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## in the lab

Each day, RDECOM's talented scientists and engineers research innovative technologies that position the U.S. Army as the world's premiere land force. "In the lab" highlights recent and on-going initiatives that will benefit soldiers.

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## Picatinny Dedicates New Precision Armaments Laboratory

By Myra Hess

Picatinny Arsenal, N.J.—Picatinny Arsenal officials recently dedicated its new, high-tech laboratory in memory of former Picatinny engineer and chief of precision munitions Robert Reisman, who championed the advancements in military “smart” munitions throughout his career.

The 215-foot tower and laboratory facility was christened the Robert A. Reisman Precision Armaments Laboratory during a ceremony held in June, which was attended by military personnel, arsenal officials, local dignitaries, friends and family.

Fire Support Armaments Center Director Col. Peter Janker welcomed everyone on behalf of Armaments Research, Development and Engineering Center Commander Brig. Gen. Larry C. Newman and explained the new facility’s mission.

“The cutting of the ribbon at this...dedication will signify the entrance of a new and critical research facility into the Army’s development community,” he said. “The Robert A. Reisman Precision Armaments Laboratory will help ensure that the United States never sends its sons and daughters into harm’s way without them having the best tools our nation can provide.”

The laboratory will be used to investigate the effects of a variety of weather conditions on low power electromagnetic signals that are transmitted and received by various electronic sensor and communication devices. The new facility consists of the tower, a laboratory and three target areas—short range (near the foot of the tower), mid-range (1800 feet from the tower) and long range (4200 feet from the tower).

The tower also is equipped with two laboratory elevators to be used to mount sensors for measurements at different heights and to simulate the descent of a submunition equipped with a sensor. It has seven platforms located at 40-foot intervals from which measurements may be made. An enclosed platform that can also be used for measurements tops the tower.

“Visionaries like Robert A. Reisman, over a decade ago, started the introspective analysis from which this tower emerged,” said Newman. “As a result, fewer future soldiers, sailors, Marines and airmen will give up their todays to ensure our tomorrows. This tower will save lives and help protect this nation.”

ARDEC Technical Director Michael Devine said that Reisman’s enthusiasm was infectious and effective.

“The plaque that we are about to unveil will serve as an inspiration just as Reisman inspired others,” he said. “He will always be here in spirit welcoming all.”

Reisman’s government career spanned more than 30 years. He was chief of precision munitions until 1995, when he was assigned to the Assistant Secretary of the Army for Research, Development and Acquisition and was responsible



The 215-foot Robert A. Reisman Precision Armaments Tower and Laboratory will be used to investigate the effects of a variety of weather conditions on electromagnetic signals. Photo by Todd Mozes



(l.-r.) Fire Support Armaments Center Director Col. Peter Janker, former General Dynamics colleague Joe Buzzet, ARDEC Technical Director Michael Devine, and Robert A. Reisman’s family Sheila (wife), Garrett and Lainie Reisman unveil the plaque in his honor. Photo by Todd Mozes

for managing the Army's technology program. In 1997, he joined General Dynamics Ordnance and Tactical Systems with responsibility for technology efforts that included smart munitions, advanced weapons systems and lethality. He was born in Newark, N.J., and graduated from the Newark College of Engineering with a bachelor's of science degree in mechanical engineering.

M.E.S., Inc. of Brooklyn, N.Y., constructed the lab, and the New York District Army Corps of Engineers managed the construction project.

**“The Robert A.  
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**—Col. Peter Janker,  
Fire Support Armaments  
Center director**

## Biosensors Team Applies Tomorrow's Solutions to Today's Biodetection Needs

by Debbie Menking

Aberdeen Proving Ground, Md.—The Biosensors Team is the Edgewood Chemical Biological Center's focal point for support of military point detection and identification requirements. The team's business area focuses on the following fields:

- Research, development, testing and evaluation of current, developmental and emerging immunochemical and nucleic acid-based assay chemistries;
- Testing and evaluation of immunochemical and nucleic acid-based assay chemistries for fielded and developmental biosensors;
- Sample preparation and processing for nucleic acid, protein and immunological analysis; and
- Research and development of sensors

The team investigates basic and applied research methodologies to produce optimal bioagent detection for a variety of immunochemical and nucleic acid based sensors. The Biosensors Team's goal-oriented approach culminates in the development of fielded biosensors that are rapid, sensitive, dependable, durable and user-friendly. Some examples of the team's work include:

- Assay conformance testing and validation studies
- Customer training;
- Assay optimization and development, production and technology transfer actions;
- Reagent development, sample processing methods and hardware development; and
- Sensor assessments, process automation and sample analysis.

Equipped with cutting-edge facilities, 14 laboratories are dedicated to the team's core mission and customer areas. In fact, the labs and are rated up to Biosafety Level II. In addition, a number of specialized systems are on hand. The immunological laboratories are equipped for rapid antibody-based analysis. Instrumentation includes: IGEN's ORIGEN® electrochemiluminometer, Meso Scale Discovery's Sector PR™, Dynatech's ML3000™ chemiluminometer, Perkin Elmer's VICTOR™ time resolved fluorometer, the Luminex 100™ System and the Molecular Devices Threshold™ light addressable potentiometer.

The molecular laboratories are equipped for real-time, nucleic-acid based detection. Some of the technologies are: the Cepheid Smart Cycler™, Idaho Technology's Light Cycler 24/32™, R.A.P.I.D.™ and Razor. Other instrumentation includes Smith's BioSeqq, the Cepheid Biological Sample Preparation System, Gene Expert™, Microfluidic Integrated DNA Analysis System,



Rebecca Tanner and Kishna Mangaya prepare small-scale lyophilizations of the FASTube technology.

**“The Biosensors Team’s goal-oriented approach culminates in the development of fielded biosensors that are rapid, sensitive, dependable, durable and user-friendly.”**

Livermore's Hand-held Advanced Nucleic Acid Analyzer, the ABT Prism® 7900 HT Sequence Detection, the ABI PRISM® 310 Genetic Analyzer and the AndCare electrochemical DNA Analyzer. The team also has full microbiological, microarray, microscopy, chromatography and small-scale production lyophilization capability.

Team clients include the Defense Advanced Research Projects Agency, the Joint Program Executive Office for Chemical and Biological Defense and the U.S. Army Medical Research Institute of Infectious Diseases. In addition to serving these clients, the team also conducts sample analysis in support of post- Sept. 11, 2001, requirements.

Having distinguished itself over the years in its development and evaluation of sensor, assay and sample processing technologies in support of the DoD Biodefense Program, the Biosensors Team is recognized in the United States and internationally for its expertise in the design of experimental parameters for evaluation of prototype hardware and emerging biosensors, sample preparation and assay technologies. Further, the Biosensors Team received the 2002 Department of the Army Research and Development Achievement Award for nucleic acid-based assay development.



**Joe Hamel and Fred Lee check the air flow of a biological safety cabinet before performing bioanalysis.**

## Benet Laboratories to Improve Gun Barrel Coatings

By Greg Vigilante

Watervliet, N.Y.—Benet Laboratories, a division of the Armament Research, Development, and Engineering Center located in Dover, N.J., is developing the next generation of protective bore coatings for large caliber gun barrels.

The battlefield demands for increased range, rate of fire and muzzle velocity have necessitated the use of higher energy propellants. Consequently, these propellants create severe wear and erosion problems in large caliber gun barrels and dramatically limit barrel life.



Benet Laboratories, a division of the Armaments RDEC, is extending the life of large caliber gun barrels, such as those in the Abrams tank, by developing a new bore coating using tantalum.

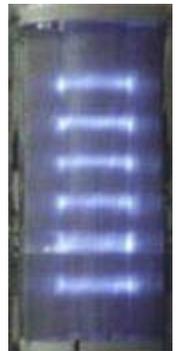
The environment experienced by a large caliber, direct fire, gun bore coating is tortuous. Bore temperatures exceeding 2000 degrees Fahrenheit are reached nearly instantaneously and decay within milliseconds. The result is a severe thermal shock environment. That coupled with high pressure, aggressive chemical propellant by-products and sliding wear from the projectile produce an environment significantly more severe than what is found in other coating applications.

In an effort to extend barrel life, a new bore coating material (tantalum) and process (cylindrical magnetron sputtering, or CMS) are being developed at Benet Laboratories. Tantalum is inherently more ductile and thermal shock resistant than the current material, chromium. Tantalum also has a melting temperature 50 percent greater than that of chromium, thereby enabling the use of future munitions having enhanced lethality.

CMS is a physical vapor deposition process that is *completely environmentally friendly*. Contrast that with the current coating process and material, electrodeposition of chromium. The chromium used in this process is a known carcinogen and toxin. The cleanup of the hazardous wastes created by the process costs the government millions of dollars each year. Moreover, current tri-service environmental requirements call for the reduction and replacement of chrome plating.

