Headquarters Department of the Army
PB-70-03-3

MAY–JUNE 2003

ARMY AL&T

AMC'S NEW RDECOM

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ARMY ENLISTED ACQUISITION PROGRAM

FROM THE ARMY ACQUISITION EXECUTIVE

Faster Fielding

I am pleased to see this issue devoted to the Army's continuing efforts to get technology out of the lab and into the field faster. The Army Materiel Command's (AMC's) new Research, Development and Engineering Command (RDECOM) is another innovative way that we are focusing on the needs of the soldier now—not a decade from now. AMC Commanding General Paul Kern, in this issue's lead article, highlights the objectives for establishing the new RDECOM, including the need to be agile enough to rapidly take advantage of opportunities no matter where they may arise.

As we continue to wage the war against terrorism, it is imperative that we continually take stock of how we can reduce the risk to our soldiers and, at the same time, make their jobs easier to perform. One good example is the Army's Rapid Equipping Force (REF) and its success in putting needed capabilities into the hands of our soldiers quickly. Once a field commander identifies an operational need, often to an REF member in theater, this small team goes to work to find an equipment solution. It may be government or commercial off-the-shelf or a near-term developmental item that can be rapidly made available.

The REF team has had several successes, particularly in Afghanistan. One such success that received high praise from soldiers in its original application is the PackBot, an unmanned ground vehicle that helps them successfully clear caves, bunkers, and compounds. After the need was identified, PackBot was fielded in just 27 days in the summer of 2002. Another example of fast fielding is the WellCam, a waterproof camera on a cable that is lowered into wells to locate weapons hidden there. It was literally configured on the spot once soldiers told the REF engineer on the ground of their suspicions. On the very first trial of the WellCam, the soldiers discovered a weapons cache packed in cosmoline or heavy grease to protect it from the elements. The rest is history.

There are other remarkable developments to solve common problems like communicating with local citizens in Afghanistan and Iraq. The Defense Advanced Research Projects Agency worked with private contractors to codevelop a phraselator that uses computer chips to translate English phrases into as many as 30 foreign languages. Users either speak into the device, which translates the English into the foreign language equivalent, or they can punch a button to call up the desired phrase. The phrases range from just a few dozen to as many as 3,500 phrases. Newer devices contain phraseology on refugee reunification and the search for weapons of mass destruction. The REF has also equipped teams far forward in Afghanistan with a less expensive personal PC with preprogrammed user-selected Pashtu phrases with outstanding results.

The successful application of teamwork and technology in Operation Enduring Freedom and Operation Iraqi Freedom marks a turning point in the way we wage war. The lessons we are learning are helping us prepare for future operations. Let me list a few of those lessons as outlined by Secretary of Defense Donald H. Rumsfeld in a recent appearance before the Senate Appropriations Defense Subcommittee.

One lesson is that *speed* matters. Coalition forces pressed through southern Iraq in a matter of weeks, racing toward Baghdad. The enemy was unable to mount a coherent defense; use weapons of mass destruction; attack neighboring countries with Scud missiles; destroy oil wells; or blow up dams, bridges, and infrastructure—in part, we believe, because the coalition advance was so fast. This experience highlights the value of capabilities that can move quickly into theater and reach targets with speed and agility.

Another lesson is the importance of *intelligence* and the ability to act on that intelligence rapidly. In Iraq, using "Time Sensitive Targeting Cells," the coalition was able to launch attacks on enemy targets, in some cases within 20 minutes of receiving the intelligence information. Planes taking off for bombing runs at times did not receive their targeting information until they were in the air and well on their way. Ground forces were able to stay "in contact" with the enemy forces and attack them with great effect, even as those forces made every effort to avoid contact. The success of these efforts in Operation Iraqi Freedom validates our increased investments in command, control, communications, intelligence, and "persistent" surveillance.

Another lesson is the importance of *precision*. The capabilities employed in Iraq were discreet. One new weapon used for the first time in Iraq—a "thermobaric" Hellfire missile—can take out the first floor of a building without damaging the floors above. This weapon is also capable of reaching around corners, into niches, and behind walls to strike enemy forces hiding in caves, bunkers, and hardened multiroom complexes. It went from development to deployment in less than a year.

It is clear that we need to change to ensure that our soldiers will have the capabilities they need to accomplish their missions today and in the future—that is what the Army's transformation is all about, and that is what AMC's new RDECOM is all about.

Claude M. Bolton Jr.

May-June 2003; PB 70-03-3

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Army AL&T **(ISSN 0892-8657) is published bimonthly by the OASAALT. Articles reflect views of the authors and not necessarily official opinion of the Department of the Army. The purpose is to instruct members of the Army acquisition workforce relative to AL&T processes, procedures, techniques, and management philosophy and to disseminate other information pertinent to their professional development. Private subscriptions and rates are available from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402 or (202) 512-1800. Periodicals official postage paid at Fort Belvoir, VA, and additional post offices. POSTMASTER: Send address changes to DEPARTMENT OF THE ARMY, ARMY ALT, 9900 BELVOIR RD, SUITE 101, FORT BELVOIR, VA 22060-5567. Articles may be reprinted if credit is given to *Army AL&T* and the author. Unless specifically requested, photo credits are not given. Approved for public release; distribution is unlimited.**

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0312201

Acquisition
Logistics
Technology

ARMY AL&T

Professional Publication of the AL&T Community

http://asc.rdaisa.army.mil/

FEATURES

DEPARTMENTS

COVER

Realigning the Army's science and technology enterprise will transform the way the Army acquires and develops technology for soldiers. Establishment of AMC's new RDECOM is a major part of that realignment.

AMC'S NEW RESEARCH, DEVELOPMENT AND ENGINEERING COMMAND

GEN Paul J. Kern

Today, as we face new threats, our needs are changing. Just as the need for detecting hidden explosives or chemical or biological agents has become a priority, so too has ensuring that our soldiers have the most lethal weapons possible. Further, we must get technology out of the lab and into the field faster. What technologies do we pursue? How and where do we find them? It is vital that we optimize the benefits of technology by sharing across the old stovepipes. But are we organized to do so?

The Army Materiel Command (AMC) recently convened an advisory group to look at the Army's science and technology (S&T) enterprise regarding concerns that, although the Army planned to transform itself for the future, its S&T base was still aligned for World War II. During the war, the scientists and engineers working with the various commodities restricted themselves to particular systems, which created an artificial barrier between technologies that could be complementary.

The senior leaders of the Army and its S&T enterprise as well as members of other Services, industry, academia, and the Department of Energy examined the Army's S&T community to substantially transform its business practices and structure to meet the needs of a transforming Army. It was and is essential to have the S&T vision in line with the Army's vision.

The advisory group returned with a proposal to create a new major subordinate command to guide and align AMC's S&T programs. This approach will enhance synergy across technology organizations, eliminate redundancy, improve the capability to do program and system integration, and improve prioritization of programs.

In October 2002, we provisionally established the Research, Development and Engineering Command (RDECOM), which has three objectives. First, it will integrate research, development, and engineering across all areas of the Army, our sister Services, universities, and other S&T resources. Second, it will move emerging technology out of the labs and to soldiers faster. The third objective is to rapidly take advantage of opportunities no matter where they may arise. Achieving these objectives requires new and innovative approaches to all aspects of technology development for the soldier.

The first organizations assigned to the new RDECOM are the Army Research Laboratory, the Army Materiel Systems Analysis Activity, the International Cooperative Pro-

The days of single, independent platforms are coming to a close. The future will require each platform to be linked to all of the others.

grams Activity, the International Research and Development Standardization Groups, the Field Assistance in Science and Technology (FAST) Activity, the S&T portion of the Simulation, Training, and Instrumentation Command (STRICOM) (now Program Executive Office, STRI), and the S&T portion of HQ AMC. MG John C. Doesburg is leading the transition effort and defining the elements of the six research, development and engineering centers (RDECs) that will transfer to the command. (See RDEC list on Page 5.) We are planning on transferring the RDECs to the RDECOM by May 1, 2003.

The RDECOM leadership is establishing Memoranda of Understanding with both the U.S. Army Training and Doctrine Command (TRADOC) and the Army Test and Evaluation Command (ATEC) to increase coordination between these commands and the Army's S&T community. The relationship with TRADOC will include the full integration of Doctrine, Training, Leadership, Organization and Soldier considerations into the technology development and transition process. Similarly, the relationship with ATEC will include the comprehensive testing considerations of the integration of technology and technology programs to facilitate the rapid and effective development and transition of technology to the soldier and maximum verification with modeling and simulation (M&S).

Deputy Commanding General BG Charles Cartwright will be the Systems-of-Systems Integrator of the new command. He will look at the capabilities the Army needs from a systems-of-systems perspective. For example, he will focus on supportability and lethality capabilities (instead of commodities such as helicopters or missiles), which will enable the scientists and engineers to integrate those technologies across multiple disciplines. In addition, the Systems-of-Systems Integrator will use M&S to reach across all the labs so that they can operate in a virtual environment from any location.

The RDECOM's M&S efforts will feed into the advanced collaborative environment. This virtual, distributed environment will link M&S, lifecycle costs, requirements, testing, and training. We are already using M&S in the Future Combat Systems acquisition process. This method of information sharing will continue to grow and become the means by which all of the Army shares concepts and breaks down organizational walls.

The days of single, independent platforms are coming to a close. The future will require each platform to be linked to all of the others. The only way we can learn to operate like that is to first build the M&S capabilities. We will start with M&S and carry it through the acquisition process in a way that ensures the training devices and the systems are fielded together.

At the same time, AMC must integrate its university research through its new research centers that have been created to accelerate emerging concepts into technology that our soldiers can use. We must evaluate whether traditional methods of product development are needed or if we can spin off business units from these research centers to integrate them into the supply base. Finally, we need to fund research and engineering throughout the weapon systems' life cycles to prolong their longevity and integrate systems-of-systems benefits into our legacy platforms.

I see the RDECOM as a key part of the Army's process to transform itself. We are breaking down old barriers. Transforming the way we acquire and develop technology for our soldiers is a step farther down that road.

In this issue of *Army AL&T* magazine, several authors have contributed examples of how the new RDECOM will optimize the benefits of technology to further Army transformation.

