical options and eliminate unattainable technologies in the early stages of a program. The Fort Bliss demos were important milestones in the VTI initiative and will provide substantial data for FCS Milestone B.

The Fort Bliss VTI event showed contractors, Joint Robotics Program officials, and a variety of key Army stakeholders that CAT and Robotic Follower technologies are ready for integration into the FCS Program and are critical to the Objective Force.

Attendees were briefed on what they would be witnessing prior to heading to McGregor Range. The ATDs integrated CAT and Robotic Follower technologies onto a Stryker chassis, and the attendees witnessed robotic follower line-of-sight following that included perception technology taken from the groundbreaking Demo III program that was "migrated over." Demo III was a Defense Department program aimed at developing and demonstrating new, evolving, fully autonomous vehicle technologies with an emphasis on perception, navigation, task planning and intelligent system architecture.

Attendees also witnessed demos including high-speed autonomous Stryker road following; dismounted robotic follower, where an experimental unmanned vehicle autonomously followed a soldier; a Robotic Follower chase, where guests piled into High Mobility Multipurpose Wheeled Vehicles to chase and observe an autonomous Stryker while it traversed rugged desert terrain; Robotic Follower observation from a bus on a dirt road; and CAT operation, where crew members tele-operated the experimental unmanned vehicle and supervised the Robotic Follower in autonomous mobility mode. Finally, VTI guests viewed a Stryker off-road following demo.

Bochenek said that the ATD demos were major mileposts on the road to fielding the Objective Force. She added, "The CAT ATD is the linchpin to advanced two-man crew stations for FCS, and the Robotic Follower ATD seeks to mature and demonstrate key robotics technology required for early insertion into FCS."

Concluding, Bochenek stated that TARDEC's Vetronics Technology Area clearly showed how the ATD pacing technologies are generating critical data to support FCS Milestone B. Additionally, TARDEC's partners are playing a major role in furthering these critical Army S&T objectives for FCS.

Parachute Accuracy Improved At YPG

A C-130H aircraft flown by members of the Wyoming National Guard recently droned over Sidewinder Drop Zone at U.S. Army Yuma Proving Ground (YPG), AZ, at a height of 15,000 feet above sea level, poised to drop a small electronic device. The several pound piece of hardware, known as a "drop-sonde," gathers meteorological data for use in parachute drops of cargo weighing more than 500 pounds. Through use of the device, heavy parachute drops that took place moments later were unbelievably accurate, hitting the ground within 100 meters of the target.

We've all seen movies in which parachute drops of supplies to waiting soldiers went awry and fell into enemy hands. According to Paul Mortaloni, Acting Chief of the Air Delivery and Soldier Systems Division, that's exactly the situation drop-sondes were designed to avoid.

Drop-sondes are deployed from aircraft through a chaff dispenser or by an unmanned aerial vehicle in advance of a parachute payload drop. "Drop-sondes provide real-time wind and meteorological information," Mortaloni explained. "This enables people onboard cargo aircraft to recompute the release point to make the actual drop more precise, based on the near real-time weather information." In the past, parachute drops were computed with meteorological data that were up to several hours old.

The drop-sonde itself is a very small device, weighing no more than a few pounds and is easily handled. However, each drop-sonde packs an electronic punch that can be a great force multiplier.

Cargo loads ranging between 1,100 and 2,200 pounds can be dropped with great accuracy through use of the drop-sondes. Although cargo loads at the proving ground are simulated with weights that weigh the same amount, actual parachutes are used. In the case of the parachutes used to drop the recent 1,100-pound loads, high-velocity 26-foot parachutes delivered the cargo to the ground at 70 to 90 feet per second. A cushioning system of honeycomb-like crushable corrugated cardboard takes up a great deal of the shock when the load hits. An actual load for this type of drop might consist of rations, blankets, boots, clothing, and many other items.

According to Mortaloni, this type of testing is important because it improves the precision of resupply drops. This particular test has taken place for about 3 years. In general, the Army is focused on developing 100-meter accuracy for all resupply drops. This can be done in various ways, such as using drop-sondes or guided technologies like global positioning systems (GPS).

YPG has performed the lion's share of the developmental testing for guided parachute systems. Most recently, Mortaloni returned from receiving his master's degree in aeronautical engineering at the Naval Postgraduate School in Monterey, CA, where he developed the aerodynamic model for the ram air parafoil system for use in the development of guidance algorithms for precision-guided systems. Precision-guided systems will eventually be capable of steering themselves to accurate, pinpoint landings. One of the considerations is cost, so several technologies are currently being studied.

The Natick Soldier Systems Center, located in Massachusetts, manages the development of these systems for the Army but relies heavily on YPG's airdrop systems expertise. YPG engineers help evaluate the systems being tested to eventually down select to a single precision-guided system for fielding.

Tests take place throughout the year with aircraft flying into the proving ground at least every other week to conduct a number of parachute drop missions.

This article was written byChuck Wullenjohn, YPG Public Affairs Officer.

Apache Combat Mission Simulator Gets Rapid Enhancement To Support Operation Iraqi Freedom

The U.S. Army Program Executive Office, Simulation, Training, and Instrumentation (PEO, STRI) in Orlando, FL, recently commissioned Northrop Grumman Mission Systems and CAE Inc. to add a critical training capability to an AH-64A Apache Combat Mission Simulator at the Fliegerhorst Army base in Hanau, Germany.