In addition to being a “green” coating process, CMS also has a number of other inherent benefits. CMS can deposit high integrity coatings at low process temperatures in order to preserve the stresses and mechanical properties in the gun barrel, can deposit alloy coatings for further improvements in wear and corrosion resistance and can deposit coatings that do not require any post-deposition machining.

Examples of industrial products utilizing sputtering include optical coatings on glass windows, barrier coatings on microelectronics and reflective coatings for automobile headlamps. The technology is being exploited, scaled-up and tailored for application to large caliber gun barrels through several leveraged efforts.



Plasma rings generated during cylindrical magnetron sputtering.

Early proof-of-principle work included a successful sputtering technology demonstration where tantalum was deposited onto a liner inserted into a 20mm Gatling gun. The barrel successfully fired 1,500 rounds comprised of 10 groups of 150 rounds each at 1,000 rounds per minute. Minimal wear was measured with little to no degradation of the coating.

Currently, a multidisciplinary team at Benet Laboratories is applying and optimizing the CMS process for the 120mm M256 tank gun and the Lightweight 120mm Line-of-Sight/Beyond-Line-of-Sight gun for the Future Combat System - Mounted Combat System. After depositions are made on 120mm barrel sections, an extensive coatings characterization protocol is utilized to assess coating integrity. Though this protocol was developed in response to this CMS program, it has been successfully used to characterize coatings deposited by various processes. The characterization involves a number of novel adhesion and service simulation tests, including laser pulsed heating, which simulates the thermal shock environment during gun barrel firing.

Concurrent with the CMS process development, a state-of-the-art Pre-Production Platform is being fabricated at Watervliet Arsenal. This platform will be used to sputter full-length large caliber barrels in 2004, followed by live fire testing. After successful firing demonstration, this technology will be available for insertion into current Abrams production and into various Future Combat System platforms. The Navy also is interested in utilizing this technology for their Advanced Gun System Program. Dual use applications of CMS technology include protective coatings for the automotive, chemical processing and food processing industries.



**A team at Benet Laboratories is applying and optimizing the CMS process for the 120mm M256 tank gun and the Lightweight 120mm Line-of-Sight/Beyond-Line-of-Sight gun.**



**Solid model rendition (l) and construction (r) of a Full-Length, Pre-Production CMS Platform at Watervliet Arsenal, N.Y. The platform will be used to sputter full-length large caliber barrels in 2004, followed by live fire testing.**

## in the field

RDECOM's primary mission is to get the right technologies in the hands of soldiers faster. "In the field" features technologies and systems developed by RDECOM that have been recently fielded or deployed to soldiers.

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## Multipurpose Cartridges Developed and Fielded in Record Time

By Percy Mistry

Picatinny Arsenal, N.J.—The Armaments Research, Development and Engineering Center's Program Manager-Soldier Weapons responded to an urgent request for 40mm thermobaric cartridges in five months—an unprecedented response time from development to fielding.

Program Executive Office-Soldier Commander Col. James R. Moran challenged the PM-SW office in November 2002 to produce 40mm thermobaric cartridges within four to six months.

Thermobaric cartridges provide soldiers with a significantly greater probability of kill/incapacitation within the effective radius. The lethality effect results from a thermobaric overpressure blast rather than fragmentation. As a result of the thermobaric reaction, all enemy personnel within the effective radius will suffer lethal effects as opposed to the conventional fragmentation round.

In order to meet the short deadline, it was decided to use existing 40mm ammunition components. The 40mm 550 fuze, the M195 cartridge case and a modified version of the M583 projectile body was used along with a YJ-05 thermobaric mix (a proprietary mix from contractor Ensign Bickford). Its performance in a smaller caliber was unknown.

Brought into the development were Ensign Bickford Aerospace and Defense and Milan Army Ammunition Plant for loading, assembling and packaging.

Along with several other accomplishments, the TACOM-ARDEC team expedited the design modification, preparation of Interim Hazard Classifications, the safety assessment report and completion of required energetic material testing. Milan loaded, assembled and packed 1,518 cartridges, fired 22 to see if they worked, shipped 308 to Aberdeen Proving Ground, Md., for safety release testing and prepared the rest for shipment.

By April 8, all tests had been completed and the cartridge had passed all tests. Milan had all the cartridges ready for shipment.

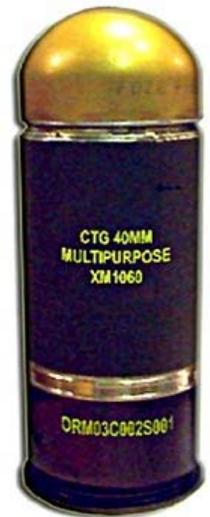
Although Maj. Gen. James D. Thurman, director of training, Office of the Deputy Chief of Staff, decided that the rounds would not be needed for the original urgent request for Operation Iraqi Freedom, he decided the cartridges could be used for the continuing war on terrorism.

On April 22, PM-SW received an urgent need from the Combined Joint Task Force—the rounds would now be used in Afghanistan. The rounds were shipped on April 30.

An e-mail from Maj. Gen. John Vines, commanding general, Combined Joint Task Force 180, made it all worthwhile.

"We love it," he wrote. "We want more! The rounds work wonderfully in caves; they are quite effective. We want a boatload."

In five short months, these cartridges were developed, tested and produced, and are now being used in the war on terrorism in Afghanistan. More are in the works.



Thermobaric cartridges provide soldiers with a significantly greater probability of kill/incapacitation within the effective radius.

**"In five short months, the new 40mm multipurpose cartridges were developed, tested and produced, and are now being used in the war on terrorism in Afghanistan."**

## First Strike Ration Provides Fast Food for Initial Fight

*Natick Soldier Center*

Natick, Mass.—When ground troops want to lighten the field ration load they carry into battle it's referred to as "fieldstripping." The Natick Soldier Center's Combat Feeding Directorate is working to prevent the need for fieldstripping through the new First Strike Ration while boosting the nutrition they need for peak performance. Still in development, the FSR is a single package, high-energy, no-utensils-required ration that would be substituted for three packages of the Meals, Ready-to-Eat for forward-deployed troops in the first 72 hours of combat.

"About seven years ago, we said there has to be a better way to assess what items are being fieldstripped, ensure that these items contain the right nutrition level and condense the cube," said Betty Davis, Performance Enhancement and Food Safety Team leader and project officer for the FSR.

Three Meals, Ready-to-Eat, also called MREs, totaling 3,600 calories were being stripped to 2,200-2,500 calories after soldiers had tossed out unwanted contents. Each FSR hits the target with about 2,300 calories. The FSR is close to half the weight and volume of the MRE, which fits into the Army's goal of becoming lighter, leaner and more mobile as it transitions to the Objective Force. The FSR also cuts down packaging waste.

When the first concept was created two years ago, it was composed of breakfast, lunch, dinner and snack pack, but Davis said the downfall was that each pouch opened the path for fieldstripping.

"Probably when the final version is in the field, soldiers will want to strip it because it's human nature, but in field tests, it has never been stripped," Davis said. "We have a great prototype FSR, but it's definitely going to be changing."

The latest prototype has proven so popular in evaluation that the U.S. Army Special Operations Support Command requested as many of the rations as the Combat Feeding employees could make in their Food Engineering Lab for shipment to Rangers deployed in support of Operation Iraqi Freedom.

Every food was selected for its ability to be eaten out-of-hand for troops on the move. From lessons learned from early concepts, the FSR has evolved into a single shrink-wrapped bag packed with a combination of familiar and new ration components. It currently contains two shelf-stable pocket sandwiches but will soon contain three based on feedback, two flavors of miniature HooAH! nutritious booster bars, two servings of the Energy Rich Glucose Optimized beverage mix (known as ERGO), a dairy bar, crackers or bread, cheese spread, two sticks of beef jerky, a package of dried fruit, a modified version of applesauce named "Zapplesauce," a Ziploc bag and an accessory packet missing the tiny bottle of Tabasco sauce but including an extra wet napkin.

Barbecue chicken and barbecue beef are two varieties of pocket sandwiches now available, and Davis said that more varieties will be added as they are developed. The sandwiches are approved for the MRE and offer for the first time tidy sandwiches that don't require refrigeration.

The dairy bar, likely to be renamed "dessert" bar, is available in chocolate, peanut butter, mocha, banana nut, vanilla nut, vanilla and strawberry flavors. The extruded bar, without a home since it was created about a decade ago, has the consistency of fudge and provides milk protein.