GEN PAUL J. KERN is the Commanding General, Army Materiel Command. He has a bachelor's degree from the U.S. Military Academy at West Point, master's degrees in both mechanical and civil engineering from the University of Michigan, and has completed a Senior Service College Fellowship at Harvard University.

A CONVERSATION WITH AMC'S RDECOM TRANSITION DIRECTOR

MG John C. Doesburg, Transition Director of the Research, Development and Engineering Command (RDECOM), was recently asked a series of questions regarding this new command. The questions and his responses follow.

What is the goal of RDECOM?

The overall goal and core mission of RDECOM is to field the right equipment to our soldiers in the shortest time possible. RDECOM is restructuring the Army's research and development (R&D) and science and technology communities under one umbrella organization. This will significantly streamline efforts, enabling us to rapidly integrate, mature, demonstrate, and deploy emerging technologies.

We have an extremely talented pool of researchers, engineers, and scientists who work hard each day to identify and develop the critical technologies that our soldiers need. RDECOM will facilitate increased opportunities for collaboration and partnership so that its staff can work to tackle problems as a team. We want to break down the stovepipes and bottlenecks so that our technological innovations can reach soldiers more quickly. To do this, we must have the agility to rapidly take advantage of technology opportunities whenever they arise. Thus, RDECOM will capitalize on emerging technologies and existing expertise to get technology in the hands of our soldiers faster.

What is your role as Transition Director?

As Transition Director, I am responsible for leading the planning process for the establishment of the new command. I am excited about my new role and have a strong commitment to seeing this command reach its vision to field technologies that sustain the Army as the premier land force in the world.

I also lead the RDECOM Transition Team, and we are completing several actions to bring the command online. In fact, we have accomplished a great deal since the transition team was established in July 2002. The Provisional RDECOM was established in October 2002. At the same time, the Army Research Laboratory (ARL) and Army Materiel Systems Analysis Activity (AMSAA) became the first organizations officially assigned to the command. In November 2002, we completed an Agreement in Principle for a joint relationship between AMC, the Army Test and Evaluation Command (ATEC), and the U.S. Army Training and Doctrine Command (TRADOC).

How will the command be organized?

Similar to the Army Soldier and Biological Chemical Command, RDECOM will operate under a board of directors. The board membership will include the technical directors, who oversee each organizational element of the command, as well as the commanding general and deputy commanding general (DCG). We will have open sessions to provide staff and other stakeholders the opportunity to share their ideas and technology solutions. There will also be closed sessions where we handle some of the tough actions that must be addressed as a large command.

The RDECOM DCG will be responsible for overseeing "systems-of-systems" integration and will have charge of the Agile Development Center that will be located at Fort Belvoir, VA.

How will the Agile Development Center support the command's mission?

Although located in theory at Fort Belvoir, the Agile Development Center, or "skunk works," is not a *place*. Most people think it will be a place where you can bend metal, fabricate, or put things together. Those actually exist at all the research, development and engineering centers (RDECs) in one way or another. So, the question is not, "Where are you going to bend metal?" If we're going to be agile, we've got to pull the right minds and the right intellectual power together from the beginning. Then, we can turn to the most appropriate integration facility to build it.

What is the concept behind the capability managers and technology integrators?

The board of directors will select capability managers and technology integrators from within the com-

mand to serve 2-year terms. Capability managers will be responsible for ensuring that our R&D efforts are focused on providing capabilities for soldiers. Technology integrators will work with each RDECOM element to facilitate seamless integration of technology.

We are primarily establishing this command as horizontal integration in the systems-of-systems approach. Thus, our focus will be on providing critical capabilities—such as survivability and lethality—that the Army needs to protect our forces. For example, most people think of lethality as missiles and guns because they destroy the enemy on the battlefield or protect the force. Lethality is actually much greater than that and can be measured in many different ways. Speed has a direct impact on lethality, so if you think of it in that context, the capability manager must assess the various elements of lethality, while considering risks and tradeoffs. Technology integrators, on the other hand, are looking at very specific technology and trying to horizontally integrate that technology across the different command areas, whether missiles, artillery, or heavy systems. Technology integration will help us to decrease the time it takes to go from lab to field.

The reason that capability managers and technology integrators serve 2-year appointments is to leverage off of something the military does very well—bringing in fresh ideas and change. One of the ways to do this is to change leadership or responsibility at set intervals. For example, the individual who oversees survivability previously focused only on that specific area. We are now expanding the horizon of that individual greatly by pairing his or her expertise with other subject matter experts to bring the best minds together to solve problems.

What is the management philosophy for RDECOM?

There are many catch phrases you'll hear associated with the new command including knowledge-based management and virtual and collaborative environment. These are more than just buzzwords; they represent in practice how RDECOM will get technology to soldiers faster. These words translate into agility, collaboration, resource leveraging, and innovation.

RDECOM supports knowledge-based management by consistently taking the knowledge it gains and returning it to the organization. When the 2-year terms of the capability managers and technology integrators have ended, they will return to their respective command organization. Meanwhile, new people from within the command step into these roles so that the command benefits from a talented pool of diverse perspectives and expertise.

If we're going to truly be an integrated and collaborative command, we need to provide a central location where our intellectual power can come together. That's why we are creating a virtual and collaborative environment, such as the Agile Development Center. In addition to video teleconferences and dedicated Web sites, we are investigating other virtual working tools. Specifically, we are looking into ways to take advantage of the virtual capabilities of the Program Executive Office, Simulation, Training and Instrumentation (PEO, STRI).

How will RDECOM partner with other organizations such as ATEC and TRADOC?

To ensure seamless integration and coordination, ATEC and TRADOC representatives are invited members of the board of directors.

RDECOM'S COMPOSITION

The following existing RDECs will become part of RDECOM:

- Aviation and Missile RDEC, Redstone Arsenal, Huntsville, AL;
- Armaments RDEC, Picatinny Arsenal, NJ;
- Communications-Electronics RDEC, Fort Monmouth, NJ;
- Tank-automotive and Armaments Command RDEC, Warren, MI;
- Natick Soldier Center, Natick, MA; and
- Edgewood Chemical Biological Center, Aberdeen Proving Ground, MD.

In addition, the following technology-focused organizations will be included in RDECOM:

- ARL Adelphi, MD, and ARL Aberdeen Proving Ground, MD;
- AMSAA, Aberdeen Proving Ground, MD;
- Science and technology portion of Simulation, Training and Instrumentation Command (STRICOM) (now PEO, STRI), Orlando, FL;
- International Cooperative Programs Activity, Alexandria, VA;
- Field Assistance in Science and Technology, Fort Belvoir, VA;
- R&D standardization groups around the world.

Involving ATEC and TRADOC early in the process will result in streamlined decisions about how these partners can support emerging technologies. One of the things that we haven't done well in the recent past is to vest ourselves for success either in combat developments, testing, or science and technology. This is because we tended to work each area separately; each one had a time and a place in which it needed to occur.

The general premise is to give the TRADOC schools and TRADOC headquarters an early opportunity to see emerging technologies, understand them, and start to make decisions on what they must do—not only from a combat development perspective, but also from a requirements perspective. Without knowing what's in the realm of the doable in technology, there's a tendency to write requirements based on a process that states, "If this is what the last piece of equipment required, then the update should be able to do that and more. So that's what I want."

Further, when we develop a technology, we turn it over to the program/project/product managers (PMs) and program executive officers and say, "Here it is, now do something with it." Under RDECOM, we're instead going to work it from a systems-of-systems approach. This means we will say, "We've been working on this technology and evaluated it in some sort of testing protocol. We know that it generally can do what we want it to do. TRADOC has looked at it and determined it meets a future capability. What do you think?" Because the PEO and PM have been involved in R&D early and we've had some upfront testing, they can ask specific questions.

How will RDECOM meet its mission to get technology in the hands of soldiers faster?

We can't wait around for a revolutionary breakthrough to solve what we think is a requirement when, in fact, what we must do is focus on capabilities and assess areas for technology insertions. Some people call it spiral development—to allow us to bring technology in quicker to the soldiers. Our process must allow us to insert technology as it matures so that we can eventually reach 100 percent of the desired result.

If we are going to transform the Army's R&D programs, we must focus our efforts on developing capabilities rather than responding to requirements.

If we are going to transform the Army's R&D programs, we must focus our efforts on developing capabilities rather than responding to requirements. If the capability is survivability, you now have a wide array of "things" that can provide that survivability. And, when you put two technologies together, you should have an increased capability or survivability. Taking this a step further, when you put four, five, or six technologies together, the combination of these results in an overwhelming capability to provide survivability.

Another example of how we can better coordinate our efforts is our air defense systems. In the past, we built air defense systems to shoot helicopters and fast-moving systems out of the sky. Over the years, we continued to build new air defense systems; however, we didn't take into account the capability that we already had in those existing individual systems that could benefit the entire air defense system. This is what RDECOM will facilitate: a systems-of-systems approach to research, development, and testing.

How will the command keep pace with ever-changing technology?

For a long time, we've been told that computer technology is changing every 18 months. If you talk to people in industry, it's changing every 9 months. If you believe that technology changes every 18 months, then what we field for Land Warrior will be five generations behind computer technology. And if you believe it changes every 9 months, it's even more outdated when we field it. So the question is, how do you break that generational gap? How do you get it down to two or three generations? The only way to do that is through the technology insertion process I mentioned earlier. If you go by the standard process we use today, which says you settle on a technology and bring it to development and fielding, then you're always going to be as far behind as we are today. Our people work too hard to see their work deployed after technology has already surpassed it.

What's the timeframe for a fully functional RDECOM?

Currently, the goal is for AMC to issue a permanent order activating RDECOM in October 2003. In the meantime, the transition team is working to establish the Agile Development Center in March. Effective May 1, 2003, the remaining subordinate elements will be under operational control of the RDECOM. As we move toward fully standing up this command, the transition team and I remain committed to making this a smooth transition.

