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## AMC International Cooperative Armaments Activity Streamlining

*By Pat Hill, U.S. Army Research, Development Engineering Command International Division*

The United States has witnessed dramatic changes in the national security environment in recent years and faces intense demands for technological superiority as we continue military operations in Iraq, Afghanistan and the in the war on terrorism.

This, along with the increasing rate of technology change and limited research and development budgets dictate an aggressive reshaping of how the Army will keep the technology edge. To support the current and future force, the Army is developing a robust ability to identify, acquire, and integrate critical technologies available from international sources into weapon systems.

International cooperative armaments activities -- interaction with foreign governments' armed forces, foreign industries and academia -- support the U.S. Army's efforts to acquire state-of-the-art technologies for our warfighters. This cooperation leverages foreign technology to field critical items more quickly, save precious resources, and to field more interoperable weapon systems, subsystems and components. Relationships formed as a result of cooperative activities create good will and synergy among our international partners as well.

In a Decision Memorandum signed in March 2003, the U.S. Army Material Command commanding general directed the streamlining of AMC's International Cooperative Armaments Activities. Emphasis was placed on improving the processes for establishment of international cooperative R&D agreements, on the method by which we established International Data Exchange Annexes and on a restructure the U.S. Army International Technology Centers. The ITCs were previously known as the U.S. Army R&D Standardization Groups.

The transformation vision for international activities includes expanding efforts to develop effective partnerships; expediting technology solutions to the warfighter; and developing an international science and technology strategy and tools to streamline and focus international resources on those activities with the highest return on investment. This supports the Army Chief of Staff's vision in providing solutions to the warfighter more quickly while streamlining, decentralizing and expanding the joint role to support the joint commanders.

Great strides have already been made towards this reshaping. An active partnership has been developed between the U.S. Army Research, Development and Engineering Command, the Deputy Assistant Secretary of the Army for Defense, Exports and Cooperation and the Deputy Assistant Secretary of the Army for Research and Technology ; an International S&T Strategy, with an S&T investment plan, is in staffing for signature by the three principal partners.

RDECOM has matrixed personnel to the DASA-DE&C's organization, creating a centralized, Army "one-stop-shop" for international agreements processing, representation to international for and general country activities. The authority to sign into effect and manage international data exchange annexes has been delegated to the technical directors to streamline the establishment process.

Nine strategic pillars have been developed by members of the new partnership to support an international S&T strategy. They include establishing an Army strategic partnership that will work in harmony, streamlining organizations and processes, developing an international S&T investment plan, restructuring the U.S. Army overseas offices for an expanded footprint, establishing and using a web-based interactive knowledge base, improving international technology integrated solutions across the S&T community, expanding the access to S&T in international commercial and academia

sectors, influencing overseas Department of Defense (DoD) research and development assets and enhancing the foreign comparative testing programs.

Another significant initiative underway is the restructure and expansion of RDECOM's overseas offices. The ITCs build cooperative relationships throughout the world and search for, identify, and provide access to foreign S&T that offers potential solutions to our Army's needs. These assets are being reshaped and relocated (nine locations by end of year) to support an expanded mission and footprint, and to align with the combatant commands for a more joint perspective to our foreign S&T solution-search efforts.

Some examples of recent international cooperative agreements established, and the US cost avoidance/resources leveraged from the foreign partner follow:

- Low Vulnerability Gun Propellant (US/Japan?)
- Insensitive Munitions (US/South Korea)
- Defensive Aide Suites (US/United Kingdom)
- Advanced Electric Component Technologies for UA (US/Federal Republic of Germany )

Another International program, the Foreign Comparative Testing Program, tests foreign non-developmental items, systems, and sub-systems against U.S. Army requirements; those proven successful are procured by our program manager/program executive officers, offering direct R&D and procurement savings and increased combat capabilities to the warfighter at greatly reduced timeframes.

The ITS will form three Regional Centers:

USAITC-Atlantic, located in the United Kingdom, will align with the EUCOM/ CENTCOM AORs.

USAITC-Americas, located in Chile, will align with SOUTHCOM/NORTHCOM AORs.

USAITC-Pacific, located in Japan, will align with PACOM and South Africa AOR.

Each Regional Center will have Sub-Regional Centers as follows:

USAITC-Western Europe, located in Bonn, Germany and USAITC-Eastern Europe, currently located in France (aligns with the USAITC-Atlantic).

USAITC-South America, located in Argentina, and USAITC-Canada, located in Canada (aligns with the USAITC-Americas).

USAITC-Southern Hemisphere, located in Australia, and USAITC-South East Asia, located in Singapore (aligns with the USAITC-Pacific).

Given the increasing frequency of joint and coalition operations, the importance of international cooperation at all levels cannot be overstated. Complementary cooperative R&D programs leverage the technology, expertise and resources of the United States and its allies to the mutual benefit of the participating nations. These activities are undertaken in support of U.S. national military strategy to ensure that our R&D and S&T programs incorporate the best technology available worldwide.

Such leveraging helps the U.S. maintain its technological advantage, improve battlefield interoperability, and sustain the defense industrial base. International cooperative R&D allows the U.S. Army to focus on current force capabilities while continuing to explore new ideas and innovations for our future force. U.S. Army's international cooperative activities

contribute greatly to readiness and modernization of the Army across a broad spectrum, as indicated by the many successes attributed to this program. The high payoffs are strong incentives for continuing such efforts in the future.

## XM-32 mortar ballistic computer rushed to U.S. forces in Iraq

By Frank Misurelli, U.S. Armament Research, Development and Engineering Center Public Affairs Office

PICATINNY, N.J. -- A lighter, more advanced and accurate mortar ballistic computer will be rushed to Iraq to support Army combat operations.

The XM-32, weighing less than two pounds, will replace the 1980's vintage M-23, which weighs about eight pounds and looks like a city telephone book. The 36 XM-32 that will be sent will be tested, and Soldiers can e-mail their comments or mail pre-addressed comment cards of the equipment's performance to Picatinny.

The XM-32 is a rugged Personal Digital Assistant device, commonly called a PDA, and uses Windows software. Mark Zhelesnik, product development team manager, compared the two products' software. "It's like comparing Atari Pong to Sony's Play Station 2," he said.