**"The latest prototype of Natick's new First Strike Ration has proven so popular in evaluation that the Special Operations Support Command requested as many of the rations as the Combat Feeding Directorate employees could make for shipment to Rangers deployed in support of Operation Iraqi Freedom."**

“We took it off the shelf, revisited it and made it cheaper to produce,” Davis said. “A number of people here are excited about it, and it could find its way into other rations, including the MRE.”

Zapplesauce is one of the best-liked components, according to Davis. The product is made with extra maltodextrin, a complex carbohydrate, for sustained energy release. Maltodextrin is also the key ingredient in ERGO, which tastes similar to a sports drink. It’s intended to increase endurance by conserving glycogen, which is energy stored in the liver and muscles. The ERGO drink packs will have a “fill-to” line so users easily know how much water to pour in. Straws were desired but are not feasible, so other options are being investigated for easier drinking and may be available as technology changes, Davis said.

HooAH!, which is similar to commercial performance bars, comes in chocolate, peanut butter, apple-cinnamon, raspberry and cranraspberry flavors. HooAH! may be fortified with tyrosine or extra caffeine for performance enhancement depending on testing results from the Army Research Institute of Environmental Medicine. Other possibilities for the FSR include breakfast-type pocket sandwiches, a protein drink or bar, high-performance energy gel and caffeinated sticks of gum.

The FSR has a shelf life of two years instead of three years at 80 degrees Fahrenheit because the rations don’t have to be pre-positioned. They have to stay warmer than 20 degrees Fahrenheit to avoid freezing, and the warfighter will have to resort to another source to heat the food because no heater pack is included. Davis said she expects the FSR to be ready for fielding by 2007.

## Modular Gloves Layer on Warmth

*Natick Soldier Center*

Natick, Mass.—Trigger fingers, as well as the rest of the hands, will be ready to react wrapped under the Modular Glove System developed by the Natick Soldier Center's Special Operations Forces, Special Projects Team. Now, special operators won't have to buy gloves on the commercial market to find a product that works for them.

The glove system brings a significant change for the Special Operations Forces, or SOF, community in hand protection, according to Stephanie Castellani, project officer.

"It's new and never been done before," Castellani said. "It's a great improvement because they've never had anything baseline that all the (SOF branches) have agreed to, and (the system) lays the groundwork for future improvements with new materials and technology."

Most importantly, the gloves pass the "trigger test."

"Function is first. They have to be able to manipulate their weapon systems," said Richard Elder, an equipment specialist with the SOF Special Projects Team. "Safety used to be the primary concern, but if he can't shoot, he'll toss it for something else."

Starting as a science initiative in 2001, the program transitioned to a fielding initiative in the past year, Elder said. In testing, special operators from different services wore the modular gloves while mountaineering, skiing and snowshoeing on a glacier in Alaska. Eight companies submitted a glove system through the Small Business Innovative Research program, but the glove system from Outdoor Research in Seattle, Wash., was chosen in the final selection.

It's composed of a Nomex contact liner, intermediate wet/dry glove and extreme wet/dry glove with a removable insulation liner. Comfort ranges from minus 20 degrees to 45 degrees Fahrenheit, depending on which individual glove or combination is worn. In all, there are five ways to dress with the glove system.

The Nomex contact liner was designed for the first layer. It's constructed of a Malden Mills Powerstretch fleece with Nomex and soft, flame-resistant Pittards leather lining the palm and fingers that provide a lightweight, flexible glove with an acceptable grip and abrasion resistance.

"This is good alone at temperatures above 40 degrees or when handling hot weapons," Castellani said. "For dexterity and tactility, everyone loved it."

The intermediate wet/dry glove, which is worn with or without the Nomex contact liner, protects from 10 degrees to 45 degrees Fahrenheit. Except for the palm, the glove's shell is made with three types of Gore-Tex laminate materials for waterproofing and windproofing, while providing moisture vapor transfer and abrasion resistance. AlpenGrip, a proprietary polymer material with a slightly rubbery feel, is used for the palm for complete waterproofing and high abrasion resistance while retaining flexibility.



The Modular Glove System is composed of a Nomex contact liner, intermediate wet/dry glove and extreme wet/dry glove with a removable insulation liner.

**"Natick's new Modular Glove System, which will be fielded this summer, offers Special Operations Forces several options of protection from minus 20 degrees to 45 degrees Fahrenheit."**

Attached inside the glove is a waterproof liner coated with brushed polyester to improve moisture wicking.

Even when the intermediate glove is worn over the contact liner, Castellani said tactility is still acceptable. Part of the credit goes to the shape of the glove with its curved fingers and tapered fingertips.

In colder climates, the extreme wet/dry glove protects from minus 20 degrees to 20 degrees Fahrenheit worn in combination with the Nomex contact liner or intermediate glove. The same AlpenGrip palm with Cordura Gore-Tex material for the shell, waterproof liner with brushed polyester coating and curved, "box-cut" fingers with an articulated thumb for dexterity are found in the extreme glove. What's different is a lengthened top portion of the shell to protect the wrists and a removable Moonlite Pile insulating insert.

Pocket heaters can be placed into either the intermediate or extreme glove, according to Castellani, but the extreme glove insert has a pocket on top designed specifically for that purpose. The extreme glove also uses hook and loop fasteners at the wrist and forearm for a snug fit.

"It's a bit bulkier, but you need the extra bulk for the extra warmth," she said. "It's been tested to minus 29 degrees Fahrenheit, so it exceeds the minus 20 requirement."

Fielding is scheduled for late summer beginning with the 10th Special Forces Group in Fort Carson, Colo. The glove system will be sold commercially, enabling conventional forces to purchase the item, according to Elder.

## Display Showcases Soldier Technology and Chow to Congress

*Natick Soldier Center*

Natick, Mass.—Why are American military forces the best protected and best sustained troops in the world today? Congress recently found out during Soldier Modernization Day, held July 15 and 17 on Capitol Hill in Washington, D.C. During this event, representatives from the Natick Soldier Center, the Program Executive Office-Soldier and the Product Manager for Force Sustainment Systems joined forces to showcase items that support the individual soldier.

The event provided members of Congress and their staffers with an opportunity to view the latest innovations in soldier technology and sample some of the newest field rations. Items on display included:

- **Land Warrior/Objective Force Warrior/Future Warrior:** As key components of Army transformation, these systems will provide increased capabilities to our warfighters using advanced technologies. Land Warrior is scheduled to begin fielding in 2004 and the Objective Force Warrior in 2010. Future Warrior is a notional systems concept for the year 2025.
- **Current Efforts in Materials, Ballistic and Chemical Protection:** Selectively permeable membrane garments, a microclimate cooling unit, modular integrated communication helmet, improvements to ballistic protection (M5 fiber) and various electrotexile fabric samples were included in this display.
- **Meals, Ready-To-Eat and Unitized Group Rations:** Attendees sampled the latest menu items that cater to the diverse cultural and ethnic food preferences of our soldiers. Innovations for future combat rations include the famous pocket sandwich for increased mobility and compressed entrees that reduce the weight and bulk of the soldier's payload.
- **National Protection Center:** This group demonstrated how the nation's first responder community can leverage military technologies to improve response templates and enhance responder protection.
- **Program Executive Office-Soldier:** Many individual weapons and equipment being used today by U.S. soldiers in Iraq and Afghanistan were deployed under the PEO Soldier Rapid Fielding Initiative, an innovative program to get state-of-the-art equipment to soldiers quickly. Items on display included Interceptor body armor, Modular Lightweight Load-carrying Equipment rucksack and M4 Carbines with forward rail assembly. The Air Warrior was also exhibited.
- **Program Manager-Force Sustainment Systems:** Force Provider, the Army's premier base camp system, provides warfighter encampments with equipment like the Modern Burner Unit, Laundry Systems, Ultra-Lightweight Camouflage Net Systems and more.

**“The event provided members of Congress and their staffers with an opportunity to view the latest innovations in soldier technology and sample some of the newest field rations.”**

## Science Advisors Get Vital Feedback from Soldiers in the Field

By Larry D. McCaskill

Imagine being under a grueling Iraqi sun and its sweltering heat and having to face off against your toughest critics? For Maj. Robert Johnston, Sgt. 1st Class Samuel J. Newland and William Andrews, the time was a learning experience. Hopefully for the soldiers it will be readjustments to life in the field.

The team, who are members of the U.S. Army Research Development and Engineering Command's Office of Field Assistance in Science and Technology within the System of Systems Integration Division, were deployed to Southwest Asia to work with senior commanders and soldiers to identify and solve operational problems in science and technology areas that surface during Operation Iraqi Freedom and offer quick solutions.

Andrews is the FAST advisor to U.S. Army Special Operations Command. Johnston is the technical manager, HSKT (what does that stand for?) for the Aviation Applied Technology Directorate in the U.S. Army Aviation & Missile Command. Newland is the senior enlisted advisor for the Natick Soldier Center. The FAST office is chartered to provide expert scientific and technical advice to commanders and their staffs.