SYSTEMS-OF-SYSTEMS INTEGRATION AT RDECOM (PROVISIONAL)

BG Charles A. Cartwright and Dr. Paul E. Ehle

Introduction

Systems-of-systems integration (SOSI) is the Research, Development and Engineering Command's (RDECOM's) "nerve center" for technical integration and synchronization. Its systems-of-systems perspective helps ensure that properly balanced trade-offs are made across individual systems and technologies. Thus, overall integrated systems are optimized for performance within cost and schedule constraints. This perspective, when combined with effective and efficient technology identification, exploration, development, test, and analysis processes, will expedite the transition of technology to the soldier. SOSI ensures that Army Materiel Command (AMC)-sponsored technology is relevant, timely, affordable, and of the highest caliber. SOSI also ensures that technology is impartially evaluated and coordinated and that it is the best obtainable from industry, academia, in-house, other government agencies, and international sources.

The Modeling Architecture for Technology and Research Experimentation (MATREX) will reach across all labs within RDECOM to ensure that the necessary architecture is in place to facilitate modeling and simulation experimentation and improved interoperability with the Future Combat Systems Lead Systems Integrator, the Army Test and Evaluation Command (ATEC), and Training and Doctrine Command.

To ensure that gaps in capability or technology areas are aligned with Army goals, SOSI is concentrating on a portfolio management approach integrating activities across individual and grouped science and technology objectives and advanced technology demonstrations. Consideration and integration of technologies outside Army labs will include foreign markets, other Services, other government agencies, academia, and industry. Advanced state-of-the-art manufacturing technologies required to produce Army systems will be included in the Manufacturing Technology Program.

IPTs

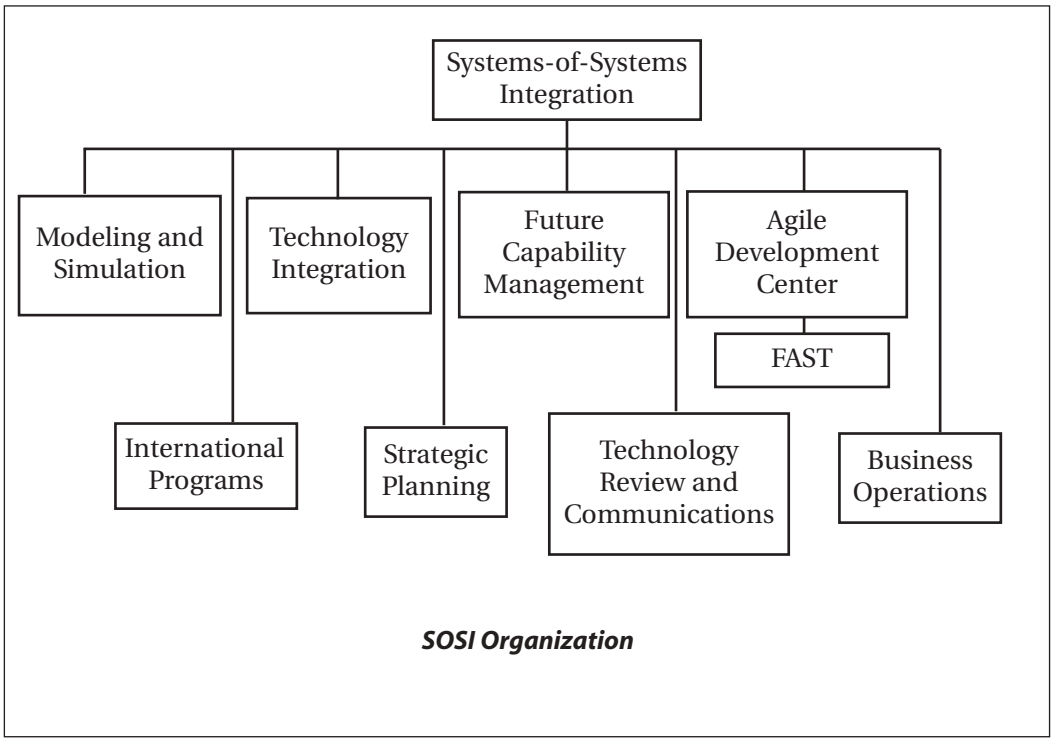
Through the use of integrated product teams (IPTs) for capability management and technology integration, the command will build portfolios of science and technology (S&T) programs. Current capability management IPTs are survivability, supportability and maneuver sustainment, and lethality. Current technology integration IPTs are robotics, and power and energy. Other IPTs will be established to support the U.S. Army Training and Doctrine Command's (TRADOC's) key operational capabilities (aka "chunks"), providing technical focus on the development of Future Combat Systems and the Objective Force.

The Agile Development Center (ADC), an activity within SOSI, expedites technology delivery to priority users. ADC links scientists and developers to field operators from the Army, joint, or interagency communities when a solution is needed quickly. It does not duplicate the activities of the innovation centers in the laboratories, but seeks to accelerate the delivery of products and prototypes requiring limited additional development. Operating with a sense of urgency, ADC recognizes that a soldier who needs help today often prefers a 70-percent, or even a 50-percent, solution delivered tomorrow over a 100-percent solution promised in the distant future.

ADC's efforts support the warfighter. Liaison elements deploy with Army forces on operational deployments to better understand the commander's current operational needs, priorities, and concerns. ADC includes the AMC Field Assistance in Science and Technology (FAST) office, which positions Army science advisors with each of the regional combatant commanders and the Army's major commands. These advisors serve as a two-way bridge between the research and development community and the field commands. These liaison elements and science advisors deployed in support of Operation Iraqi Freedom to shorten the time between the identification of operational needs and delivery of technical solutions from the laboratory.

Partnerships

In foreign markets, "technology mining" will be used to identify new and cutting-edge technologies in both the industry and academic



SOSI Organization

arenas. Primary emphasis will be on finding the elusive technology that will bring a major breakthrough in military application. Additionally, interface with the Office of the Deputy Assistant Secretary of the Army for Defense Exports and Cooperation is significantly enhanced by having a direct link into RDECOM through SOSI.

SOSI strategic planning will include partnerships with DOD organizations, industry, academia, other Services, and other government agencies. Initial partnering agreements are in progress with ATEC; TRADOC; and Sandia, Oak Ridge, and Lawrence Livermore National Labs.

Outreach efforts are being made with historically black colleges and universities and minority institutions to encourage students with appropriate educational backgrounds to work for the Army after graduation. This activity will be part of SOSI efforts to enhance the management of the Army's Engineers and Scientists (Non-Construction) Career Program (CP-16).

The recently introduced *RDECOM Magazine* will provide a forum to introduce and discuss cutting-edge technologies and research that supports operational commands and the warfighter. Feature articles will focus on technology and initiatives to provide desired capabilities for the Future Combat Systems and the Objective Force. The magazine is distributed to senior leaders of Congress, DOD, Department of the Army, and other Services. It is available online at **www.rdecom.army.mil**.

Conclusion

The primary focus of SOSI is to make a significantly more effective, efficient, timely, and productive AMC contribution to the military system acquisition process. This will be accomplished by providing proven mature technology at an accelerated pace within available resources. This process will be significantly enhanced through the use of a collaborative environment, a systems-of-systems perspective, and a clear focus on the Army's Future Combat Systems and Objective Force.

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DR. PAUL E. EHLE is the Principal Deputy for SOSI at RDECOM. He has a bachelor of engineering science degree in mechanics from Johns Hopkins University, a master of science in engineering mechanics from the University of Pennsylvania, and a Ph.D. in mechanical engineering from the University of Iowa. In addition, Ehle is a graduate of the Army War College.

ARL WITHIN THE OBJECTIVE FORCE

Leonard I. Huskey and Allen F. Grum

Introduction

The Army Research Laboratory (ARL) of the Research, Development and Engineering Command (RDECOM) is the Army's corporate basic and applied research laboratory. ARL consists of the Army Research Office (ARO) and six directorates: Weapons and Materials, Sensors and Electron Devices, Human Research and Engineering, Computational and Information Sciences, Vehicle Technology, and Survivability and Lethality Analysis. The Army relies on the ARL team for scientific discoveries, technologic advances, and analyses to provide warfighters with capabilities to succeed on the battlefield.

ARL has a rich history of providing research and technology for the Army. Predecessor organizations were responsible for many significant accomplishments such as the first digital computer, ENIAC (Electrical Numerical Integrator and Computer); the invention of the proximity fuze; and development of the photolithography process for integrated circuits.

Today's Technology

Looking deep inside any system used by today's Army, one can see the results of ARL research. These results include highly lethal kinetic energy ammunition, the most effective advanced armor in the world for the Abrams tank, and the load-bearing pack and the Kevlar helmet for the individual soldier. Most recently, ARL has supported ongoing Army operations with a wide range of rapidly transitioned technologies including language translation, improved face shields, sniper detection, and cave-clearing robotic technologies.

Furthermore, we continue to push the envelope across the full spectrum of science, technology, and analysis for the Army. For example, ARL is providing critical analytic and technical support to the Project Manager (PM), Brigade Combat Team in developing and fielding the Stryker vehicle. ARL's contributions include assessments of Stryker survivability from the full spectrum of battlefield threats, identification of technology insertions for survivability enhancements, human figure modeling to examine C-130 transportability, and human-systems integration assessments.

Warfighter Capabilities

The Army's Future Combat Systems (FCS) will bring unprecedented capabilities to the warfighter. ARL is developing technologies such as active protection against kinetic energy penetrators and lightweight armor/structures to defeat medium caliber threats for integration into the FCS by the U.S. Tank-automotive Research, Development and Engineering Center (RDEC).

In addition to the advent of the FCS will be major enhancements to Land Warrior. For the Objective Force Warrior, ARL materials for new lightweight, flexible body armors and sensors for detection and identification of chemical and biological threats will be provided to the Army Natick Soldier Center.

Future weapon systems being developed by the Armaments RDEC, Picatinny Arsenal, NJ, and the Aviation and Missile RDEC, Redstone Arsenal, AL, will incorporate our technologies for novel lethal mechanisms, advanced energetics and insensitive propellants, smart munitions, directed energy, and electromagnetic guns.

Advanced Sensors And Devices

The next generation of advanced sensors and electronic devices being developed by the Communications-Electronics RDEC, Fort Monmouth, NJ, will be integral to future Army weapons and surveillance and reconnaissance systems. ARL technologies in electro-optics, microwaves, radio frequency (RF), and acoustics will enable that next generation of sensors. Our research in nanotechnology, photonics, and micromechanical devices will allow for that next generation of electronic devices.