"This system uses a Windows Graphical User Interface. And most Soldiers are familiar with using Windows, which tends to be very intuitive," said Timothy Rybarski, lead software developer for the XM-32.

At a cost of less than \$3,000 apiece, the XM-32 comes with a complete accessory kit. The older M-23 cost \$15,000 when it was fielded.

The plan is that by next year XM-32s will replace all 1,400 M-23s for Army and Marine Corps combat forces.



Photo by Frank Misurelli  
Mark Zhelesnik, left, product development team manager at Picatinny, answers questions from local reporters regarding the light-weight XM-32 Mortar Ballistic Computer, which Mike Patriarca, project director, holds.

## Honduras demining mission proves to be a success

By Martha McCaslin

**U.S. Army Communications-Electronics Research Development and Engineering Center - Night Vision and Electronic Sensors Directorate**

FORT BELVOIR, Va. - Members of the Communications-Electronics Research, Development and Engineering Center's Night Vision and Electronic Sensors Directorate recently received an award for their assistance in saving lives for the work as part of a humanitarian assistance project in Honduras.

Maj. Gen. Paul Freeman, president of the Inter-American Defense Board presented medals to Christopher Wanner, Maj. Sewaphorn "Noy" Rovira, Greg Bullock, Sigberto A. "Bert" Garcia, John Snellings, all from NVESD's Humanitarian Demining Team and to Gene Berry of the Prototype and Experimentation Branch.

The team was honored for their work in developing equipment to help remove landmines from the last acres of mine fields in Honduras, and for training Honduran Army deminers in its use. The Humanitarian Demining Team executes the Department of Defense Humanitarian Demining Research and Development Program for the Office of the Assistant Secretary of Defense for Special Operations and Low Intensity Conflict.

The need for the extra effort stemmed from deeply buried mines, undetectable and unreachable by ordinary means that were believed to be between the Honduran and Nicaraguan border. The excessive burial depth was due to extensive flooding of the river associated with Hurricane Mitch in 1998. The course of the Rio Negro River moved several hundred yards to the south in places, moving with it the Honduran/Nicaraguan border and hence responsibility for the mines. High mineral content and the lack of minefield records also hindered the search and removal process.

Large explosions, believed to be anti-tank mines buried up to 50 centimeters deep, occurred several times while Honduran deminers were in the process of destroying antipersonnel mines. Metal detectors and dogs normally used to detect landmines are not effective at such depths. During the fiscal year 02 Humanitarian Demining Research and Development Program Requirements Workshop, representatives from Honduras and the IADB identified the need for a solution to clear these deeply buried mines.

The NVESD Humanitarian Demining Team put their expertise to work and came up with a design unique to the problem. Wanner, the project leader, and personnel in the NVESD prototype facility designed and developed the Sifting Excavator to implement an innovative, multi-step approach with the goal of clearing mines buried up to 50 centimeters deep.

First, the Sifting Excavator digs an extended trench with the standard bucket parallel to the minefield. It then makes a second pass where the sifting "forklike" bucket is inserted into the bottom of the minefield trench and operated in such a way that it collapses a small section of the wall back into the trench. Finally, a third pass is made with a commercial off-the-shelf sifting bucket attachment. The sifting bucket scoops up and sifts the collapsed soil to remove mines and large debris in a separate area.

The Sifting Excavator was delivered to the government of Honduras for an operational field evaluation in November of 2003, slightly over one year from the initial in-country assessment.



A Honduran deminer carefully marks an uncovered mine.

Rovira and Bullock handled the complex effort of deploying the Sifting Excavator to Honduras. Coordination with several military and civilian government offices in Honduras, the U.S. and the IADB was necessary in addition to the normal challenges associated with shipping a large vehicle with spares to an overseas location.

Once in Honduras, Snellings and Berry joined Wanner in deprocessing and training the Honduran Army operators. During the evaluation, the Honduran Sifting Excavator operators and a manual demining team excavated and sifted almost 2000 square meters of land in over 181 hours of operation – an estimated four to five thousand tons of Honduran earth.

There were a few interesting interruptions during training and operations. There were the amorous bulls encroaching on the training area, tarantula fights taking place in holes dug for test mines and lunches consisting of iguana soup. These hardships only made the business challenges of broken axels, ruptured hydraulics and the like easier to bear. Each day ended with the team passing out candy to the local children who were delighted to see the training team pass through and mobbed the car like a presidential motorcade.

The Hondurans have employed the Sifting Excavator in their minefield clearance operations since February.

In the near future, Honduras is expected to issue a declaration that it is safe from the threat of mines to internationally recognized standards of safety.

“It was a great environment in which to work, and satisfying to be part of the final effort leading to the expected announcement of a mine-safe Honduras,” said Wanner.

(NVESD’s Humanitarian Demining Team is sponsored by the U.S. State Department and the Office of the Secretary of Defense for Special Operations and Low Intensity Conflict and is a part of the Communication-Electronics Research, Development & Engineering Center of the Research, Development, & Engineering Command subordinate to the US Army Materiel Command.)

## Command participants in Homeland Security exhibition

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SAN DIEGO, Calif. - The U.S. Army Research, Development and Engineering Command participated in this year's Department of Homeland Security and National Defense Intelligence Association Exhibition in San Diego recently. The command's exhibit consisted of displays from five RDECOM organizations. The objective of the conference was to gain an understanding of DHS' science and technology objectives, requirements and processes. "Our objectives from the Army side were to make industry, academia and other government agencies aware of our capabilities in the military and homeland security arena," said Linda Longo, RDECOM Lead Business Specialist.



The RDECOM booth was comprised of displays from U.S. Army Aviation and Missile Research, Development and Engineering Center; U.S. Army Research Lab; the U.S. Army Communications-Electronics Research, Development and Engineering Center; Natick Soldier Center; Simulation and Training Technology Center; and the U.S. Army Tank Automotive Research, Development and Engineering Center.