In addition to capturing information on equipment across the materiel spectrum, Johnston said their trip lifted the spirits of some of the deployed soldiers.

"The face-to-face discussions and communications proved to be as good for the soldiers' morale as it was for information gathering. When they saw us and discovered what our mission was, they knew people cared about them and what they were doing," Johnston said.

"The soldier's input is invaluable when it comes down to analyzing equipment and the soldier's needs. As an American, I am proud of what our soldiers accomplished. They had to maintain with heavy individual loads in the desert heat and they did it remarkably well. We've got great soldiers out there doing great things," Johnston continued.

"If we are seriously looking at resolving problems, we need to be down range with the soldiers," Newland said. "Initially they were a bit apprehensive about talking to us. Once they got comfortable with us being around they began to loosen up, and the floodgate of information opened up.

"They began telling us about all the things that worked well and what needed improvement. By hearing it directly from soldiers on the ground they fought on, we have a better chance of identifying things that could be solved by a science and technology insertion," he said.

According to Andrews, the soldiers were more than happy to provide information about their different systems and situations.

"They warmed up to us pretty fast and began pulling out lists. We were able to get input from all different levels about similar and different items of interest. Some of the soldiers had even worked out possible solutions in their heads to the challenges they faced."

"I was in Afghanistan doing a similar collection of soldier feedback last year. Then, we used a written survey. This time it was face-to-face communication, and the soldiers seemed far more receptive," Newland said. "They seemed to be

**"By hearing it directly from soldiers on the ground they fought on, we have a better chance of identifying things that could be solved by a science and technology insertion."**

—Sgt. 1st Class Samuel J. Newland, FAST advisor

less confident in the results of written reports than in what could be accomplished through face-to-face discussions. In the end, they actually thanked us for both coming and caring.”

## Congressional Staff See the Light at Night Vision Directorate

*Communications-electronics Research, Development and Engineering Center*

Fort Monmouth, N.J.—Throughout the year, the Night Vision and Electronic Sensors Directorate welcomes a variety of groups to its facilities, allowing them a brief look into life within the compound. During these tours, guests visit some of the more interactive amenities, such as the microfactory, mine lanes and firing range. However, a group of 10 congressional staff members recently were given a special, behind-the-scenes tour that gave them more insight into the directorate.

The directorate is part of the Communications-electronics Research, Development and Engineering Center. The Office of the Chief Legislative Liaison invited the congressional staff members because of their interest in research and development activities. Many of the staffers' home states are hosts to these kinds of facilities as well and it was interesting for them to see other such ventures.

Upon their arrival, the staffers were provided an informative and entertaining overview of the lab. Then, they were taken on a lengthy tour of the facilities. Next, they were briefed on a variety of the directorate's technologies, including night vision goggles, Remote Observation/Confirmatory Sensor program, Backpack Unmanned Autonomous Sensor for Surveillance and Target acquisition to Enhance Reconnaissance. In addition, they also received briefings on technologies to support the Small Unmanned Aerial Vehicles, such as the Vehicle Mast Mounted Sensor Suite, Laser Illuminated Viewing and Ranging, counter-terrorism/homeland defense programs and force protection.

John Leitch, a staff member of Sen. Barbara Mikulski (D-Md.), found the day to be interesting and engaging.

"In the beginning, I was a little intimidated by the large variety of technology that you have here. I enjoyed all the hands on demonstrations that we saw throughout the day, and then in the end, when we discussed the application of many of the technologies being used for force protection, it all came together really well. You see this kind of stuff on TV, but working in an office like mine you never interact with it. This visit gave me an opportunity to do that which I found really interesting," said Leitch.

This seemed to echo the sentiments of all the staff members as they left to return to their offices.



A group of 10 Congressional staff members recently experienced a special, behind-the-scenes tour of CERDEC's Night Vision and Electronic Sensors Directorate.

**"I enjoyed all the hands on demonstrations that we saw throughout the day, and then in the end, when we discussed the application of many of the technologies being used for force protection, it all came together really well."**

—John Leitch,  
a Sen. Barbara Mikulski  
(D-Md.) staff member

## partnership

RDECOM partners with industry and academia to capitalize upon advancing technologies and to develop the next generation of scientists and engineers. RDECOM Magazine's "partnership" news department highlights the command's successful collaborations with industry and academia.

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## Cooperative Helicopter Research Takes Flight at Center

By Jim Bowne

Redstone Arsenal, Ala.—Government and industry share a common dilemma. They both realize that a modern treatment of systems engineering is needed in today's research and development environments. In addition, the Department of Defense's acquisition reform efforts and priority for reducing total ownership cost are placing more emphasis on innovative approaches to systems engineering and creating an advanced engineering environment for its implementation.

To help offset a potential shortage of qualified engineers in the future, especially those in the rotorcraft arena, David Weller, along with others, decided one answer might be to partner with academia to help create a solution. Weller is director of the Advanced Systems Directorate at the Aviation and Missile Research, Development and Engineering Center.

According to Weller, the formation of the U.S. Army Aviation and Missile Command in October 1997 may have inadvertently played a role in a shortage of engineers.

"After the transfer of the aviation mission and functions from St. Louis, Mo., to Redstone Arsenal in 1997, we recognized that because of the loss of senior engineers at (Aviation and Troop Command) who didn't relocate and the aging work force, that not only the AMRDEC, but possibly the rotorcraft industry as a whole, had lost a lot of systems engineering expertise," Weller explained.

"There are few universities today (that) provide a graduate level program in engineering and research that is structured around a modern approach to rotorcraft systems engineering coupled with the creation of an advanced engineering environment," Weller continued.

To help alleviate the shortage, the center entered into a cooperative agreement with the University of Alabama at Huntsville, or UAH, in August 2002.

"The cooperative agreement was competitive, and UAH won," Weller said. "The objective of the agreement was to establish a Rotorcraft Systems Engineering and Simulation Center in Huntsville, Ala. And the purpose of the agreement was to share available resources, both personnel and dollars. We felt this would be synergistic with, and beneficial to, AMCOM's mission."

The Rotorcraft Systems Engineering and Simulation Center will subsequently operate under the direction of an Eminent Scholar. It also will incorporate a cooperative team of academic, industry and government researchers having a common goal of rapidly advancing rotorcraft technology and jointly resolving critical, time-sensitive, rotorcraft issues.

"Under the agreement, we gave UAH a number of tasks," Weller explained. "Some of these tasks are to be completed within 36 months and some within 60 months."



**The establishment of a new Rotorcraft Systems Engineering and Simulation Center will provide a badly needed graduate level program centered on rotorcraft systems engineering.**

For example, within 36 months, UAH will establish an accredited degreed academic curriculum. "The primary goal is for UAH to become recognized as a scholastic center of rotorcraft engineering excellence within 60 months," Weller said.

"An eminent scholar, with a national reputation in aerospace systems engineering and simulation, will be the director of the Rotorcraft Systems Engineering and Simulation Center," Weller continued. "The eminent scholar will serve as the focal point for developing a Huntsville-centric engineering environment that will consist of scholastic and academic research; modern educational, computational, communication and networking facilities; advanced simulation techniques and processes; and professional relationships applicable to aerospace applications."

The establishment of the Rotorcraft Systems Engineering and Simulation Center, the eminent scholar and the cooperative agreement are essential steps toward developing viable local resources for superlative government research, development and engineering, as well as eminent educational opportunities. The center is expected to become a "center of excellence" within the rotorcraft community.

"Now, almost one year into the agreement, all participants are currently collaborating on various programs, exchanging technology and technical information, and sharing facilities, equipment and technical expertise," Weller said.

**"There are few universities today (that) provide a graduate level program in engineering and research that is structured around a modern approach to rotorcraft systems engineering coupled with the creation of an advanced engineering environment."**

**—David Weller,  
director of the AMRDEC's  
Advanced Systems Directorate**

## MANTIS Breaks Through the Darkness

By Marna Palmer

Fort Monmouth, N.J.—To the naked eye, a green target positioned in front of a green background can be difficult to detect quickly and engage accurately. If the green target were more easily detected by a different sensor and assigned a different color, such as red, on a color display and if complex scene information were processed and displayed to maximize ease of movement and combat efficiency, then many vision-based challenges currently encountered on the battlefield could be overcome.

This is the idea behind a new collaboration between the Defense Advanced Research Projects Agency and the Science and Technology Division of the Communications-electronics Research Development and Engineering Center's Night Vision and Electronic Sensors Directorate to develop an integrated helmet mounted vision assistance device, known as the Multi-Spectral Adaptive Networked Tactical Imaging System, or MANTIS.