The capability of the Army's command, control, communications, computers, and intelligence (C4I) system to provide decision supremacy and enhanced survivability through decisive engagements will be enabled by our technologies for

high-bandwidth communications, advanced battlefield processing and collaboration, microscale weather, battlefield visualization, and defensive information operations.

Other Technologies

Soldier performance will be increased by ARL technologies for enhanced solder perception and cognition, individual and team decision-making, and crew performance in complex task environments.

ARL technologies in machine perception, autonomous tactical behaviors, and soldier-machine interaction will enable unmanned ground vehicles for reconnaissance (increasing the survivability of soldiers) and logistics (unmanned convoys and small-unit mules).

Sustainability is a key consideration for the Objective Force. ARL technologies for active twist rotors will assist the Aviation Missile RDEC in significantly reducing maintenance requirements caused by rotor vibrations. ARL research programs in power and energy impact the Army across the entire spectrum of combat and logistics operations and will provide technologies for innovative vehicle propulsive power and lightweight, reliable, efficient power for the individual soldier.

Experimental Facilities

To execute these programs, ARL operates a unique, unparalleled, aggregate of experimental facilities. Our facilities at Aberdeen Proving Ground (APG), MD, provide laboratory and experimental capabilities for investigations in materials characterization and processing, internal

ballistics, flight motion of projectiles, terminal ballistics, explosive mechanics and blast, and effect of soldier loads on physiologic and cognitive abilities. Our recently completed Tactical Environment Simulator allows us to immerse a soldier into a full audiovisual and pseudo-mobile environment for characterization of the cognitive and sensory perception issues associated with FCS and Land Warrior. Our Adelphi Laboratory Center facilities provide us the ability to deposit, etch, and characterize a wide range of materials through the use of six molecular beam epitaxy systems, a full suite of microanalysis tools, and clean-room space that is populated with the latest in silicon, III-V, and II-VI semiconductor processing equipment. This enables new research into nanoscale devices, microelectromechanical systems for radio frequency and power applications, wide bandgap power electronics, fuel cells, and opto-electronic devices. Experimental facilities at APG and White Sands Missile Range (for acoustic and seismic characterization, missile flight simulation, electronic environment characterization and monitoring), and evaluation of the effects of munitions on aircraft support analyses of the survivability and lethality of Army materiel.

ARL operates one of four DOD High Performance Computing Centers, providing us the ability to perform the massive, highly complex, computationally intense calculations requisite to achieving the Objective Force.

Partnerships

ARL's ability to draw from internal and external sources of diverse and high-quality research talent allows us to fulfill the Army's science and technology (S&T) needs. Our research staff of more than 1,250 research scientists and engineers (more than 32 percent with doctoral degrees) focuses our in-house research on capabilities not available in the private sector. However, researchers at ARL have long recognized that they cannot do it alone.

Through ARO, ARL capitalizes on the research capabilities of academia. The Single Investigator Program, supporting more than 600 academic researchers and 1,500 graduate students per year, provides the venue for innovative explorations along multiple pathways. University Affiliated Research Center initiatives are focused on S&T issues of critical importance. Examples of these include the Institute for Advanced Technology at the University of Texas-Austin, the Institute for Soldier Nanotechnology at the Massachusetts Institute of Technology, and the soon-to-be-established Institute for Biotechnology. ARL also awards DOD Multidisciplinary University Research Initiatives for efforts such as nanoscale scavengers and sensors, learning-based control, and computer infrastructure protection and software.

To fuse the efforts of both academia and industry, ARL's Collaborative Technology Alliances (CTAs) are government, industry, and academic research partnerships focused on Army transformation technologies wherein the expertise resident in the private sector can be leveraged to address key Army challenges. There are five CTAs: power and energy; advanced sensors; communications and networks; advanced decision architectures; and robotics. The alliances include participation from Army RDECs, other Service labs, and other DOD and U.S. government agencies.

We rely on our partnerships with the RDECs to ensure rapid transition of research from the laboratory to the field. Fifty percent of our research programs are focused on near- and mid-term challenges identified by the RDECs. The other 50 percent of our research programs are focused on the Army's long-term scientific challenges—an investment in the future. Our partnerships with the RDECs will be further strengthened and emphasized as RDECOM is fully established.

Conclusion

The Army has embarked on an ambitious transformation journey; ARL is aware of its role in that journey. ARL is committed to delivering scientific discoveries, technologic advances, and analyses to provide warfighters with capabilities to execute full-spectrum operations. The ARL research team, its partnerships and collaborations, its research facilities, and its total commitment to the mission are all focused on delivering the motto emblazoned on our unit crest, "Technology to Win."

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AVIATION AND MISSILE RESEARCH, DEVELOPMENT AND ENGINEERING CENTER

By Dr. Steven Patrick Decland Smith

The Aviation and Missile Research, Development, and Engineering Center (AMRDEC), Redstone Arsenal, AL, brings to the new Research, Development and Engineering Command (RDECOM) a world-class research, development, and engineering center with approximately 2,300 employees, including more than 1,700 scientists and engineers who provide technical services and conduct scientific research and development in disciplines that support AMRDEC customer platforms and weapons systems. AMRDEC's budget is more than $880 million per year. AMRDEC conducts its operations in approximately 1.7 million square feet of facilities with a total investment exceeding $975 million.

AMRDEC employees have embraced the very challenging vision of "*Swift Decisive Victory Without Casualties*," which is based on the precept that combat effectiveness can be increased tremendously by shortening the soldier's engagement cycle, giving the soldier "one shot, one kill" capability, and helping the soldier survive to continue to take the battle to the enemy. AMRDEC primarily focuses on inherently survivable standoff weapon systems that are rapidly deployable, lethal, flexible, sustainable, and affordable. AMRDEC employees build on a well-planned technology base program and have repeatedly proven their abilities by demonstrating affordable solutions to overcome critical technical barriers in customer programs. AMRDEC applies leading-edge expertise to weapon system problems to rapidly develop and transition technology into fielded weapon systems to provide the soldier with the survivability and lethality needed to enable swift, decisive victory while still providing best-value solutions. The center's number one goal is to "exceed the greatest expectation of its customers," and AMRDEC employees are committed to technical excellence and unsurpassed services to provide the best possible weapon systems to their ultimate customer—the U.S. soldier.

A recent major technical accomplishment that illustrates the widening scope of AMRDEC's goal is the integration of a HELLFIRE laser-guided missile with an Air Force Predator unmanned aerial vehicle (UAV). AMRDEC's improvements and modifications give the Predator the capability not only to identify targets of opportunity on the battlefield, but also to engage and destroy these targets in real time. This capability to loiter over a battle area for extended periods of time, allowing man-in-the-loop identification, recognition, and weapon engagement of targets, has given the Predator a new, expanded role, the importance of which has become increasingly evident since the events of September 11, 2001. The nature of the conflict in Afghanistan dictates the need for 24-hour-a-day surveillance and the capability to immediately engage a target of opportunity as it appears with a weapon offering excellent lethality against both hard and soft point targets. The weaponized Predator has proven to be invaluable in achieving destruction of high-value targets while minimizing losses to friendly forces. AMRDEC's Predator/HELLFIRE weaponization program, in partnership with the Program Executive Office, Tactical Missiles, and U.S. Air Force Air Combat Command, has been a model in demonstrating that a fast-track, urgently needed program such as weaponized Predator can be designed, developed, and fielded in less than 5 months after approval.

Continuing critical efforts in unmanned systems development, AMRDEC successfully executed a demonstration with soldier operators of remote "plug and fight" capabilities from an eXperimental Unmanned Ground Vehicle at the Redstone Technical Test Center, Redstone Arsenal, AL; MacGregor Test Range, Fort Bliss, TX; and Fort Knox, KY. The demonstration included remote firings of a suite of light assault weapons, interchanged with the Javelin missile, in conjunction with the operation of a remotely launched UAV. All commands were provided externally. All hardware performed flawlessly, including first round kills against an armored target for the Javelin. Battle damage assessment was provided by the remotely launched and controlled UAV that sent back imagery to the operator stations located in fixed facilities on the range. This demonstration provided key information on the importance of the cooperativeness of unmanned ground vehicles and UAVs and the increased benefits of a lethal payload. This system-of-systems solution concept is a mainstay in the new RDECOM.

Speed of transition from laboratory to field is another goal of RDECOM and AMRDEC's quick development of critical technologies for the modification of the HELLFIRE AGM-114K missile (MOD-K) to meet an urgent operational need for fragmentation lethality against a broad range of targets is an excellent example. The primary urgency was related to global military operations involving the United States. The MOD-K is

an excellent example of AMRDEC transitioning advanced technology to deployment in a very short time at minimal cost. The MOD-K effort, including simulation, design, fabrication, test, and deployment, provided a joint service capability in less than 8 weeks.

The Army identified a requirement for an Advanced Precision Kill Weapon System (APKWS) to fill the weapon gap between the current unguided 2.75-inch rocket system and the HELLFIRE anti-armor missile. AMRDEC's Low Cost Precision Kill (LCPK) 2.75-inch Guided Rocket Advanced Technology Demonstration program has shown key technologies and performance requirements in support of the APKWS by developing and flight testing a low cost, accurate 2.75-inch guided rocket that provides a standoff range surgical strike capability against specified soft point targets. The LCPK guided rocket uses an existing rocket motor that integrates with proven laser and precision guidance technology. The LCPK guided rocket is compatible with existing fielded HELLFIRE laser designators and has demonstrated HELLFIRE-like accuracy in recent flight testing. AMRDEC formally transitioned the LCPK technology and prototype designs to the APKWS program on Dec. 20, 2002, with a successful Milestone B decision to proceed to System Development and Demonstration.

AMRDEC, the only full life-cycle software engineering center in the Army and one of four organizations in the federal government to achieve a Level 4 or greater rating in an assessment of its software engineering processes, joins an elite group of software development organizations worldwide. A Level 4 rating means that the organization's software development process and products are measured and understood quantitatively. Significant quality and productivity improvements have resulted from the utilization of a defined development process. AMRDEC provides software support to most of the Army's major weapon systems in the Army's only facility designed for tactical battlefield automated systems support. The center is an internationally recognized leader in software technology, software development, and software verification and validation.

AMRDEC weaponized the Predator UAV in less than 5 months.