"The displays represented warfighter technologies applicable to Homeland Security," said Joanne Wall, RDECOM Exhibit Lead. (Submitted by U.S. Army Communications-Electronics Research, Development and Engineering Public Affairs Office)

## Membrane pouch purifies beverages

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NATICK, Mass. -- Contaminated water can go in, but only pure water seeps through the self-hydrating membrane pouch in development at the Department of Defense Combat Feeding Directorate here.

Based on the vinyl commercial X-Pac hydration pouch technology developed by Hydration Technology Inc. (HTI) in Albany, Ore., Combat Feeding is aiming to modify HTI's current membrane to incorporate a forward osmosis membrane into military packaging.

The prototype pouch is designed to take water from any available freshwater source—rivers, lakes, ponds or puddles—to hydrate beverages or dry ration foods to reduce combat weight and logistics of potable water.

"With Future Force Warrior, (researchers) are looking at ways to reduce weight and volume," said Andre Senecal, a senior food technologist and project officer for the membrane pouch. "Food is what troops usually like to sacrifice when paring down their load weight. They're also not carrying enough water."

Based on hydration requirement data, a physically active soldier requires about 10 liters per day in a hot environment, he said. Soldiers now carry about 5 liters.

Drinking water can be purified using reverse osmosis, where it is forced by a powered pump through a semi-permeable membrane to remove contaminants from a solution within 15 minutes. The same membranes are used in the self-hydrating pouch in a process called forward osmosis.

Both filter more than 99.9999 percent of the bacteria that might be found in non-potable water, but FO works by pulling water through the membrane. Although slower, it requires no power and does not foul the filter even with muddy water. Ingredients in the beverage powder or food that have charged ions, such as salts, sugars and amino acids, energize the osmosis, drawing water in like a sponge. The process takes three or four hours to completely hydrate a 12-ounce beverage, according to Senecal.

"We want something consumable, so we have to balance these ingredients with the osmotic components that actually drive the process," he said. "The toughest piece is to rehydrate beef stew or some other entrée. There's no great osmotic potential. We'll have to work out a design, maybe separating the components or reformulating the ration."

Senecal said interest in a self-hydrating membrane pouch started in the 1980s, but the break came in the 1990s when Combat Feeding met with HTI. Combining their sturdy membrane technology and the packaging expertise of another Combat Feeding industry partner, Pactech in Rochester, N.Y., a prototype membrane pouch was introduced this year.

The prototype has the same multi-laminate foil used in the Meal, Ready-to-Eat, a resealable plastic zipper at the water intake side of the inner pouch and an outer membrane pouch holding the food or beverage. Water is filled into the inner pouch and sealed to begin the osmosis. When ready, warfighters tear off the outer pouch end and open the zipper to consume the hydrated contents.

With the look and feel of a waxed textile, the membrane has a robustness not demonstrated during previous attempts to develop the technology, Senecal said. However, durability in rough handling tests must still be done with food ingredients already incorporated into the pouch to simulate military field handling to ensure they don't tear under stress.

Not its own ration, he said the pouches are intended to become a part of existing and future rations. Possibilities include the Meal, Cold Weather/Long Range Patrol ration, survival food packets and the developmental First Strike Ration. Depending on what rations are used, water weight savings can range from 4-12 pounds. It also can be joined with new generation hydration systems for Future Force Warrior, especially helpful when Soldiers wear a self-contained suit.

Initial evaluation of prototype packages is scheduled for next year, with a larger-scale evaluation set for 2007. Besides food, Senecal said the technology has interested the Air Force for medical intravenous solutions and Navy for sea survival kits to purify salt water.

## CERDEC Successfully Demonstrates “MOSAIC” of Technologies

During a two-month long experiment at the Mobility Assessment Test and Integration Center (MATIC) in Laguna Pueblo, N.M., the Communications – Electronics Research, Development and Engineering Center’s (CERDEC) Space and Terrestrial Communications Directorate (S&TCD) demonstrated new technologies that may change battlefield communications and potentially save lives

MOSAIC (Multifunctional On-the-Move Secure Adaptive Integrated Communications) is a suite of technologies that builds a tactical communications network across a diverse area without relying on existing communications infrastructure on the ground. Additionally, MOSAIC supports important wireless battlefield communications and allows those communications to be prioritized based on the urgency of each message, while still sharing the same network resources.

“MOSAIC is the first system that is able to autonomously form, prioritize network traffic and use airborne routers all at the same time,” said Larry Muzzelo, the MOSAIC Advanced Technology Demonstration manager. “The demonstration in New Mexico was significant because we were able to test all of MOSAIC’s capabilities in an operationally relevant field environment for the first time.”

One of those capabilities, known as ad-hoc mobile networking, allows MOSAIC’s networks to automatically organize themselves without any human input.

“MOSAIC allows for voice and data services similar to a cell phone system, but here the base stations as well as the phone itself are moving,” Muzzelo said.

For example, if a group of MOSAIC-equipped vehicles approaching a mountain split into two groups that travel around opposite sides of the mountain, MOSAIC will automatically split the original network into two independent ones that seamlessly reconnect when they are able.

“Although other networks have shown portions of this capability, the MOSAIC experiment marked the first time that this capability has been integrated with other technologies into one comprehensive suite,” said Aris Staikos, an engineer with S&TCD’s Sensor Networks Branch.

The MOSAIC team also demonstrated MOSAIC’s Advantaged Node technology (ANT), which allows airplane or satellite-based routers, known as “nodes,” to be incorporated into the network.

“Our Advantaged Node technology solution provides an automated way to best use the limited number of airborne assets in a tactical network,” said Benjamin Foresta, an engineer with the S&TCD. “For example, in a case where there is a lot of congestion, the ANT protocol re-routes traffic so that high priority messages, i.e. ‘call for fire’ messages, are allowed to use the fast airborne route while lower priority messages are forced to take the longer ground paths.”

That ability, known as Quality of Service, enables the technology suite to determine the importance of each message and hold back the less urgent ones while still allowing emergency notices to get through.

Data collected during the experiment showed that without MOSAIC, any given message, regardless of its importance, reached its intended recipient approximately 40 percent of the time; when MOSAIC was activated, high priority messages get through the heavily congested network 90 percent of the time.