MANTIS provides real time fusion and display of high resolution helmet-integrated microsensors spanning the range of visible to infrared light and augments the display with relevant battlefield information, all in an integrated system that weighs less than 1.8 pounds on the head and consumes less than 10 Watts of power. The fused imagery is projected onto the visor of the helmet, allowing the soldier to also see the battlefield with his own eyes. This multi-sensor fusion approach will help locate targets hidden in the background, facilitate mobility in complex terrain and aid in the identification of friend or foe.

MANTIS, a DARPA-funded program, uses miniature digital video sensors operating in the visible/near infrared, short wavelength infrared and long wavelength infrared, adaptive video sensor fusion, augmented reality and high resolution color microdisplay technology to improve the soldier's ability to target and move on the battlefield of the future. Due to the wide range of technical challenges presented by MANTIS, DARPA and the directorate have teamed up to ensure its success. DARPA is furnishing the funds and program directors, while the directorate is providing the technical expertise to drive many of the new critical component technology areas to completion. Their shared goal is to design and produce two prototype MANTIS products for transition and evaluation by the Objective Force Warrior program.

"One of the biggest challenges we face is the development of a passive solid state low light sensor technology with performance comparable with current Night Vision goggles," said Mike Grenn, a scientist with the Infrared Camera Technology Branch. "MANTIS pushes the state-of-the-art in each of the component technology areas," Grenn continued.

The ultimate goal is to meet the demanding performance, weight and power requirements in an integrated helmet package that is suitable for evaluation by the warfighter in the field.

DARPA and NVESD believe that MANTIS has the potential to revolutionize vision system technology for the warfighter. This joint effort is yet another step forward in the "conquest of darkness."

**"One of the biggest challenges we face is the development of a passive solid state low light sensor technology with performance comparable with current Night Vision goggles."**

**—Mike Grenn,  
a scientist with the Infrared  
Camera Technology Branch**

## Small Business Partnerships Lead to Innovative Solutions

By Maj. Janice M. Baker and John H. Ruehe

Washington, D.C.—The Army works to maintain its technological edge by partnering with industry and academia. Agile, free thinking, small (fewer than 500 employees), high tech companies often generate the most innovative and significant solutions to meet our soldiers' needs. The Army seeks to harness these talents for the benefit of our soldiers through two innovative research and development programs—the Small Business Innovation Research and the Small Business Technology Transfer. Both programs involve small businesses in early stage research and development projects.

These programs provide timely investment capital, enabling small companies to develop dual-use technologies and products to bring to the marketplace. Dual-use is defined as technologies that, first and foremost, benefit the soldier, but which also are commercially viable. Ultimately, the Army SBIR and STTR Programs benefit the Army, the private sector and our national economy.

The Army Research Office is responsible for the SBIR and STTR Programs. Activities include generating SBIR and STTR topics, evaluating Phase I proposals, awarding and monitoring all Phase I contracts, soliciting and evaluating Phase II proposals (with the assistance of other Army research organizations) and transitioning the management of resulting Phase II efforts to other Army research and development organizations, where appropriate. SBIR and STTR are very competitive, about one in 10 Phase I and one in three Phase II proposals are selected for award.

Congress established the SBIR Program in 1982, and the current reauthorization of the program is until 2008. By law, the Army must reserve 2.5 percent of its extramural research and development budget, meaning that part of that budget goes “out of house,” for contracts to private companies and for competitively selected SBIR awards to small businesses. The fiscal year 2003 SBIR budget is \$165 million.

Army scientists and engineers develop SBIR solicitation topics that address current and anticipated warfighting technology needs. These topics are internally reviewed in the Research Development and Engineering Centers and then reviewed by the U.S. Training and Doctrine Command and representatives of the Army logistics community. Senior Department of Defense officials conduct the final review to ensure compliance with national defense priorities and requirements. Approved topics are then posted in a semi-annual DoD solicitation.

Successful SBIR projects move through the three SBIR phases. Small businesses enter the SBIR process by submitting concepts in the form of Phase I proposals against these topics. Phase I is the entry point where a company proves the feasibility of its concept in six months for up to \$70,000. An option for up to \$50,000 is available to fund interim Phase I—Phase II activities if the project is selected to receive a Phase II award. Phase II is a substantial R&D effort, up to \$730,000 over two years, and is intended to result in a dual-use technology, product or service. In Phase III, the successful company markets its dual-use product or service either to the government, the private sector or both. No SBIR funding is provided in Phase III.

The STTR Program, like SBIR, is a government-wide program that Congress mandated through the Small Business Research and Development Enhancement Act of 1992. The STTR program is re-authorized until 2009. STTR was established as a companion program to the SBIR Program and is executed in essentially the same manner; however, there are several distinct differences. The STTR budget is separate from the SBIR budget and is determined by an assessment of 0.15 percent (increases to .3 percent in fiscal year 2004) of the Army's extramural research and development budget (versus 2.5 percent for the SBIR Program).

**“These programs provide timely investment capital, enabling small companies to develop dual-use technologies and products to bring to the marketplace.”**

STTR has the same objectives as SBIR regarding increasing the involvement of small businesses in federal research and development and the commercialization of their innovative technologies. Unlike the SBIR program, in STTR, small businesses are required to partner with universities, Federally-Funded Research and Development Centers and other non-profit research institutions. The STTR Program is designed to provide an incentive for small companies and researchers at academic institutions. Each STTR proposal must be submitted by a team that includes a small business (as the prime contractor for contracting purposes) and at least one research institution, which have entered into a written agreement for the purposes of the STTR effort. Also, the project must be divided such that the small business performs at least 40 percent of the work and the research institution(s) performs at least 30 percent of the work. Either party, or a third party may perform the remainder of the work. STTR moves through a similar three-phase process to SBIR. Phase I efforts are for six months, and up to \$100,000 and Phase II efforts are for two years and up to \$750,000.

For both programs, the requisite research and development is conducted by a network of laboratories and centers located within the Army's major commands: (1) Army Materiel Command, its subordinate Research, Development and Engineering Command, which includes the Army Research Laboratory; the Simulation and Training Center; and six Research, Development and Engineering Centers; (2) Army Test and Evaluation Command; (3) Space and Missile Defense Command; (4) Medical Research and Materiel Command; (5) Corps of Engineers; and (6) Deputy Chief of Staff for Personnel's Army Research Institute.

## Research Paying Dividends in Preserving Ranges

By Jack Crowley

Picatinny Arsenal, N.J.—The New Mexico State University Physical Science Laboratory hosted a quarterly review of the Armaments Research, Development and Engineering Center's Hazardous Material Management and Technology Demonstration Programs in early June in Santa Fe, N.M. The program supports the Army Heavy Metals Office and munitions development project managers by ensuring the continued availability of Army test ranges at Yuma and Aberdeen Proving Grounds for the development of improved depleted uranium penetrators for the M1 Abrams tank.

The two-day session featured the laboratory investigators' early findings and "new starts" that ranged from the study of depleted uranium fate and transport in a constructed "garden" and within the arroyos (dry stream beds) in the arid Yuma Proving Ground climate, remote aerial-survey location technologies (using both high-resolution color photography and various radar techniques), to extensive phytotechnology (the use of plants) studies for metals uptake and stabilization.

One fascinating investigation involves actual gene-level investigations conducted by the NMSU Department of Chemistry to investigate the symbiotic transfer that occurs in the rhizosphere—that "sphere" that occurs between the plant and the soil itself.

With the assistance of the center's Hazardous Material Management and Technology Demonstration Program Manager, the university's agenda was enriched by briefings from a number of experts who participated in range studies at Naval Air Weapons Test Center, China Lake, as well as the soils and contaminant modeling experts from the Army Corps of Engineers Engineer Research Development Center, Vicksburg, Miss., and the Stevens Institute of Technology team that developed a depleted uranium filtration system for contaminated water for use at Aberdeen Proving Ground, Md.

"I wanted to expand the vision and cause increased networking between and among the (Physical Science Laboratory) investigators and other companies and agencies that have 'been there and done that,'" said Per Arienti, Army Heavy Metals Office program manager.

"The work done at China Lake was important to us since it involved assessments of heavy metals, particularly depleted uranium that had been fired by (the) Navy. The findings, technologies and methodologies that were employed at China Lake have parallels with our own ranges and the studies we're engaged in. This information will support the work of our developer community here in Program Executive Officer - Ammunition, as well as benefiting our Army Testers, Range Managers and others," continued Arienti.

One briefer said that China Lake is "...not the end of the Earth, but you can almost see it from there."