AMRDEC has DOD's best Value Engineering (VE) program with $3 billion in documented cost savings and consistently achieves 70 percent of the Army Materiel Command's total savings and 30 percent of DOD's total savings. AMRDEC's Service Life Prediction Program has achieved over $8 billion in cost avoidance. AMRDEC's Prototype Integration Facility (PIF) is a Government Owned, Government Operated (GOGO) facility/concept concentrated on meeting the rapid response needs of the Research, Development and Engineering Command, DOD, and ultimately the warfighter. Customers buy solutions, not technology; therefore, the GOGO PIF concept focuses on assembling and integrating the necessary government and industry expertise to render a true rapid response.

AMRDEC personnel are among the world's premier aviation and missile technologists who have proven their abilities by repeatedly demonstrating affordable solutions to overcome technical barriers in customer programs. Personnel are continually recognized for their achievements. Recent individual awards include the Missile Systems Management Award, the Paul A. Siple Medallion for Scientific Achievement, the Technology Transfer Excellence Award, several Presidential Rank Meritorious Executive Award Winners, the Tibbetts Award, and numerous Research and Development Awards. In the past 13 years, AMRDEC has received 9 DOD VE Best Field Command Awards, 8 DOD VE Professional Awards, and 5 DOD Best Individual/Team Awards. AMRDEC personnel and programs continue to enjoy the commendation and recognition from elite groups and societies worldwide.

The greatest change in the Army's posture since the end of the Cold War is the transition from a heavily forward-based force to a primarily CONUS-based force with many notable exceptions (e.g., Bosnia). This transition places a high premium on deployability in a logistically-challenged legacy Army which, because of decades of facing a well-defined threat, is strongly oriented toward heavy forces. AMRDEC employees are focused on making the pre-eminent warfighting force in the world even more lethal, survivable, flexible, deployable, and affordable while reducing its logistical footprint in response to the Army vision.

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FORT MONMOUTH CONDUCTS C4ISR ON-THE-MOVE DEMONSTRATIONS IN SUPPORT OF OBJECTIVE FORCE TASK FORCE

Bruce A. Testa

On August 17, 2001, Dr. A. Michael Andrews II, Deputy Assistant Secretary for Research and Technology, Office of the Assistant Secretary of the Army for Acquisition, Logistics and Technology, stated, "The Army's transformation to the Objective Force will provide a strategically responsive force that dominates across the full spectrum of operations. The cornerstone of this transformation is our ability to achieve enhanced lethality and survivability through the effective use of command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR) while on the move (OTM). The commander must be supported by robust intelligence, surveillance, reconnaissance, and beyond line-of-sight fires." Andrews directed that the U.S. Army Materiel Command stand up a Special Projects Office at the Communications-Electronics Command (CECOM) Research, Development and Engineering Center (RDEC) to conduct a series of C4ISR technology demonstrations, with the first completed in February 2003, as the capstone scenario.

These demonstrations will illustrate that state-of-the-art, beyond-line-of-sight sensors, weapons, and communications can effectively be integrated into a C4ISR system-of-systems, capable of supporting the successful development of the Army's Future Combat Systems (FCS). Included in these technologies are a variety of science and technology (S&T), program manager (PM), Defense Advanced Research Projects Agency, and commercial systems. In response to this direction, the RDEC authorized the Special Projects Office to establish a C4ISR laboratory and testbed to perform a series of on-the-move vignettes in a relevant field environment. Fort Dix, NJ, with a maneuver area of 30 by 40 kilometers, was selected for the field maneuver area.

GIC Sets Up Laboratory

The Government Integration Center (GIC) at Fort Monmouth, NJ, was established to provide laboratory facilities for hardware and software integration, worldwide communications, and laboratory testing. To facilitate the migration of technologies from the lab to the field, as well as provide mechanisms for a distributed laboratory structure, the testbed at Fort Dix and the GIC were connected on a high-bandwidth data network. The demonstration area at Fort Dix also uses a high-bandwidth connection to Fort Belvoir for video teleconferencing applications and data exchanges.

Further, this effort provides a common venue for the FCS Lead Systems Integrator, U.S. Army Training and Doctrine Command (TRADOC), and the FCS program management team to evaluate emerging tactics, techniques, and procedures (TTPs); develop baseline C4ISR architectures; and reduce risk during the acquisition process with "in-the-mud" evaluations. The scenario developed for the first demonstration is separated into a series of 22 vignettes. There are four primary vignette categories:

The Army's transformation to the Objective Force will provide a strategically responsive force that dominates across the full spectrum of operations. The cornerstone of this transformation is our ability to achieve enhanced lethality and survivability through the effective use of command, control, communications, computers, intelligence, surveillance, and reconnaissance while on the move.

–Dr. A. Michael Andrews II
Deputy Assistant Secretary for Research and Technology
OASAALT

command and control, communications, sensors, and fusion.

Command And Control

The command and control vignettes focus on mission collaboration and rehearsal, and information management across echelons. They examine the physical and cognitive impact of conducting complex, highly automated command and control (C2) functions while OTM and the ability to enable significant enhancements in force synchronization through collaborative planning and execution. They will also examine C2 requirements for controlling and tasking unmanned ground vehicles, hunters, and killers in a networked environment.

Communication

The communication vignettes examine how well a multitier communications network supports the ability to sustain continuous connectivity—stationary and OTM—over varying terrain conditions. They also examine OTM high-bandwidth range extension, OTM satellite communication reachback, scalable mobile network, quality of service resource management, and admission control function in heterogeneous ad hoc wireless networks.

Sensors

The sensor vignettes examine sensors and sensor groupings required to provide levels of convergence (timeliness, target type, and environment) adequate to support the levels of lethality and survivability the FCS requires. Specifically, the ability to execute the commander's tasking; detect, identify, and track targets; and operate at extended ranges will be examined. Sensors participating in the first demonstration include tactical unmanned aerial vehicle (TUAV) countermine, unattended ground sensor, ground-based signals intelligence, TUAV electro-optical/infrared, and synthetic aperture radar/moving target indicator/tracking systems.

Fusion

The objective of the fusion vignette is to examine, quantify, and qualify the impact of semiautomated fusion architecture on the accuracy, deconfliction, completeness, timeliness, and reliability of an FCS unit of action (UA) common operational picture (COP). Specifically, it measures to what extent a fused UA COP provides continuous situation awareness of unfriendly targets over a specified range within a specified time. Measures of effectiveness include classification, deconfliction and completeness, timeliness, targeting accuracy, and reliability.

Conclusion

In summary, these series of demonstrations are crucial to developing the Army FCS C4ISR baseline architectures in support of the Objective Force. It is the only viable alternative to conducting C4ISR hardware demonstration prior to Milestone B and is significant as it allows TRADOC to evaluate TTP, PMs to reduce acquisition risks, and the S&T community to insert technology during the spiral development and acquisition processes.

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RDECOM'S EDGEWOOD CHEMICAL BIOLOGICAL CENTER

Timothy Lavery, Susan K. Luckan, and Joseph H. (Jim) Zarzycki

Introduction

As the threat of chemical and biological (CB) weapons grows ever more ominous for the United States and its allies, the Edgewood Chemical Biological Center's (ECBC's) contributions to the defense of our national interests becomes ever more crucial. ECBC, located at the Edgewood Area of Aberdeen Proving Ground (APG), MD, focuses its work around core competencies in biology and chemistry and plays a unique role among all other research and development (R&D) groups within the Army. Designated as the lead DOD laboratory for nonmedical chemical and biological defense research, ECBC provides integrated CB defense solutions to the Army, the joint Services, civilian first responders, intelligence agencies, and the international CB defense community.

Products for the warfighter remain the top priority for ECBC. With 85 years of experience and its capability to work with actual chemical and biological agents for defense purposes, ECBC is especially able to deliver effective and reliable warfighter products that identify CB agents and protect personnel and equipment from such threats. The organization has long partnered with other Army and joint Service groups to ensure that CB protection and detection measures are incorporated into the early designs of warfighting systems. The Army Materiel Command's new Research, Development and Engineering Command (RDECOM) will facilitate these relationships and encourage integrated capabilities, dual use, and interoperability.

Detection Equipment

ECBC is well known for its contributions to CB agent detection equipment such as the Joint Biological Point Detection System (JBPDS), which is currently in its third generation in 10 years. Each new version has been smaller, lighter, more durable, and more capable—in a word, better. ECBC is now hard at work on the fourth generation of this biotechnology application. From 1996 to 1999, as part of an Army advanced technology demonstration program, ECBC developed a Biological Attack Warning System (BAWS) that became the first successful real-time, lightweight biological alarm system, ultimately earning ECBC the U.S. Army R&D Achievement Award in 2000. By May 2000, the latest evolution of the BAWS was fully integrated into the JBPDS, and by September 2001 it was transitioned to industry and incorporated into the first production JBPDSs.

In response to heightened security following September 11, 2001, ECBC engineers adapted the JPBDS technology suite for use in standard commercial trailers, which were inconspicuously deployed on a very rapid timetable to monitor for biological agents at multiple sensitive locations. These systems have performed around-the-clock aerosol monitoring in the national capital region for more than a year. ECBC provided technical reachback for the response to the anthrax threat, and ECBC personnel also supported monitoring and security operations at the 2002 Winter Olympics in Salt Lake City, UT.

Warfighter Protection Equipment

ECBC is universally recognized for its work in respiratory protection for the warfighter. ECBC continues to lead in technology base activities in design, material, filtration, and test technology to support both fielded and developmental mask systems. Recently, ECBC design and technology development supported full-scale development transition of the Joint Service General Purpose Mask (JSGPM) Program. The JSGPM satisfies all joint Service chemical/biological mask field and combat vehicle applications for the next-generation soldier and is significantly influencing future civilian respiratory protection systems. In addition, performance and test criteria developed at ECBC have been used to create national standards for the National Institutes of Occupational Safety and Health and the National Institute of Standards and Technology for evaluation of first responder equipment.

Decontamination, important for returning equipment and territory to usability following an attack, is another focus of ECBC work. The Advanced Catalytic Enzyme System is a nontoxic, noncorrosive, nonflammable, lightweight, environmentally safe enzyme-based decontamination system for chemical and biological threat agents. Decon Green, another new ECBC product, is a simple solution composed of common high-volume commercial chemicals that affords broad-spectrum decontamination of CB warfare agents. Both new technologies reduce the logistical burden and can be transitioned to civilian production and use.