**The CERDEC’s Space and Terrestrial Communications Directorate MOSAIC team poses for a picture after a successful two-month long experiment in the New Mexico desert.**

“The goal is for the right information to get to the right decision maker at the right time,” said Jim Stevens, Rockwell Collins’ principal systems engineer for Mobile Networks, who worked on MOSAIC.

“High priority users are given priority on the network,” Muzzelo added. This prioritization means that, for example, a nuclear, biological or chemical (NBC) weapons alert will automatically take precedence over a request for more food.

“In our test, the time it took for a high priority message to be received decreased from six seconds to less than one, while NBC alerts decreased to less than half a second,” Muzzelo said. “And those additional seconds could be critical in terms of donning protective gear and, ultimately, saving the lives of our soldiers.”

The Laguna experiment, which culminated in an exit demonstration on June 2 and 3, also demonstrated that MOSAIC was able to work with radios, routers and other communications products developed in the commercial sector.

“We were able to show that MOSAIC technologies were able to coexist with commercial routing protocols,” Staikos said. “MOSAIC had interoperability with Cisco’s Quality of Service and routing services, as well as a Milstar satellite and wireless LAN (local area network) radios during the exit demonstration.”

In Laguna Pueblo, the MOSAIC technologies were hosted on Rockwell Collins’ prototype versions of the Joint Tactical Radio System, which were mounted on a C12 airplane, one humvee and seven sport utility vehicles.

The systems were used in a simulated tactical scenario that spread over 20 square miles of New Mexico’s desert and sent information back to the Native American-owned MATIC.

“The MATIC facility and the Laguna tribe played an integral role in the success of this demonstration,” Muzzelo said. “I can think of very few other locations that have the terrain, facilities and personnel to accomplish what we accomplished here.”

That terrain includes 530,000 acres of test range comprised of mountains, valleys, wooded areas, plateaus and the occasional ancient volcano spire.

“This is truly a unique location, area and facility,” said Chris Ahmie, president of Laguna Industries Inc., the company that oversees MATIC.

Though the experiment and demonstration were both extremely successful, the engineers who work on MOSAIC say they won’t be satisfied until these technologies are integrated into fielded systems.

“That’s really the end state,” Muzzelo said. “This is only the beginning.”  
(Submitted by U.S. Army Communications–Electronics Research, Development and Engineering Center)

## Picatinny breaks ground for new lab

By Peter J. Rowland

**U.S. Army Armament Research, Development and Engineering Center Public Affairs Office**

PICATINNY, N.J. -- Army officials here recently broke ground for a new \$17.7 multi-functional laboratory for researching new propellants.

Sporting a white hardhat and wielding a shiny, chrome-plated shovel, Armament Research, Development and Engineering Center Director Michael P. Devine lifted the first spadeful of dirt and construction officially began.

New Jersey's U.S. Rep. Rodney Frelinghuysen joined Devine in the symbolic excavation along with Dr. B. V. Rao, executive vice president, Hirani Engineering and Land Surveying, P.C., Mineola, N.Y., George Makhoul, president and chief executive officer, MES Inc., and Picatinny Garrison Commander Lt. Col. Paul T. Seitz.

Devine called the ground breaking "an important milestone in Picatinny's overall modernization efforts."

"When this high-energy propellant formulation complex is completed, we will look at it with pride and recognize that we have accomplished something that will allow us to better serve and protect our nation's Warfighters," he told the audience of one hundred guests and employees.

Frelinghuysen spoke briefly during the ceremony, praising Picatinny and calling it one of the most important defense facilities in the nation. He also called for a moment of silence in memory of Marine 2nd Lt. John T. Wroblewski of Oak Ridge and Spc. Ryan E. Doltz of Mine Hill. Doltz and Wroblewski lost their lives in Iraq earlier this year.

The new facility will support exploratory and advanced research and development of propellants, propelling charges and igniters for the military, Devine said. It will consist of 17 different buildings of varying size.

"When completed, this new facility will replace 34 buildings at Picatinny where this work currently is performed," he said. "Consolidation of these activities in one location will save us approximately \$1 million per year."

Devine said the facility is the installation's largest single military construction project to date. The Armament Research, Development and Engineering Center, one of Picatinny's largest organizations, will operate the facility. The new facility is being built on the site of a former explosive operations area in the east central portion of the installation. The U.S. Army Corps of Engineers New York District will oversee the project. The facility is scheduled for completion in 2007.



Photo by Todd Mozes

(Left to right) Dr. B.V. Rao, Michael P. Devine, George Makhoul, Lt. Col. Paul T. Seitz and U.S. Rep. Rodney Frelinghuysen break ground for Picatinny's new high-energy propellant formulation facility as Col. Peter S. Janker, Jeffrey Frye, Dr. Joseph A. Lannon and Col. John A. Merkwan look on.

## eCYBERMISSION Winners Visit ARL for Army Enrichment Day

By *Stephany Jaramillo*

*U. S. Army Research Laboratory Public Affairs*

ADELPHI, Md. - The winners of the 2003-2004 eCYBERMISSION competition recently visited the Army Research Laboratory.

The contest began with 833 teams consisting of 3064 students. The teams came from small towns and big cities across the nation and from Department of Defense Education Activity schools around the world. Students form into teams and select a real-life mission challenge by identifying a problem, formulating a hypothesis and conducting research and experiments to develop a solution.

Sixteen teams made it to the national final competition. These finalists and their team advisors toured the Adelphi Laboratory Center to see some of the research being conducted.

The all-day visit began with a warm welcome from Associate Director of Laboratory Operations Carrie Kendrick and a quick lesson and drill in "Hooah" from Sgt. Maj. Enoch Godbolt. It wasn't long before the auditorium reverberated with Hooah shouts and the students were pumped and ready to go. Geared to sixth through ninth graders, the tour stops were hands on and interactive.

The nine stops included viewing military displays & HMMWV Armor Survivability Kit, mock weapons, chembio masks, personal armor protection and a variety of military items were available for the students to handle and try on.

The door component of the HMMWV Armor Survivability Kit was demonstrated, showing the students a glimpse of a real armored door just like the ones being outfitted in Iraq to save soldiers' lives. The students were able to touch the steel and glass and sit in the HMMWV.