**Dr. Mahmoud Wazne, Stevens Institute of Technology, is shown at the Aberdeen project site. This successful filtration system is now being installed in Aberdeen Proving Ground's SuperBox to remediate runoff contaminants. Photo courtesy Stevens Institute of Technology.**



**Dr. Peter Lammers, Chemistry Department, NMSU, discusses rhizosphere genetic markers at the Santa Fe conference. Photo by Jack Crowley**

“This template could aptly describe (Yuma Proving Ground) as well,” said Mark McCormack, the radiation safety officer at Yuma, who described a RangeSafe-funded experiment he leads to decontaminate old tank gun tubes using Corpex© a material used by the Nuclear Regulatory Commission to clean piping at nuclear power plants.

“Academic institutions, such as New Mexico State and Stevens Tech, have been key partners in the Heavy Metal Office’s effort to support our PMs, Range Managers and the Developmental Test Command,” Arienti said.

“For the past several years we’ve been using a mix of mining, phytotechnology and other novel approaches to address Army range issues. It is critical that our range infrastructure remain intact so that soldier readiness can be maintained,” he continued.

“Happily, these programs have been actively supported by the congressional delegations from the states where the ranges reside,” said Jim Frankovic, chief of the Army Heavy Metals Office. “We’ve been working on a series of concerns that were developed by the Office of the Project Manager-Maneuver Ammunition Systems and the Developmental Test Command several years ago, as well as seeking out new ideas and technologies.

“When we get this kind of support, the costs to programs and range managers are nil, and we can go from the lab to the range across a broad spectrum of investigations. This has high payback to the Army in both good environmental stewardship and the continued availability of ranges to both developers and the ‘shooters.’ For example, the filtration/cleaning systems fabricated by Stevens Tech researchers fully cleaned the two tanks at (Aberdeen Proving Ground and Army Research Lab) and are now being installed to handle the runoff in the SuperBox at Aberdeen. It’s important work to us all,” continued Frankovic.

Dave Thomsen, PM MAS’ representative at the Progress Review, echoed these sentiments.

“Individual programs or munitions items can hardly be expected to fund these types of basic research—this work is extremely important to the developer community,” he said. “The results are becoming evident already in new approaches to range management and in investigating the behavior of various target metals. The knowledge that comes from these types of investigations helps to assure that we have open Army ranges for both our testing and our soldier training.”

(Per Arienti, Army Heavy Metals Office program manger, contributed to this article.)

## people

RDECOM's talented scientists, researchers and engineers are among the top in their field. The "people" section includes news and feature articles about the command's diverse staff, including profiles, awards and other accomplishments.

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## Dr. Gay Kendall Stimulates Young Minds Through the Wonders of Science

By Larry D. McCaskill

Fort Bragg, N.C.—Flashing a smile and a twinkle in her eye, Dr. Gay Kendall is exciting and stimulating young minds through the wonders of science. As a science advisor in the Army Materiel Command's Field Assistance in Science and Technology Activity, Kendall is providing technological assistance to the XVIII Airborne Corps at Fort Bragg, N.C. She also spends some of her time at Fort Bragg encouraging students to consider science as a career choice.

Kendall developed a passion for sharing knowledge during her time as an undergraduate student. A young female professor in her physics department inspired her to volunteer her time to work with children.

"I quickly realized the benefits to having young women actually meet and interact with a female scientist. That was my initial motivation. I never met a female scientist while I was growing up, and that may be why I had never really thought about becoming one myself," Kendall said.

"I remember in elementary school parents coming in to talk about their careers with our class. The parents who came were all working in what might be considered traditional gender roles," Kendall said. "For example, a female nurse came to talk to us, then a male doctor, a male policeman and finally a male engineer, who just happened to be my dad. And of course, our elementary teachers were all female. The first female scientists that I met were professors at the university I attended as an undergraduate."

A lover of music and a musician, Kendall said that it's quite common among women scientists to be introduced to scientific careers via a non-traditional route. As a musician, she became interested in the technical aspects of sound, so she moved to New York City to find work as a sound engineer in a recording studio. Finding heavy competition in that field, the 41-year-old Kendall decided to obtain some formal training in electronics in order to become more marketable. It was then that the science bug bit her.

"I had never taken physics in high school," said the Pennsylvania native. "I didn't receive credit for the first physics course that I took in college, but I really liked it. I took another one, and then another, and the material just kept getting better and better! Before I knew it, I had a bachelor's degree and then a master's degree in physics. And a dozen years after it all started, I completed my PhD in engineering physics at Rensselaer Polytechnic Institute in Troy, N.Y."

According to Kendall, educational literature indicates that students as early as in fifth grade are making decisions about what is gender appropriate in terms of careers.

"If you haven't met a woman scientist, then you just don't think of it as a career option when you're a young female student. I think these issues are very subtly communicated to us, and that's why it's important to have a diverse group



Dr. Gay Kendall hopes to raise children's interests in science and also making a subject that they may originally be wary of a little more engaging.

**"I think we can all give back in a number of different ways...For me, it's very important to work with children. I'm committed to it, I really enjoy it and it's just great fun."**

—Dr. Gay Kendall,  
FAST science advisor

of scientists and engineers going out into the schools. This way kids can meet somebody they may be able to relate to," she said.

Being able to take a few hours a month to volunteer her time giving science presentations has always been important for Kendall.

"It played a big factor for me in deciding where I wanted to work. I honestly wouldn't work anywhere that didn't allow me to spend some time going out into the schools and working with kids. The Army has been very supportive of it, as they see the long term benefits."

Kendall hopes that her presentations are helping to raise children's interests in science and also making a subject that they may originally be wary of a little more engaging.

"I personally found the science that I was taught in middle school to be pretty boring. All I can remember is classifying rocks, which was fun at first but got old pretty quickly. I had no idea that there were so many different fields within science, and how exciting they can all be," Kendall said. "This is one of the things that I try to explain to students when I enter the classroom. Just because they don't enjoy math or science right now doesn't mean that it doesn't get a lot more interesting as they branch out into different topics."

Kendall says the workshops that she conducts are designed to provide students the opportunity to have fun while conducting hands-on science experiments. She is particularly hopeful that this experience will help lessen the anxiety some female students have regarding hands-on activities. Boys, she said, tend to be more inclined to hang out in the garage during an oil change or when the lawnmower is getting fixed.

"Since that's often being done more by dads than by moms, girls seem less likely to view these as activities that they should be involved in. As a result, some girls have anxiety about using tools, taking things apart or fixing things."

Kendall conducts four workshops on different scientific topics: polymer materials, electrostatics, fractals and the science of soap bubbles. The activities range from creating a slime-like substance as an introduction to the properties of materials, to using bubbles as a means of learning about surface tension, to making cereal 'dance' as a result of a build up of static charge. These workshops are tailored for different age groups by varying the sophistication of concepts and terminology that are introduced to students.

"When you're working with preschool or kindergarten kids, you're doing more magic than science," she said. "But even with the youngest ones, you'd be surprised at how sophisticated their thought processes are."

All of Kendall's science activities are very inexpensive and use materials that are easily found around the house. She calls it doing "science on a shoestring budget."

"You can do any of these activities with a classroom full of students for approximately \$10 worth of materials, some time and some patience."

"Gay makes it fun for the kids; they really learn an awful lot about the science behind each of the activities, like hydrogen bonding and molecules," said Jack Byers, chief, Technical Review & Communications Division, within AMC's System of Systems Integration Office. "For example, she teaches them about positive and negative charges. The kids know some of this already but this gives them a greater depth. She makes it a lot of fun. In the electrostatics workshop, she actually makes cereal dance and the kids get the biggest kick out of that."

For Kendall, reaching out and helping others is important.

"I think we can all give back in a number of different ways. As an Army scientist or engineer you can mentor other professionals who are just starting out, or mentor students through vehicles like the Army's E-Mentor Program. You

can participate in a wide variety of activities that support local schools, such as career days, science fairs or job shadowing programs. For me, it's very important to work with children. I'm committed to it, I really enjoy it and it's just great fun."

In addition to lending a helping hand, Kendall offers this piece of advice to her students and the adults around them: "Stay open-minded. I think that's the most important thing. I hear students from as early as third grade say that they don't think they would like to become a scientist since science is hard. I take great issue with this. Whenever anyone asks me if doing science is hard, I say, 'No. Working at a fast food restaurant is hard. Working at something you do not enjoy and are not getting paid well to do is hard! Doing something that challenges you is very different, and can be rewarding on so many different levels.' In this sense, I assure them that doing science is really not very hard at all."

## ARDEC's Lean Six Sigma Holds Third Certification Ceremony

Robert W. Scott and Samuel H. Figueroa

Picatinny Arsenal, N.J.—Another milestone for Lean Six Sigma was achieved when VSE Corporation recognized the hard-earned efforts of 101 Green and Black Belts at a recent certification ceremony. These “Beltees” were the engine for change behind 27 improvement projects, encompassing all functions, both technical and managerial, within the Armaments Research, Development and Engineering Center.