ECBC also provides life-cycle development of survivability-increasing obscurants and nonlethal

weapons exclusively for the Army. The goal of the Smoke and Target Defeat Technology Area is to develop and improve smoke and obscurant, nonlethal, and incendiary technologies that provide effective, affordable, and efficient crowd control; screening of deployed forces from threat force surveillance sensors; and effective defeat of target acquisition devices, missile guidance, and directed energy weapons.

ECBC personnel conduct Bio Safety Hazard Level 3 work to further the U.S. Army's biological agent decontamination capabilities.

International Services

ECBC provides extensive cooperative and international services in the CB arena. Since the end of the 1973 Arab-Israeli War, when the sophistication of Soviet CB defense equipment was illustrated, ECBC has conducted an almost continuous series of evaluations of foreign nuclear, biological, and chemical (NBC) defense and obscuration equipment. ECBC has assembled a team of NBC defense equipment experts to work with the U.S. Central Command (CENTCOM) in a cooperative defense initiative (CDI) against weapons of mass destruction with the Ministries of Defense from a number of nations in the Middle East. The team tests, inspects, and reports the readiness condition of the participating nation's detection, protection, and decontamination equipment. CENTCOM and the CDI nations use this information to improve NBC defense postures.

Following Operation Desert Storm and continuing today, ECBC personnel directly support U.N. weapons inspections in Iraq by performing forensic sampling, assessment, and destruction of Iraq's weapons of mass destruction facilities and weapons. The CB Services element of ECBC continues to provide training and expertise to the United Nations and other allies in the war on terrorism. ECBC also plays a significant role in characterizing and testing chemical and biological substances that the intelligence community identifies as potential CB agents. In addition, ECBC leverages its capabilities and experience through many international partnerships, forging valuable links within the small community of CB defense laboratories worldwide.

Homeland Security Initiatives

On the home front, ECBC was named in the 1996 Nunn-Lugar-Domenici Domestic Preparedness legislation to lead a nationwide training and testing program for first responders to improve readiness for handling incidents involving chemical, biological, and radiological weapons of mass destruction. More than 27,000 first responders in approximately 100 of the Nation's largest cities received training from ECBC personnel. Today, ECBC continues to support homeland security through a variety of avenues with other branches of military, government agencies, and private entities.

Conclusion

ECBC, with its unique capabilities and critical mission, plays a broad yet specific role within RDECOM, the Army, and the joint Services. Armed with nearly a century of hands-on CB defense expertise, ECBC looks forward to ensuring even greater ground-floor integration of detection, protection, and decontamination technologies in warfighter products.

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U.S. ARMY NATICK SOLDIER CENTER: DOING SOMETHING FOR THE SOLDIER EVERY DAY

Dianne St. Jean

Introduction

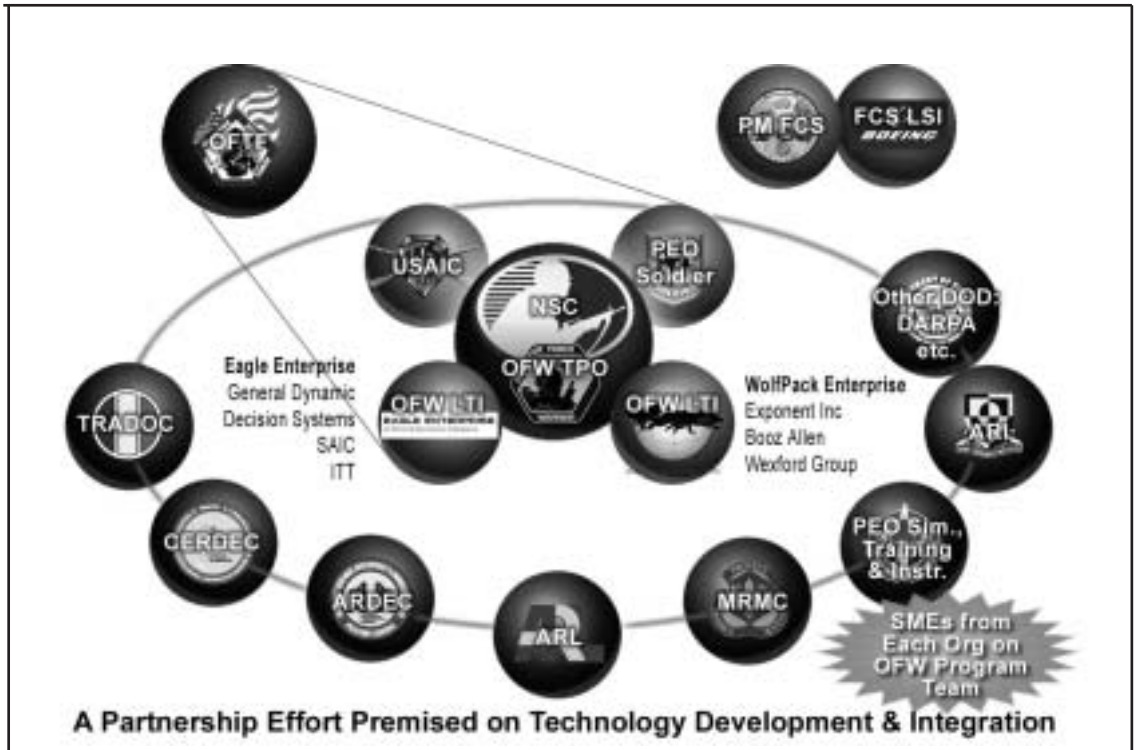
The Natick Soldier Center (NSC), located at the U.S. Army Soldier Systems Center in Natick, MA, is the Army Materiel Command's (AMC's) research, development and engineering center dedicated to maximizing the soldier's survivability, sustainability, mobility, combat effectiveness, and quality of life by treating the soldier as a system. As such, NSC is responsible for a full spectrum of soldier and soldier support research and development (R&D), including combat rations and field feeding, aerial delivery, personnel parachutes, individual and collective protection, clothing and individual equipment, shelters, and organizational equipment.

Situated near the Army's birthplace, NSC is also the birthplace of the soldier-as-a-system concept. NSC's focus has always been soldier-centric, from its early manifestation in the Soldier Integrated Protective Ensemble Advanced Technology Demonstration (ATD), through transition to the PM-managed Land Warrior (LW) Program, to the current Objective Force Warrior (OFW) ATD supporting the Army's transformation to the Objective Force. In addition, NSC's precision airdrop technology program will provide critical technologies and the initial system integration necessary for the Precision, Extended Glide Airdrop System, a cornerstone of the Army's logistics transformation strategy. Essentially, everything the soldier wears, carries, or consumes is either designed, developed, or integrated at NSC.

Technology Integration

One of the key tenets of AMC's new Research, Development and Engineering Command (RDECOM) is integration. NSC leads or co-leads numerous forums to ensure integration of R&D across the full spectrum of activities. For example, NSC chairs the Office of the Secretary of Defense (OSD)-chartered Warrior Systems Technology Base Executive Steering Committee; the OSD TARA (Technology Area Review and Assessment) Protection, Sustainment, and Physical Performance technology subarea; leads the Joint Committee on Tactical Shelters as Executive Secretary; and co-chairs the Joint Technical Airdrop Group. Two areas where technology integration is of significant importance are the DOD Combat Feeding Program and the OFW ATD. The Army is the DOD Executive Agent for Combat Feeding and NSC executes the major portion of this responsibility through development of technologies for field food service equipment and combat feeding systems for all Services. In the ration area, NSC has responsibility for the entire life cycle (science and technology (S&T) through supporting Defense Logistics Agency war reserves). An effective leveraging program is in place to include a strong partnership with the Research and Development Associates (R&DA), a trade association of government agencies, academia, and industry. Under this streamlined process, warfighter-suggested ration improvements enter the procurement cycle in only 18 months.

The OFW ATD is the Army's premier S&T program for integration of soldier-system focused technologies. Under NSC leadership, the OFW technical team is comprised of subject matter experts from across the Army S&T community, including most of the other RDECOM elements. (See the illustration on Page 19.) Systems engineering and strategic partnerships are key components of the glue that binds the OFW effort. In addition to the collaboration within the S&T community and with the lead technology integrator (LTI) contractor teams, NSC maintains strong partnerships with the U.S. Army Training and Doctrine Command (TRADOC) and Program Executive Office (PEO), Soldier. TRADOC has participated from the inception of the OFW Program and will, in parallel with NSC LTI support, develop the Operational Requirements Document for the Land Warrior-Advanced Capability (LW-AC). TRADOC's approved Soldier-as-a-System Mission Needs Statement represents a paradigm shift in how the Army manages the soldier as a system. As acquisition partners, NSC and PEO, Soldier have worked diligently to craft a tightly coupled S&T and acquisition strategy to ensure rapid, mature technology transition and insertion to achieve fielding of LW-AC. In fact, the OFW Executive Integrated Product Team is co-chaired by the NSC Director; the Commanding General, U.S. Army Infantry Center and School; and PEO, Soldier. The



ARDEC: Army Armaments Research, Development and Engineering Center
ARI: Army Research Institute
ARL: Army Research Laboratory
CERDEC: Army Communications-Electronics Command Research, Development and Engineering Center
DARPA: Defense Advanced Research Projects Agency
FCS LSI: Future Combat Systems Lead Systems Integrator
MRMC: Army Medical Research and Materiel Command
OFW TPO: Objective Force Warrior Technology Program Office
OFTF: Objective Force Task Force
OFW LTI: Objective Force Warrior Lead Technology Integrator
SME: Subject Matter Expert
USAIC: U.S. Army Infantry Center
TRADOC: Army Training and Doctrine Command

OFW Program is truly a model of extensive horizontal and vertical integration.