Students learned about the Combat Feeding Program. The First Strike Ration was showcased and Hooah bars were given as take away samples.

In the Vision Dome/LADAR, the group experienced a simulated rollercoaster ride and learned that the sensations are comparable to what might be experienced in flying an Unmanned Aerial Vehicle. The students also donned glasses to get a 3D view of laser radar.

At the Night Vision Laboratory display night vision goggles were used in near complete darkness with thermal cameras and other infrared technologies. "That was so cool. I learned so much," said Cody Dowd, a sixth grader from the Heidelberg Middle School, Heidelberg, Germany, a Department of Defense Education Activity school.

A prototype of a roll-up flexible display was demonstrated and fuel cells were passed around for each student to have a close look and feel the difference in the weight of fuel cells.



**At the Military Display, a student is helped on with a Kevlar vest by Sgt. 1<sup>st</sup> Class Ralph Brewer, Weapons and Materials Research Directorate.**

Students and advisors donned caps and booties to experience the clean room. They received a small magnifying box with a silicon die patterned enclosed. The die contained the ARL logo, eCYBERMISSION name, tour date, and tour participants' names. The memento was a reminder not only of ARL and the tour but of the types of processes required for making micro- and nano-scale devices and why clean rooms are necessary to realize such technology.

A combination of a high definition show and hands-on interactive physical science demonstrations were featured in the National Science Center Discovery Van.

Lunch was served on the patio adjoining the ALC cafeteria. The menu was a choice between brown bag with sandwiches, chips and cookies or Meals Ready to Eat. A soldier was on hand to recommend MRE selections.

Comments throughout the day were enthusiastic and positive. Alan Fisher, Fair Acres N.M. Blazer 6 Team said, "It's been great. It's even better this year. Love the MREs, the nanotechnology and the clean room."

eCYBERMISSION Army Enrichment Day closed with student volunteers performing cadence and a mock paratrooper jump from the ALC auditorium stage under the expert coaching of Godbolt, followed by two young ladies from the Hawaiian team in eCYBERMISSION tee shirts who said aloha by dancing a graceful hula.

## Frangible Case Technology for NLOS Non-lethal

*By James Garner and Michael Maher , U.S. Army Research Laboratory*

EDGEWOOD, Md. - U.S. military forces increasingly find themselves in situations compatible with the use of non-lethal weapons. Extending the range and spheres of influence, of these non-lethal weapons is considered essential as an option in future conflict scenarios.

With this in mind, the Army Research Laboratory and the U.S. Army Armament Research Development and Engineering Center, Picatinny Arsenal, N.J., have joined in an effort to produce a nonlethal artillery projectile. With support from Los Alamos and Edgewood Chemical Biological Command, ARDEC has taken the challenge of selecting and tailoring the payload and expulsion issues, while ARL will focus on its traditional area of expertise in ballistics and develop technologies for a non-lethal carrier of the selected payload. The goal of this effort is to project nonlethal payloads to ranges similar to those of standard artillery.

Extending the range of nonlethal capabilities poses several technological challenges. From the start the projectile must withstand the high acceleration environment required to achieve extended ranges. High-density, high-strength metals are particularly well suited to withstand these environments.

Unfortunately, these metals, at even relatively low velocities, carry lethal energies at range. As such, lightweight, high-strength materials that quickly dissipate their energy at the target are needed. This dictates the use of highly specialized composite technology. The composites must not only meet the structural requirements of launch but must fragment to part sizes and geometries with nonlethal characteristics.

Tailoring the frangibility of the projectile with controlled fragmentation of the round to produce nonlethal parts to achieve this goal is crucial. Aeroballistic challenges in stabilizing the projectile and selecting the correct fuze mechanism to achieve the reliability and nonlethality needed forces the examination and development of creative solutions.

A concept for producing controlled fragmentation of the round to produce specific geometries is under examination. The part fragments are prefabricated and assembled into a round. The concept hinges on the use of thin foil aluminum alloy interfaces to rapidly debond along part lines to produce the specific part configuration that is required.

The steady state velocity of the parts that results from the expulsion sequence is of great interest since it will determine if the part is lethal or not. The assumption is that the fragmentation pieces will quickly reach their terminal velocity after expulsion. Dropping the parts from a helicopter and tracking their descent with radar made a measurement of this velocity. Two altitudes were selected (500 and 1000 ft) to determine if there were velocity variations on impact.

These heights also facilitated recovery of the pieces, as pieces dropped from greater heights drifted substantially. The velocity history of the part as measured by the radar is shown in Figure 1. The downward velocity of the part and its weight determine the energy of the part and hence whether the part is "nonlethal" or not. The widely held threshold for lethality is 58 ft-lb (75 J). The energies obtained show that the parts are well below the threshold. Part velocities from both drop heights did not show markedly different velocity profiles, and downwash effects from the helicopter are presumed negligible at greater than 300 ft from the helicopter. To aid in the radar tracking of the parts aluminum tape was affixed to exterior of the pieces. This concept worked well, as good radar tracking was achieved for almost all the parts.

The testing went extremely well due to the efforts of a number of Aberdeen Test Center personnel. The helicopter crew was Tom Skahl and Jeff Via. Walt Zdon directed the Weibel radar crew.

## Employee reaches airborne milestone

NATICK, Mass. -- Peter Stalker first jumped out of an airplane as a 19-year-old Soldier in 1953. Today Stalker continues his freefalling antics as a Department of the Army civilian employee testing parachute prototypes.

The Parachute Prototype Facility team leader at the Soldiers System Center, Stalker joined eight civilian employees and Soldiers from the Natick Aerial Delivery Life Cycle Team for a static line parachute jump at Fort Benning, Ga., recently to commemorate the 51st anniversary of his airborne school graduation.

"It was marvelous. The C-17 (airplane) is as nice as your living room," Stalker said, who's recorded more than 3,000 jumps in his lifetime. "It doesn't seem to bother me physically. I like the impact and I enjoy the bang."

Back in his Army days, make that also a punch.

The Massachusetts native enlisted in 1952 as an infantryman in a heavy weapons platoon and decided to go airborne for the extra pay. At airborne school in Fort Benning, he was selected to become an instructor, but during a parachute entanglement with another student in the jumpmaster course, he broke his foot.