The ceremony is like a graduation, the “Beltees” are recognized as Green or Black Belts when they complete their project. This ceremony also marked the certification of the first Senior-Level Executive. E. Carroll Gagnon, deputy program executive officer for Program Executive Office-Ground Combat Systems, received his Green Belt Certificate. He contributed to the organizational restructure of the Project Manager-Combat Ammunition Systems and Program Manager-Mortars merger.



Norm Frigon, director, VSE Corp., Management Sciences Division (far right), congratulates the 101 Green and Black Belts who received their certification. Participating with him in the ceremony were: (l.-r.) Fire Support Armaments Center Commander Col. Peter Janker, Quality Engineering Director and ARDEC Lean Six Sigma Chairman Paul Chiodo, Program Executive Officer for PEO-Ammunition Brig. Gen. Paul Izzo and Deputy Program Executive Officer for PEO-Ground Combat Systems E. Carroll Gagnon. Photo by Todd Mozes

The ARDEC Lean Six Sigma recognizes four categories of return on investment or benefit to the customer. This allows the teams to recognize not only the monetary but also the “hard to put a number on” aspects of their payback. These are: Quality/Customer Satisfaction, cost, Schedule and Risk.

The following are four examples of the product of the 27 teams recognized in the ceremony. These demonstrate the effectiveness and efficiency of using this methodology.

- **Quality/Customer Satisfaction**—The “secretary” role within the arsenal was not competitive with the job offerings from outside. This equates to a personnel shortage, as many secretaries retire and there’s a lack of career progression within the ranks. Thus, a Black-Belt Team employed Lean Six Sigma to re-define this role. They developed a complete career track with greater responsibilities, career growth and challenge. The administrative assistants now relieve managers from many tasks, letting them concentrate on making the organizations they lead more effective. This effort was achieved in four to eight months.
- **Cost**—The loading of PAX-2A explosive into M80 artillery projectile grenades required shutdown of the loading equipment after making 2,000, far short of the 25,000 per shift requirement. A Black Belt Team identified the problems and developed experiments to assess the solutions. In addition, the team identified additional problems in the line and solved them. As a result, the loading now exceeds the 25,000 requirement, and eliminates the “hidden rework” of sending some explosive back for processing into the “right size” for loading. This improvement is easily transferable to all artillery grenade lines by just changing the tooling. The potential across the board life-cycle savings is estimated at \$738 million.

- **Schedule**—With the obsolescence of DoD 5000, there is potential to improve the management processes controlling our weapons and munitions. A Green Belt Team addressed the lengthy and nightmarish hurdles to get critical documents approved in time for milestone review. Missing such windows can prove fatal to a program. After assessing the document review and approval process, the team streamlined all concurrences of personnel who are integrated into the IPT's efforts. Thus, only the approval signatures and a few concurrences are now required. This saves a lot of work and "signature chasing" to all participants.
- **Risk**—One electronic test set supporting M762A1 Fuze production was not only a bottleneck but also an imminent line shutdown risk. This unit had to work three shifts to keep up with one shift's production, and had little available time for preventive or corrective maintenance. A Green Belt Team introduced new test technology that effectively tripled the test throughput, can be upgraded to new requirements with ease and made the test more realistic by using actual Army fuze-setter components. As a result, the new multi-unit tester is nearly three times as fast, drastically reduces the overtime required while making a production ramp-up feasible and eliminates much of the production risk of the old unit.

## Mathes Takes Over as TARDEC Development Director

*Rae Higgins*

Warren, Mich.—The Tank-automotive Research Development and Engineering Center gave the nod to another one of its own on July 9 when Thomas M. Mathes was promoted to the Senior Executive Service. As TARDEC's newest SES and executive director for development, Mathes leads TARDEC's design and manufacturing and international research and development activities, advanced concept development, system requirements, and petroleum and water business areas.

Mathes entered government service in 1981 as a mechanical engineer with the Tank-automotive Command. Prior to this promotion, he served as TARDEC's director of the design and manufacturing technologies. He has long championed the benefits of 3D solid modeling. In 1996, he led a government/industry "synthetic manufacturing" team, whose work resulted in a then Vice President Al Gore's "Hammer" Award.

Mathes has been the chairman and the United States' principal representative to NATO's ad hoc working group on vehicles and vehicle components since 1997. In 1998, he became the U.S. principal representative to NATO's subgroup on mechanical and general engineering. He was elected the subgroup's chairman in 2002.

Mathes holds a bachelor's of science degree in design. He is a member of the Society of Automotive Engineers, the Society of Manufacturing Engineers, the Association of the United States Army, the Senior Executive Association and the American Federation of Government Employees Local 1658.



As TARDEC's newest SES and executive director for development, Thomas M. Mathes leads TARDEC's design and manufacturing and international research and development activities, advanced concept development, system requirements, and petroleum and water business areas.

## A Look Back at Technology's Past: Meet the Metascope

By Marna Palmer

Fort Monmouth, N.J.—With technology evolving at record speed, it's rare to find old-fashioned night-vision equipment like the Metascope. However, Sgt. Roger Kelley, of the Bloomington Police Department in Bloomington, Ind., found this technology relic while cleaning out an old storage room.

Kelley's find is of particular interest to the Communications-electronics Research, Development and Engineering Center's Night Vision and Electronic Sensors Directorate. The directorate currently has a 1954 model of the Metascope on display in its historical case and can now add Kelley's discovery to its archives.

"I had hoped to get my hands on a training manual for the device so that my street patrol could use it. Right now, only our SWAT team has night vision," Kelly said. However, after learning of the instrument's antiquity, he decided to instead send it to the directorate to include in their historical collection.

The Metascope's most "modern" ancestor is the Handheld Thermal Viewer, AN/PAS-7, which can also be found in the historical case. Although finds like these are rare, they are a good reminder of how far night vision technology has advanced.



Sgt. Roger Kelley, of the Bloomington, Ind. Police Department, stumbled upon an antique night vision device, called the Metascope, while cleaning out an old storage room.



The Metascope represents a piece of night vision technology history and can be found on display in the Night Vision and Electronic Sensors Directorate's historical archives case.

## ECBC Fills Senior Level Positions

### *Edgewood Chemical Biological Center*

Aberdeen Proving Ground, Md.—The Edgewood Chemical Biological Center recently filled three senior level positions, making the organization stronger, more robust and better equipped to meet critical challenges presented in national defense and homeland security.

Dr. Raymond Mackay was appointed director of the Research and Technology Directorate. A previous Clarkson University professor and program director of the university's National Science Foundation, Mackay holds a doctorate in chemistry from the State University of New York at Stony Brook. With an extensive background in chemical engineering and research, Mackay offers ECBC a wealth of knowledge in science and technology solutions and the execution of fundamental studies to enhance the knowledge of chemical and biological weaponry.



**Dr. Raymond Mackay, ECBC's new director of the Research and Technology Directorate.**

Jeffrey L. Hinte was recently promoted from Advanced Planning and Initiatives Business Development Division team leader to AP&I director. Hinte has more than 14 years of experience directing military, civilian and contractor personnel working in laboratory and program management of chemical, biological and obscurant defense. As AP&I director, Hinte will oversee the U.S. Chemical Biological Defense, Science and Technology, International Cooperative Programs; technology transfer and cooperative research and development initiatives, patents and intellectual property issues; and lead the strategic and business planning efforts at ECBC.



**Jeffrey L. Hinte now serves as director of ECBC's Advanced Planning and Initiatives Directorate.**

Dr. Joseph Corriveau has accepted the position of research and technology deputy director. Dr. Corriveau joins ECBC from the Office of the Deputy Assistant to the Secretary of Defense (Chemical/Biological Defense) where his primary responsibility involved program planning, coordination, integration and oversight of science and technology activities. Specific duties included serving as executive secretary for the annual Chemical and Biological Defense Technology Area Review and Assessment and executive secretary of the Counterproliferation of Weapons of Mass Destruction Panel of the Joint Warfighter Science and Technology Plan.



**) Dr. Joseph Corriveau is ECBC's deputy director of research and technology.**

## Kirnes Assumes Product Manager of Mortars Role

By Myra Hess

Picatinny Arsenal, N.J.—Project Manager for Combat Ammunition Systems Col. Nathaniel Sledge recently hosted a Change of Management Ceremony for the product manager for mortar systems, where Lt. Col. Larry D. Hollingsworth relinquished management to Lt. Col. Andre C. Kirnes. Hollingsworth is now attending the Army War College as an Executive Fellow at the University of Texas, Austin. Kirnes comes to Picatinny from Orlando, Fla., where he served as the assistant project manager for acquisition in the Joint Simulation Systems Project Office.