Modeling And Simulation

NSC uses modeling and simulation (M&S) analysis throughout its varied commodity areas. M&S is an integral part of NSC's research in areas such as nutritional models for combat rations, parachute systems designs, predictive models for airbeam shelters, and casualty-reduction assessments for soldier protection. To respond to the need for soldier systems analysis and assessment, NSC has transitioned from a collection of individual, threat-based models to an integrated, soldier-centric model called the Integrated Unit Simulation System (IUSS). IUSS allows analysts of the complex interrelationships among soldiers, their equipment, and the battlefield dynamics to assess the effectiveness of our forces based on the contributions of individual soldiers. IUSS supports program managers (PMs) in making informed decisions through the application of Simulation and Modeling for Acquisition, Requirements and Training (SMART) to reduce acquisition time, avoid program costs, reduce program risk, and support development of better soldier systems and individual equipment. In recent years, NSC has worked with industry, academia, and other government and international agencies to integrate intelligent, goal-based behavior in IUSS to better represent dismounted warrior performance, situational awareness, and decisionmaking.

The Need For Speed

Technology integration is all for naught unless the new technology gets into the hands of soldiers as rapidly as possible. NSC efforts in this area range from addressing immediate needs of the current force through quick-reaction programs, partnering with PEOs, PMs, and users to transition mature technologies; and transitioning key technological developments to the commercial sector.

Quick response to combatant commander needs can significantly enhance unit capabilities. During 2002, NSC Large Area Maintenance Shelter technical assistance teams deployed in support of Operation Enduring Freedom for 517 workdays. NSC's command post building blocks, collective protection components, and solar covers were developed and delivered for immediate use by the U.S. Central Command for their deployable command post. Working with PEO, Soldier, NSC also supported a rapid clothing and individual equipment fielding initiative for the 82nd Airborne Division. NSC teams originally developed many of these items for the U.S. Marine Corps and Special Operations Forces (SOF). Through unique partnerships in the Combat Feeding program, the Meal, Ready-to-Eat (MRE) has expanded to 24 different menus with more than 120 new components added during the past 9 years.

Recent NSC developments in conductive (electro) textiles have transitioned to PEO, Soldier, improving integration of electronic subsystems into protective clothing. This same technology development has already found its way into commercial applications. Both Lands' End and Malden Mills Manufacturing Inc. collaborated to use NSC-developed "power-bus" technology for their wireless electric blankets that are now commercially available.

Another significant transition success story is the Interceptor Body Armor and Small Arms Protective Insert developed by NSC for the Marine Corps and leveraged by the Army. Through advancement of new, lightweight ceramic composite materials, NSC was successful in achieving a 13-percent weight reduction in the ballistic vest and more than 40-percent weight reduction in the ballistic insert. This was accomplished without performance degradation and while addressing a new blunt-trauma requirement. In conjunction, NSC successfully executed a manufacturing technology program that evaluated the different ballistic plate materials and manufacturing processes. This resulted in a technology that is not only mass producible, but reduces the cost by 25 percent. Undoubtedly, the most meaningful result is the soldiers' lives saved by this technology advancement. As the Under Secretary of Defense for Acquisition, Technology, and Logistics E.C. "Pete" Aldridge noted, "Every bullet deflected by advanced body armor represents a visit not paid to a spouse or parent by a military chaplain."

Workforce Rejuvenation

NSC's mission requires broad but unique disciplines—from food and textile technology, aeronautical engineering, and rigging to anthropology, biomechanics, and human factors engineering. Career development is an NSC priority as evidenced by the fact that about half of the scientific and engineering workforce has advanced degrees and 90 percent of the acquisition workforce has at least one certification. Many have double and triple certifications in multiple acquisition career fields. Targeting the abundance of colleges and universities surrounding Natick, NSC has recently hired more than 61 employees (12 percent of the NSC workforce) in entry-level programs. The average age of these new employees is 26 with a grade point average of 3.3 (compared to the average of 2.4 for interns in the Northeast). Of particular note, 45 percent of the new interns have advanced degrees. They represent the latest in technological skills (e.g., biomechanics, fire science, and nanotechnology) from such institutions as the Massachusetts Institute of Technology (MIT), the University of Massachusetts, and the Worcester Polytechnic Institute. NSC's recruiting success is a significant accomplishment because Massachusetts is one of the country's leading technology states, and the competition for technically trained personnel is particularly intense.

In a unique partnership with the local union and with feedback from employees, NSC is proposing a reinvention laboratory personnel demonstration project to achieve flexible, streamlined merit processes to attract, develop, reward, and retain the most talented and dedicated workforce, which will ensure that NSC, RDECOM, and AMC remain at the forefront of superior technology generation and application.

Conclusion

NSC is positioned to continue to transform itself to meet Army objectives for the future. Acquisition, partnership/relationship, workforce, and organizational transformation are all components of NSC's future direction. But at the heart of it all, NSC will continue to do what has been its hallmark for the past 49 years: *doing something for the soldier EVERY DAY.*

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AMSAA: EXCELLENCE IN ANALYSIS

David J. Shaffer and
Steven H. Kratzmeier

The U.S. Army Materiel Systems Analysis Activity (AMSAA) is the Army's center for systems performance, systems effectiveness, and logistics analyses. Its mission is to conduct responsive and high-quality materiel and logistics systems analyses to support decisionmaking for equipping and sustaining the U.S. Army. AMSAA has a clearly defined vision to be a world-class analytical organization that:

- Is committed to giving the soldier the decisive capability to win across the spectrum of future military operations;
- Provides the analytical expertise to help guide the Army in selecting, acquiring, fielding, and sustaining new technologies; and
- Develops the analytical workforce of the future.

As an element of the newly formed Research, Development and Engineering Command (RDECOM), AMSAA will play an integral role as the RDECOM focuses on "fielding technologies that sustain America's Army as the premier land force in the world."

Measuring Performance

As the Army's center for system level performance and effectiveness, AMSAA has developed methodologies and models to characterize the functionality of the full spectrum of Army materiel systems by accurately predicting critical performance variables, such as weapon accuracy, target acquisition, probability of inflicting catastrophic damage, and system reliability. AMSAA is responsible for the generation and/or certification of these performance and effectiveness measures and ensuring their standard use across major Army and joint studies.

In addition to generating data, AMSAA analyzes the performance and combat effectiveness of conceptual, developmental, and existing systems. AMSAA conducts and supports analyses of alternatives, system cost/performance tradeoffs, early technology tradeoffs, weapons mix analyses, and requirements analyses. These analyses are used by Army and DOD decisionmakers to support research, development, procurement, and logistics decisions with the goal of providing quality equipment to soldiers.

Analytical Complexity

As the technical complexity of materiel systems increases and focus is placed on system-of-systems concepts, the analytical workload increases and makes systems performance and effectiveness analyses more difficult to conduct. AMSAA has aggressively pursued improvements to analytical tools and processes to conduct or support analyses addressing organizational and operational concepts, materiel requirements, materiel solutions, affordability, and investment priorities of the Stryker Brigade, Future Combat Systems, and Objective Force. Examples of efforts initiated are sensor/data fusion methodology, nonlethal weapons system performance methodology, system level active protection model, dismounted infantry modeling in military

AMSAA plays a critical role in logistics transformation initiatives, such as Logistics Modernization Program, National Maintenance Program, and Single Stock Fund.

AMSAA has critical integrated analysis capabilities.

operations in urban terrain, and system-of-systems methodology development.

As a result of its materiel system analysis mission, AMSAA is the Chair of the Joint Technical Coordinating Group for Munitions Effectiveness (JTCG/ME), which develops munitions effectiveness information (Joint Munitions Effectiveness Manuals or JMEMs) for operational commanders, weapon system designers, logisticians, and DOD targeteers, weaponeers, and planners. JMEMs are the sole source for joint Service authenticated non-nuclear weapons effectiveness data for DOD. JTCG/ME ensures standardization and improvement of the databases and methodologies in target vulnerability, delivery accuracy, weapons characteristics, and determination of non-nuclear weapons effects.

Logistics Analysis

AMSAA's logistics analysis expertise encompasses the range of Army needs, from the development and refinement of new logistics models to the analysis of innovative or modified logistics concepts. AMSAA conducts in-depth inventory analyses at all echelons of the Army support structure including inventory analysis, situational analysis to determine root causes of supply chain problems, and

The electronic and mechanical Physics of Failure Program pioneered the development of design and analysis tools to predict reliability and minimize potential redesign at the component level.

optimization management models. In-house models and methodologies are used to support acquisition logistics requirements, such as determining initial provisioning packages meeting readiness performance goals at the least possible cost, determining optimal mix of contractor and organic maintenance support, recommending cost-effective levels of repair for subsystems and components of new systems, and analyzing current levels of repair to determine if changes are warranted. Also, AMSAA is heavily engaged in the Army planning process for sustaining our forces across the full range of operations by developing Supply Class IX spare part requirements addressing the inventory augmentation for Army units that deploy. Requirements are computed to achieve readiness targets based on unit demand history and expected increases in operational tempo.

AMSAA is the Army's executive agent for the Sample Data Collection and Field Exercise Data Collection programs providing quantitative and qualitative operational maintenance, manpower, reliability, and logistical support data for fielded materiel systems. These data are the foundation of critical information provided to warfighting units and many of the logistics analyses being conducted for senior Army leadership. AMSAA plays a critical role in logistics transformation initiatives, such as Logistics Modernization Program, National Maintenance Program, and Single Stock Fund. AMSAA develops and analyzes inventory decision support systems, conducts cost benefit analyses of supply chain operations, and evaluates new forecasting techniques. AMSAA's support is integral to realizing significant logistics improvements, including increased flexibility, responsiveness to the customer, reduction in the generation of excess, and providing the best mix of supplies in a timely manner.

Reliability And Maintainability

AMSAA uses its expertise in reliability, availability, and maintainability to develop methodologies and conduct a range of analyses across the Army. AMSAA serves as the Army's Executive Agent for reliability and maintainability standardization improvement by developing and implementing related acquisition excellence initiatives. AMSAA develops and applies reliability engineering approaches that assess the reliability of Army materiel and recommends ways to reduce life-cycle costs. The electronic and mechanical Physics of Failure (PoF) Program pioneered the development of design and analysis tools to predict reliability and minimize potential redesign at the component level. PoF is based on the fundamental principle that it is not only important to understand, prior to "system build," how things work, but equally important to understand how things can fail in their intended operational environments. These types of detailed analyses are critical in the design of systems that have led to extended failure-free periods for Army systems, thereby reducing the logistics footprint and decreasing the time required to deploy Army equipment.