During his recovery, an opportunity opened to join the post boxing team, which led to assisting the boxing team at the U.S. Military Academy at West Point, N.Y. He kept his jump status with a small airborne unit.

Leaving the Army in 1955, he pursued a professional boxing career that ended after five fights. He also trained to become a private pilot and remained involved with parachuting, this time skydiving with a school he opened in Pepperell, Mass., and barnstorming at local fairs around New England. Their performances were years before the establishment of military jump teams, such as the Golden Knights.

"I needed the money, anything for \$100," Stalker said, which supplemented income as a toolmaker to support him and his family. "There was nothing you could read about (skydiving). We learned it after about a year of beating ourselves up. We made more tree landings than field landings."

Once, an updraft carried his parachute from about 2,000 feet to 16,000 feet before he was able to break out of it and land at a country club during an armed forces day in New York. On another occasion, he modified his canopy to be able to get an extra lift. Instead, he zoomed straight down.

"I was told that it looked like I bounced 10 feet," Stalker said, describing his landing. "My pants split open. The next day I hurt all over, but I didn't break any bones."

Parachuting became more than a side job when Stalker fulfilled a longtime desire for employment at Natick Laboratories, as it was called then, in 1968 when he was hired as a fabric worker at the Parachute Prototype Facility.

The facility fabricates prototype personnel and cargo parachutes, harnesses and accessories, modifies equipment and provides quick-response production.



**Peter Stalker, team leader of the Parachute Prototype Facility, descends to the drop zone at Fort Benning, Ga. (Photos are by Sarah Underhill, U.S. Army Soldier Systems Center, Natick, Mass.)**

He continued jumping out of airplanes as a skydiving instructor after work, but it wasn't until the 1980s that Stalker was able to return to jumping for the military. For the first time, civilians responsible for research and development of parachutes were authorized to attend jump school. After a refresher course, Stalker returned to his paratrooper roots.

"This teaming between military and civilians was the brightest decision. It helps give the engineers and designers credibility with the troops," he said. "(Returning) was like I never missed a day. It was a different aircraft but the same feeling. There's always a tension. There's a closeness, a feeling that you overcome that fear. If I ever thought my equipment couldn't do the job, I'd be the last person off the plane."

Compared to the T-7 parachute of 1953, the current T-10 is gentler and more forgiving, according to Stalker. Decades of refinement on the T-10 make it a tough parachute to replace, but with heavier combat loads, a replacement to slow the rate of descent is on the way.

He now works closely with industry as a "contractor's troubleshooter," where he can apply his broad expertise that expands outside shop foremanship, said Edward Doucette, director of Airdrop and Aerial Delivery, who's worked with Stalker for 19 years.

"He's really a testament of how smart he is with production. He has a rare skills set," Doucette said. "(Plus) he's enjoying himself. He loves jumping. I don't think he'd stay if he couldn't jump."

Stalker jumps at least once a quarter to stay qualified, gaining experience with a variety of static-line parachutes, and has a physical every other year to calm any fears of his fitness.

"You don't grow old if you stay with it. We have a jump schedule, and I look forward to it," Stalker said, who has no immediate plans of retiring. "It's been the thrill of my life working here for the Soldier. I just love 'em. Because of that I can't seem to let go." (Submitted by U.S. Army Soldier Systems Center)

## ARL Contractors Given Opportunity to Serve at Reagan Funeral

*By Paul D. Schmitt, U.S. Army Research Laboratory Public Affairs Office*

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ADELPHI, Md. - Two Army Research Laboratory Emergency Operations Center contractors were given an opportunity to play a small part in history.

Army Sgt. 1<sup>st</sup> Class Forrest Garrett and Navy Journalist Second Class Mark Peterson were put on notice shortly after President Ronald Reagan's death that they might be called upon to serve during his funeral. In the end, Garrett marched in the processional to the Capitol Rotunda while Peterson was on standby until being released from duty.



Both Garrett and Peterson are contractors with SYTEX of Vienna, Va. and work at the Adelphi, Md. Facility.

Garrett, who is stationed with the U.S. Army's 5115<sup>th</sup> Theater Support Unit, was part of the Army Reserves contingent in the procession. His detail marched between the U.S. Army Band and the U.S. National Guard. Garrett had also served during President George W. Bush's inauguration in 2000.

"It was an historical event," he said of the Reagan funeral. "But I treated it like I was just called to do my duty. President Reagan really took care of the soldiers when he was Commander-in-Chief."

Garrett remained on standby for the funeral ceremonies and would have helped escort Reagan's casket back to Andrews Air Force Base if needed.

Peterson, stationed at the Washington Navy Yard, was disappointed not to be called upon. He would have assisted the Secret Service in monitoring the crowd during the ceremonies.

"President Reagan made a huge impact on my life. He was the first President I remember, and he had a great influence on my thoughts on the military and the government," Peterson said.

## A heroes welcome for Soldiers returning from Iraq

*U.S. Army Research Laboratory Public Affairs Office*

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ADELPHI, MD - Two Army Research Laboratory soldiers were recently welcomed home after serving a tour in Baghdad, Iraq.

Maj. Gregory Hollifield, Sensors and Electron Devices Directorate, and Sgt. Maj. Enoch Godbolt, volunteered to serve abroad late last year. Both men were honored at a recent ceremony..



John Miller, acting director of ARL, commended their service during his opening remarks and emphasized that their actions illustrated the importance of ARL “in assuring the safety of our soldiers.” Godbolt and Hollifield worked with ARL scientists providing fixes for technology used by ground soldiers.

The two were characteristically humble, both in their response to the ceremony and in their remarks. “I’m just one man,” said Hollifield about his efforts in Iraq. “There’s a lot of people who have done a lot more than me.”

Godbolt received an additional honor during the ceremony. On April 16, Godbolt was wounded by shrapnel from an enemy rocket attack in Baghdad. For his bravery and actions taken while wounded, Godbolt received the Purple Heart. The award, presented to Godbolt and his family by Miller, represented the first soldier in the newly formed U.S. Army Research, Development and Engineering Command to receive the high honor.