Early in the Operation Iraqi Freedom conflict, several U.S. Army Apache helicopters and their pilots experienced "brownout" over the sands of Iraq. A brownout results from the swirling sands and debris caused by rotor downwash, which diminishes pilot visibility and orientation. To address the brownout problem, the Army wanted the ability to deliver high-fidelity training for this condition to Apache pilots who would be deployed to the Gulf region in the near future.

PEO, STRI; Northrop Grumman; and CAE Inc. performed a major upgrade to the Apache Combat Mission Simulator in Hanau over the past 20 months, and the simulator was nearing its formal "ready-for-training" date. A major part of the upgrade work was the addition of the CAE Medallion visual system, a state-of-the-art visual system designed for high-performance, high-fidelity training. In late March 2003, the Army identified brownout training to simulate the conditions experienced in Iraq as an immediate requirement. The team quickly incorporated the enhancements requested, and 33 crews from the 1st Battalion, 501st Aviation Regiment began training April 1 for the brownout conditions during day and night takeoffs and landings.

"While we've provided the capability to conduct training in blowing sand and brownout conditions in our AH-64A Combat Mission Simulators since the early 1990s, the experiences of our Apache pilots in the early stages of Operation Iraqi Freedom dictated that we needed a greater level of visual realism in the simulator," said COL Kevin S. Noonan, PEO, STRI Project Manager for Combined Arms Tactical Trainers. "The new visual system in our Apache Combat

NEWS BRIEFS

Mission Simulator is capable of delivering the fidelity and realism required for special conditions such as brownout. The quick response by the Army/industry team enabled our combat pilots to more adequately prepare for missions they were likely to encounter on the battlefields in Iraq," he added.

PEO, STRI provides the life-cycle management of interoperable training, testing, and simulation solutions for soldier readiness and the Defense community. The command produces a host of high-technology simulation programs for the U.S. Army and is responsible for supporting most of the Army's training systems around the world.

AWARDS

Army Technology Transfer Awards

Scientists from the U.S. Army Soldier Biological and Chemical Command's Edgewood Chemical Biological Center (ECBC) and Natick Soldier Center (NSC), both components of the U.S. Army Research, Development and Engineering Command (Provisional), received Federal Laboratory Consortium (FLC) Awards for Excellence in Technology Transfer for 2003. Winners were honored at the FLC Annual Meeting held in Tucson, AZ, this past May.

The FLC is a congressionally chartered network of federal laboratories designed to promote and strengthen technology transfer nationwide. The FLC established this annual award to recognize individuals or teams from federal laboratories and commercial sector partners who have done outstanding work in transferring technology to the commercial marketplace.

Nominations are submitted by the laboratories and are judged by a panel of technology transfer experts from industry, state and local government, academia, and the federal laboratory system.

The Army received three of the four awards won by DOD laboratories this year. Recipients of these awards and highlights of their achievements follow.

Design, Development, Training, Fielding, And Continued Consultation For Mobile Laboratories. In the event of a chemical, biological, or radiological terrorist attack, first responders, military leaders, and local and federal agencies need tools that will allow them to sample and analyze materials in a precise and uniform manner. This will enable the efficient and accurate field analysis of chemical and biological materials.

The technologies developed by the team of Monica Heyl, Charles Henry, and Dr. Dennis Reutter included turnkey capabilities that integrate and standardize field sampling as well as the analysis tools that support the users. Numerous partnerships using various technology transfer mechanisms contributed to the success of the project. Some of these partners include Purified Microenvironments, QuickSilver Analytics Inc., the FBI, and the FDA.

Both the public and private sectors have benefited from these mobile laboratory technologies. This team has provided enhanced strategies that will ultimately help to improve law enforcement efforts to protect the U.S. against terrorism and the threat of weapons of mass destruction.

Antibody Engineering For Expression In Insect Cells And Larvae. This technology addresses an advanced method for manufacturing recombinant proteins in insect cells and larvae. It consists of genes for a recombinant antibody that binds a biological warfare agent (botulinum toxin). The genes were cloned in such a way that makes it possible to produce the antibody in insect larvae. These antibodies are currently used as the recognition component of sensors that can detect biological threat agents.

Award recipients included Dr. Kevin O'Connell, Patricia Anderson, and Dr. James Valdes of ECBC and Terry Chase of Chesapeake PERL Inc. (C-PERL). By way of a Cooperative Research and Development Agreement (CRADA) between ECBC and C-PERL, C-PERL scientists are pioneering a technology that transforms insect larvae into miniature protein factories. This represents the latest attempt to manufacture biological material for use in a new generation of medicines and diagnostic tests.

The CRADA has proven successful for both parties, and the partnership has enabled C-PERL to more than double the size of its staff. Last year, the company won the Maryland Biotech/Life Sciences Incubator Company of the Year Award.

Small-Scale Cogeneration Of Heat And Electrical Power. The first practical, small-scale cogenerator, developed by the NSC team of Don Pickard and Frank Dileo, efficiently provides the energy needs of a battalion-level field kitchen. Cogenerators produce heat and electrical power from a single process that is 80 percent more efficient than separate heaters and generators. A high-temperature two-phase mixture of steam and water is injected into an expander, and an alternator coupled to the expander produces electrical power while the remaining heat is used for cooking and sanitation.

The team worked with engineers from Yankee Scientific, a company in Medfield, MA, to adapt the liquid