Prior to Orlando, Kirnes served as the program executive officer for Air Missile Defense System Integration and test officer in Huntsville, Ala. He is not a stranger to New Jersey since he spent some time at Fort Dix in the late 1980s and early 1990s, when he was assigned to Headquarters 3rd Battalion, 39th Infantry. He later commanded Company B, 3rd Battalion, 39th Infantry and Company E, 4th Battalion, also at Fort Dix.

He graduated from Middle Tennessee State University in 1983 and was commissioned as a second lieutenant in Air Defense Artillery. He also attended Middle Tennessee State, where he received his master's degree in business administration and economics in 1992.

His military education includes Air Defense Artillery Officer Basic Course, Air Defense Artillery Advanced Course, the Army Command and General Staff College and the Advanced Program Management Course. Among his awards and decorations are the Meritorious Service Medal (with three Oak Leaf Clusters), Army Commendation Medal (with one Oak Leaf Cluster), Army Achievement Medal (with one Oak Leaf Cluster), Army Superior Unit Award, National Defense Service Medal, Army Service Ribbon, Overseas Service Ribbon and Parachutist Badge.

He has three children, Cameron, Breana and Julien.



**Project Manager for Combat Ammunition Systems Col. Nathaniel Sledge (left) passes the PM-Mortars Charter to Lt. Col. Andre C. Kirnes, who assumed management of PM-Mortars at a recent ceremony. Photo by Todd Mozes**

## New Garrison Commander Comes on Board

By Myra Hess

Picatinny Arsenal, N.J.—The Armaments Research, Development and Engineering Center welcomes its newest garrison commander Lt. Col. Paul T. Seitz, who has replaced Lt. Col. Ernest G. Crone, Jr. At a change of command ceremony held in June and hosted by Diane M. Devens, northeast regional director of the Installation Management Agency, Crone relinquished the reins to Seitz.

Devens presented several medals and the Order of St. Barbara to Crone before his departure to Washington, D.C., and the Pentagon. She praised Crone's dedication and enthusiasm that never waned despite the daunting responsibilities that ensued during his command, such as Sept. 11, 2001, and the A-76 Study and transition to Johnson Controls. She also said that replacing Crone is another talented soldier, who has just served in Qatar and in military intelligence positions.

"Not only is the Garrison and Picatinny a great place to work, but the work done here is very important," said Crone

Seitz said, "I look forward to working with all of you in this difficult time for the nation and the Army," he said. "Picatinny has a great reputation in the Army, and I promise to keep a safe and productive environment."

Seitz comes to Picatinny from MacDill Air Force Base, Fla., and Camp As, Saliyah, Qatar, where he served as chief of the Long Range Branch, Plans Division, J2, U.S. Central Command. Prior to this, Seitz served as the operations officer, Collection Management Branch, Joint Intelligence Center Central, J2, U.S. Central Command, MacDill Air Force Base and the chief of the Plans Branch, Operations Division, J2, U.S. Central Command at MacDill Air Force Base.

Seitz is a graduate of Military Intelligence Officer Basic and Advanced Courses; Junior Officer Career Cryptologic Program, National Security Agency; Airborne and Jumpmaster Courses and Command and General Staff College. He holds a bachelor's of science in business from St. Peter's College, Jersey City, N.J. and master's of science in administration from Central Michigan University at Fort Meade Campus, Md.

His awards and decorations include the Bronze Star, Defense Meritorious Service Medal, Meritorious Service Medal, Joint Service Commendation Medal, Army Commendation Medal, Joint Service Achievement Medal, Army Achievement Medal, Armed Forces Expeditionary Medal and the Senior Parachutist Badge.

He and his wife, Sylvia, have three daughters: Laura, Helen and Katherine.



Outgoing Garrison Commander Lt. Col. E. George Crone, Installation Management Agency Northeast Regional Director Diane Devens and incoming Garrison Commander Lt. Col. Paul T. Seitz stand before the audience at the recent Change of Command Ceremony. Photo by Todd Mozes

## news briefs

The "news briefs" section provides quick summaries of various news and events from throughout RDECOM.

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## 51st Defense Working Group on Nondestructive Testing to Meet in November

The United States Air Force 361st Training Squadron/Detachment 2 will host the 51st Defense Working Group on Nondestructive Testing, scheduled for November 4-6. The Defense Working Group on Nondestructive Testing provides the only forum for Army, Navy, Air Force, Marine, Defense Logistics Agency and Defense Contract Management Agency representatives to freely exchange information pertaining to nondestructive testing methods, equipment and applications.

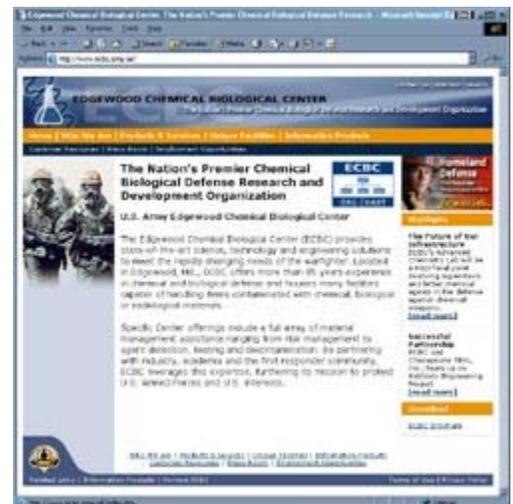
For the past 50 years, this group has met annually, providing a conduit for engineers, scientists and technicians to present technical problems and innovative testing systems to the assembled specialists. With reductions in expenditures for maintenance, repair and acquisition of new systems, it has become imperative that the Defense of Department maximize the useful life of present assets, while developing economical maintenance strategies. The working group plays a significant role in this process as it provides quantitative and qualitative input on the characteristics of systems and components during all phases of life-cycle management. This ability to test and inspect without destroying or degrading equipment ensures the highest standards of personnel safety while providing the most inexpensive method available to assess useful life and readiness of current assets.

## ECBC Launches New Website

The Edgewood Chemical Biological Center recently launched a new and improved Web site designed to make information about its chemical and biological defense technologies and services more easily accessible for customers. The site features late-breaking information about developments that meet the warfighter's rapidly changing needs and highlights ECBC's array of material management services in protection, detection and decontamination.

Designed to help strengthen critical military, federal, state and local emergency response capabilities, the Web site presents pertinent information about CB-related challenges in homeland security and offers a comprehensive listing of upcoming security and technical conferences.

Visit ECBC's website today at <http://www.ecbc.army.mil/> to learn more about center-wide initiatives and cutting-edge advancements in CB defense.



ECBC's new website improves access to many of the center's resources.

## **ECBC Announces Preparedness Courses for Emergency Responders**

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The Edgewood Chemical Biological Center is offering a one-day workshop on Weapons of Mass Destruction, with a focus on basic awareness and responder operations for civilian and military emergency responders. This workshop is intended to enhance the response capabilities of emergency first responders to a terrorist use of WMD. The seminar will take place on Aug. 20 at the Battelle Eastern Science and Technology Center in Aberdeen, Md., from 8 a.m. to 5 p.m.

Two courses will be included in the workshop. The Responder Awareness Course will help participants build their level of awareness and improve response capabilities during a WMD incident. Course topics include identifying signs, symptoms and characteristics related to a terrorist incident involving chemical, biological and nuclear materials, as well as recognizing possible dissemination devices. The Responder Operations Course will train responders on how to initiate the correct defensive posture during a WMD terrorist incident and includes discussions on personal protective equipment, decontamination, basic concepts of downwind hazard analysis and detection and identification equipment.

The classroom courses are available to all interested emergency responders. The cost of the Responder Awareness course is \$180 per person. The full day workshop including both courses is \$270. Lunch will be provided for full day participants, and certificates of attendance will be presented. For more information, or to register, please contact Verna Puckett at (410) 306-8691.

## **RDECOM Employee Wins NAACP Award**

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Gregory Chappelle, a scientist/engineer from the Tank-automotive Research, Development and Engineering Center recently received the National Association for the Advancement of Colored People's Roy Wilkins Renowned Service Award. Chappelle won the award for his educational outreach efforts with middle school students during the past year and his 10 years of work with the nation's Historically Black Colleges and Universities/Minority Institutions and inner city middle schools.

## monthly features

Each month, RDECOM Magazine features articles on specific aspects of the command's mission. The “monthly features” section enables readers to learn more about the command's diverse mission and activities.

The August 2003 edition of RDECOM Magazine features cutting-edge technologies that have been or soon will be deployed to soldiers in the field. The articles included in this section demonstrate the Research, Development and Engineering Command's agility to quickly develop technologies and solutions that are critically needed on the battlefield. The articles listed below are this edition's monthly features, and span the [in the lab](#) and [in the field](#) news departments.

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- [Multipurpose Cartridges Developed and Fielded in Record Time](#)