Both men were given rousing ovations by ARL employees who packed the Army Research Center auditorium to show their support and gratitude.

“I’ve never seen a country with more potential than that one,” noted Hollifield, speaking about the progress being made by coalition forces. “We need to keep mobilizing our effort to help the people and our troops over there.”

Godbolt added that the Iraqis recently liberated from the rule of Saddam Hussein appreciate U.S. efforts.

“There were a lot of kids who would give us ‘thumbs-up’ signs when we drove through the streets,” he said. “You might see some bad things on the news, but we are making progress.”

## Miller Named New ARL Director

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ADELPHI, Md. - Maj. Gen. John C. Doesburg, commander of the U.S. Army Research, Development and Engineering Command (RDECOM), has announced the selection of John M. Miller as director of the U.S. Army Research Laboratory.

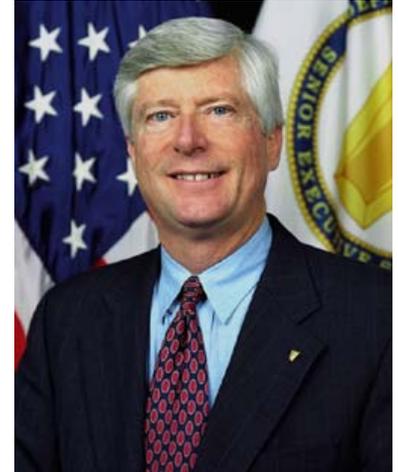
Miller has been serving as acting director of the laboratory since March 2003.

In making the announcement, Doesburg said, "We look forward to Mr. Miller's continued success and proven leadership in directing the United States Army Research Laboratory to new horizons in research, which is so vital to the mission accomplishment of American warfighters around the world."

Miller served in a number of positions at ARL and the U.S. Army Harry Diamond Laboratories, during his federal career. Prior to that Miller was a project engineer at Pratt and Whitney Aircraft Co.

Miller has a bachelor's degree in Aerospace Engineering and a master's degree in Mechanical Engineering, both from the University of Maryland. Among his awards and honors, in 1980 he received the U.S. Army Research and Development Award for outstanding technical achievement, and in 1998 he was appointed to the federal government's Senior Executive Service.

ARL, part of the U.S. Army Research, Development and Engineering Command, is the Army's corporate laboratory for fundamental and applied research. ARL provides key technologies and analytical support as well as critical links between the scientific and military communities to help American soldiers in the battlefield. ARL has major sites at the Adelphi Laboratory Center and Aberdeen Proving Ground in Maryland and White Sands Missile Range in New Mexico, and shares facilities with NASA at two sites, NASA-Langley, Hampton, VA, and NASA-Glenn, Cleveland, OH. Its Army Research Office in Research Triangle Park, NC manages ARL's extramural basic research program. (Submitted by U.S. Army Research Laboratory)



## Soldier Systems Center holds change of command

### *U.S. Army Soldier Systems Center*

NATICK, Mass. -- A change of command and change of responsibility ceremony in Hunter Auditorium July 7 welcomed a new commander at the Soldier Systems Center who now has three roles.

Brig. Gen. James R. Moran, Program Executive Officer Soldier at Fort Belvoir, Va., has taken on the additional responsibilities of Commander, Soldier Systems Center and Deputy Commanding General for Operations, U.S. Army Research, Development and Engineering Command.

Moran has replaced Col. David Bongji, who has transitioned to Deputy Commanding General of the Soldier Systems Center.

Moran recalled when Lt. Gen. Joseph Yakovac asked him if he could perform each of the roles. Moran said he could do each one, and then was told to do them at the same time.

"It's an honor to be here today," Moran told the work force and guests in attendance. "I need your help (in order to keep all these missions performing successfully). With your products, you're saving Soldiers' lives, improving their quality of life and improving their combat effectiveness. I'm proud to be a part of an organization committed to helping the warfighter."

Doesburg said Moran is up to the task that is more than enough for one person.

"If you look at his past, he's proven he can do it," Doesburg said. "I couldn't have asked for a better (Program Executive Officer), and because of that I'm confident in his ability as Senior Mission Commander and Deputy Commanding General for Operations.

We're not sure how it's going to work, but he's going to get it right."

For his last assignment, Bongji received the Meritorious Service Medal for what he achieved during his time in the position, according to Doesburg. The role of Deputy Commanding General for Operations was driven by the war on terrorism.

"This is the fourth time I've changed command, and it never gets easy," Bongji said. "You think about all the things you've accomplished and what you wanted to accomplish. You always go away thinking what you still would have liked to do." He said he's enjoyed his time here so far and as a 23-year infantry veteran, appreciates the accomplishments of the work force as a consumer of products developed here.

"You're doing something for the Soldier every day, and I really mean it," he said. "When it comes to supporting the warfighter, you do that better than anyone."

## ROBERT F. HANDSCHUH NAMED A FELLOW OF ASME

Robert F. Handschuh, Ph.D., an aerospace engineer at the U.S. Army Research Laboratory, NASA Glenn, has been named a Fellow of American Society of Mechanical Engineers.

The Fellow grade is conferred upon an ASME member with at least 10 years of active engineering practice and who has made significant contributions to the profession. Handschuh earned his doctorate in mechanical engineering from Case Western Reserve University, Cleveland, Ohio. He is also a member of the American Helicopter Society.

Founded in 1880 as the American Society of Mechanical Engineers, today's ASME is a 120,000-member professional organization focused on technical, educational and research issues of the engineering and technology community. ASME conducts one of the world's largest technical publishing operations, holds numerous technical conferences worldwide, and offers hundreds of professional development courses each year. ASME sets internationally recognized industrial and manufacturing codes and standards that enhance public safety. (U.S. Army Research Laboratory)

## Chem-Bio Defense Quarterly Publication

Want to know what's going on in the world of chemical and biological defense? Visit the Chem-Bio Defense Quarterly publication at <http://www.jpeocbd.osd.mil/magazine.htm>. (Joint Program Executive Office for Chemical Biological Defense)



## Sensors, detectors for homeland security are focus of workshop

OAK RIDGE, Tenn. - National security technologies and some of the people who could help make those technologies a reality will be in the spotlight in September at a workshop hosted by Oak Ridge National Laboratory.

The event, scheduled for Sept. 14-16 at the River Terrace Resort in Gatlinburg, Tenn. will attract some of the world's best scientists as well as program managers, policy-makers and representatives from national laboratories, government, private agencies, academia and instrument manufacturers.

"Detector and sensor research and technology will play an increasingly important role in homeland security and national defense," said ORNL scientist and conference organizer Gary Van Berkel. "Our goal is to bring together the science, the policy makers and the sponsors and foster interaction to help push forward development in these areas."

In addition to numerous lectures from distinguished scientists, the event will feature products of several companies and demonstrations of sensors and detectors. Highlighted sessions will focus on mass spectrometry, including sample preparation and processing, application to forensics, and miniaturized mass spectrometers. Other sessions will focus on micro-electro-mechanical systems and various optical electrochemical and biological sensors.

The deadline for exhibits is Aug.20.

The conference, titled Detector/Sensor Research and Technology for Homeland and National Security, builds upon last year's mass spectrometry workshop in Knoxville, which attracted 170 people.

Additional information is available at the Web site at:

[http://www.ornl.gov/sci/homeland\\_sec\\_workshop/index.html](http://www.ornl.gov/sci/homeland_sec_workshop/index.html). For more information call Ron Walli, Oak Ridge National Laboratory (865) 576-0226. (Oak Ridge National Laboratory Communications & Community Outreach)

## International T&E Association (ITEA) Annual International Symposium

Test Week 2004, August 30 - September 2, 2004, represents a unique partnership of the very successful Army T&E Days conference with the established, long-standing International T&E Association (ITEA) Annual International Symposium. This premier event will be hosted in Huntsville, Alabama at the Von Braun Center, South Hall. This conference is open to Government, Industry, and Academia organizations supporting National Defense. Information on the conference can be obtained from two distinct websites: [www.itea.org](http://www.itea.org) or [www.testevaldays.com](http://www.testevaldays.com). Point of contact is Sherry Hilley, (256) 842-6715 (DSN 788), [sherry.hilley@us.army.mil](mailto:sherry.hilley@us.army.mil). (AMRDEC)

## Terrorist Modus Operandi and Possible Attack Signatures

Do you know what to look for? How does a terrorist operate? What can you do to help? Report any suspicious activity, regardless on how insignificant you might think it is. No matter where you live or work, you can help by being aware of the terrorist's modus of operandi.

The Al-Qaeda network is present in dozens of countries around the world including the U.S. Terrorists will plan and prepare for years before they strike. Time is on their side. They are most likely to select political, military, and/or economic targets based on the following three criteria:

- Targets that are recognized symbols of U.S. life and power in the Muslim world.
- Targets producing mass casualties, spreading fear and panic and hurting U.S. morale.
- Targets whose destruction will negatively impact the U.S. economy.

Potential targets meeting these key criteria can be hard targets such as key government buildings and military bases, or soft targets such as bridges, commercial buildings, mass-transit systems or key energy sector facilities.

A review of Al-Qaida's modus operandi suggests the method(s) of attack will very likely be dictated by target selection. They will most likely opt for an attack method that has the highest probability of success, having made this determination based on security around a given target.

Al-Qaida's leadership encourages senior plotters and operatives to brainstorm and propose ideas based on previous operations, available operatives and open-source reports. The group's use of commercial aircraft as missiles, with the use of shoes to conceal explosives and the use of vehicle-borne improvised explosive devices (VBIEDs) disguised as security vehicles are examples of the innovative methodologies they have applied to given targets and security situations.

### On-the-Ground Managers

These key individuals are the forward-deployed leaders of a given operation – most likely knowledgeable of all facts or the operation, including the intended targets, timing and methods of attack. Ideally, these operatives would have arrived at least a year before the planned attack and may not travel with other members of the team. They may have autonomy to change both the targets and the timing of the operation if the situation on the ground dictates.

### Operational Foot Soldiers

Due to heightened security since 9/11, the muscle of a given operation may now be chosen by field planners if secure communication or access to senior leadership is not available. To safe guard the operation, attack operatives will most likely be told only as much as needed about a terrorist operation and may not know the exact details until the moment of execution.

Depending on the operation, terrorists may not enter the target country until it is absolutely necessary to decrease the possibility of compromise. In addition, muscle operatives while possibly traveling together in small groups will most likely travel in a staggered fashion to avoid suspicious patterns that can raise their profile or their risk of being detained.

## Expected Behavior of Operatives

Operatives are expected to behave in certain ways to reduce their profile and avoid drawing the attention of authorities; they can make mistakes and may not adhere to strict operational instructions. They are told to live close to their cover as possible and blend in.

They should not live near the target due to security precautions and should avoid contact with anyone, including Arabs and Muslims, outside their immediate operational group. They are instructed to pray quietly at home and not openly and should generally downplay their religion. To further minimize contact, they are instructed to only acquire jobs if appropriate for their cover.

## Timing of the Attack

Determining the precise day or time of the attack is extremely difficult. They will very likely have autonomy to select the optimum time. External facts such as weather and security posture may alter their decisions in the final stages.

They may time their attacks with anniversary dates of previous attacks or other symbolic occasions, but the most important fact appears to be operational readiness and the probability of success.

## Procuring Weapons

Explosives and precursors will normally be acquired in a no alerting manner a month or more in advance and in small amounts from the lowest source or distribution in order to limit possible alerting the authorities. They will rely on a private enclosed space to build the explosive device such as privately owned garages, storage units, rented or abandoned warehouse. Any vehicle used in an attack will be purchased weeks to months before the actual attack date so functionality and load capacity can be tested. Stealing a vehicle to be used in an attack is discouraged because of the unnecessary risk of exposure. Purchasing a vehicle will allow more control over the situation and leave a limited trail for the authorities to follow.

Remember to report any suspicious activity immediately to your installation's law enforcement activity or your local law enforcement agency. (Compiled by the U.S. Army Research Development and Engineering Command Antiterrorism Law Enforcement and Physical Security Office)