The interdependent core analytical capabilities of AMSAA are unique in both breadth and depth across the life cycle of Army materiel. AMSAA is a key independent and objective "analytical arm" of Army leadership. It provides critical information as acquisition, logistics,and technology decisions are made—ensuring that soldiers get the right equipment to win across the spectrum of all future military operations.

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TARDEC TECHNOLOGIES: SPEARHEADING THE TRANSFORMATION

"The Soldier Is The Focus Of Everything We Do"

Paul D. Mehney and Rae A. Higgins

Introduction

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

TARDEC's Mission

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

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

Advanced Collaborative Environments Lab

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

A first of its kind in the Army materiel development community, ACE offers materiel and combat developers marked advantages over traditional vehicle development methods. Stakeholders need not wait for hardware to take an active role in development—they are an integral part of the process from the outset. Warfighters take a direct, active role in fielding a quality system, thereby maximizing operational effectiveness. Stakeholders form a consensus more quickly, clearly pinpointing issues that must be resolved before production. Subject matter expert involvement (safety, training, test and evaluation, maintenance, transportation, etc.) is exponentially increased for those who might only have PowerPoint-briefing access to information until hardware prototypes are built. ACE transcends stovepipes to identify and resolve system issues early and, in so doing, the Army decreases development timelines and life-cycle costs.

TARDEC's Transformation Role

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

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

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

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

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

Objective Force development does not stop with vehicle systems. TARDEC's petroleum and water business area is responsible for researching Army petroleum products including durability testing of biodegradable hydraulic fluids and grease as well as for advances in water purification and generation methods. TARDEC's water labs, working with industry partners, are exploring water-generation methods from nontraditional sources. Currently in testing is a revolutionary system that generates and purifies potable drinking water derived from vehicle exhaust. For the individual soldier, the lab is overseeing field trials of a small penlike water purification system that generates mixed oxidant disinfectant, which can purify between 150 and 300 liters of water. A soldier will be able to carry this technology, allowing water purification from a local source. Commenting on the importance of these initiatives McClelland stated, "These types of programs, during which TARDEC partners with industry, often using off-the-shelf technology, give us the ability to get products to our warfighters faster. They also have direct bearing on the sustainability of

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

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

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

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

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

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

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

Conclusion

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

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ARMAMENT RESEARCH, DEVELOPMENT AND ENGINEERING CENTER

"Providing America Advanced Armaments For Peace And War"

Michael P. Devine and
Anthony J. Sebasto

Introduction

The Armament Research, Development and Engineering Center (ARDEC), headquartered at Picatinny Arsenal, NJ, is sometimes called the Army center for lethality because it is the origin of more than 90 percent of the Army's lethality.

ARDEC's overall mission is to improve fielded items; develop new items; maintain a strong armament technology base in government, industry, and academia; and provide technical support to soldiers in the field. By accomplishing these objectives, ARDEC achieves its vision of "Providing America Advanced Armaments for Peace and War."

ARDEC is an organization whose entire fabric is committed to providing its ultimate customer, the soldier, the most effective products found anywhere in the world. During the past 5 years, ARDEC has received many prestigious national awards for its commitment to service, including the Presidential Award for Quality, two Army Community of Excellence Awards, and several Army Research and Development Organization of the Year Awards.

ARDEC's Transformation Role

ARDEC's efforts are focused on the following 10 major business areas: smart munitions, indirect fire, direct fire, soldier weapons, mines and demolitions, gun propulsion, fuzing and lethal mechanisms, fire control, munitions survivability, and pollution prevention. Typical ARDEC programs exist in each the following phases of the acquisition process: technology base, production, system design and development, and fielded items. With 2,800 associates chiefly situated at 5 different locations throughout the United States, ARDEC employs a talented cadre of scientists, engineers, technicians, and other professionals. This nationally recognized team has focused on the Army Chief of Staff's vision of transforming the Army into a rapidly deployable, agile, versatile, lethal, survivable, and sustainable force.

ARDEC and its Picatinny-based customers are expected to be preeminent providers of life-cycle lethality research, technology development, engineering, and sustainment throughout the transformation period. Their presence is evident in the near-term Interim Force developments and fieldings that are helping the Army achieve a more deployable combat vehicle force. Armaments like the 105mm main gun for

ARDEC is an organization whose entire fabric is committed to providing its ultimate customer, the soldier, the most effective products found anywhere in the world.

the Mobile Gun System and the 120mm mortar system and its current munitions are just a few of Picatinny's commodities that form part of the Interim Force, the U.S. Army's first major step in the transformation process.

ARDEC's accomplishments during the past 5 years include advancement of key armament technologies, type classification of 78 items, and materiel release of 85 others that provided key systems to our fighting forces. Technology advances include nonlethal munitions, a demolition kit for Special Operations Forces, new high-explosive cartridges for the 81mm mortar system, modular artillery propelling charges, a multi-option artillery fuze, electronic time fuzing, insensitive propellants and explosives, and other armaments and munitions.

ARDEC is currently executing 54 advanced technology projects, 61 active small business innovative research projects, 60 products in design and development, 168 products supported in production, 1,386 products supported in the field, and 62 active cooperative research and development agreements with industry. In addition, the center provides simulations, modeling, virtual prototyping, advanced scientific computing, and a wide range of sophisticated engineering services. Among the major programs that ARDEC supports are the Multi-Role Armament System for the Future Combat Systems, objective crew-served weapons and objective individual combat weapons, multi-purpose anti-tank projectiles, advanced explosively formed penetrators, and kinetic energy warheads.

ARDEC's state-of-the-art facilities include the Armament Technology Facility, which brings together small- and cannon-caliber armament system design and validation and testing of the latest technologies. In addition, the Advanced Warhead Development Facility tests and evaluates shaped charge and explosively formed penetrator warheads in a completely contained and highly instrumented environment. Further, its Armaments Software Engineering Center is a life-cycle software engineering center for armament platform and weapon digitization efforts.

Developing Weapons For Homeland Security

Many of the technologies developed by ARDEC support the Army's warfighting capabilities and will be adapted for homeland security needs. Infrared, acoustic, and radar sensors—used singly or in combination—can provide intrusion detection and perimeter security. Multispectral X-ray technology can facilitate real-time inspection of baggage and small crates at security checkpoints. Hyperspectral infrared imaging can detect chemical and biological agents, while Picatinny's improved nonlethal munitions can increase security perimeters by stopping threats at a greater range and incapacitating antagonists if required. High value targets can be protected by layered defenses incorporating acoustic cannons and hypersonic sound devices, while smart audio and video surveillance systems can more effectively control crowds and yield intelligence about hostile threats.

Conclusion

In the future, guns and munitions will continue to become smaller, smarter, and more affordable. In fact, ARDEC is exploring new novel propulsion technologies that enable guns to be more readily integrated on very small robotic platforms weighing less than 6 tons as well as on unmanned aerial vehicles.

ARDEC's mission continues to expand. Thus, it will continue to play a significant role in shaping the future of armaments, particularly as tactical advanced energy weapons systems evolve. Many of these systems are based on directed energy technologies like lasers, high-powered microwaves, acoustics, electronic beams, and plasmas. ARDEC has strong, established partnerships with DOD, the Department of Energy (DOE), and academia, each of which is exploring these same advanced technologies. In partnership with DOE and the Army Research Laboratory, ARDEC is establishing the path that leads to the 2005 to 2015 timeframe for evaluation, development, and fielding of these technologies and their potential application.

In this way, ARDEC continues to accomplish its vision while providing the advanced technologies needed to maintain peace and, if necessary, to defend America at home and throughout the world.

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ECYBERMISSION:

INNOVATIVE WEB-BASED COMPETITION

The U.S. Army, in collaboration with Booz Allen Hamilton, has created an innovative Web site and competition to increase interest among middle-school students in the areas of science, math, and technology. The unique Web-based competition at **eCYBERMISSION.com** encourages students to use science, math, and technology in unlikely ways to solve problems in their community while simultaneously competing for regional and national awards. The site helps students feel successful at solving math, science, and technology problems.

Army leadership has long recognized the importance of science, math, and technology to the Nation's global competitiveness and security. However, interest in these areas among today's youth has been steadily declining. In an effort to reverse this worrisome trend, Army Chief of Staff GEN Eric K. Shinseki asked Dr. A. Michael Andrews II, Deputy Assistant Secretary for Research and Technology, Office of the Assistant Secretary of the Army for Acquisition, Logistics and Technology, to develop a premier competition to engage students who wouldn't normally be interested in these areas. Other motivators for the competition include the Army's strong desire to give something back to the Nation's communities and families and the support that **eCYBERMISSION.com** provides to the President's education initiative.

The first of its kind, eCYBERMISSION's key attraction for middle-school students is that it is entirely Web-based. The eCYBERMISSION Web site is highly interactive and provides student teams with a wealth of resources and support. For example, **CyberGuides** (Army volunteers who provide students online support and motivation) allow students to post questions and seek guidance. Also available on **eCYBERMISSION.com** are fun and exciting features such as **What's News**, which provides students current events in the areas of science and technology, and **Cool Links** to related Web sites.

Ambassadors, who are volunteers from the civilian and military sectors of the Army, are key promotional resources for establishing eCYBERMISSION as a premier science, math, and technology competition. These dedicated individuals visit local schools to promote the competition and describe it to school officials, teachers, and students. Through the efforts of these volunteers, the competition can reach its goal to increase interest and involvement by middle-school students across the Nation in the areas of science, math, and technology.

Since its national launch on Oct. 1, 2002, eCYBERMISSION has rapidly caught the attention of students, teachers, and administrators across the Nation. Seventh- and eighth-grade students in the United States, its territories, and DOD Education Activity public, private, and home schools are eligible to participate in the competition. A total of 903 teams (3,228 students) registered to participate from each of the four competition regions (Northeast, Southeast, Northwest, and Southwest/Pacific).

To participate in eCYBERMISSION, a team of three or four students identifies a community problem related to sports and recreation, arts and entertainment, health and safety, or environmental issues. By focusing on these areas of concern, students realize through self-discovery that science, math, and technology play an important role in their daily lives. Once a problem is identified, team members develop a hypothesis, conduct research and experiments, and prepare their project for submission to **eCYBERMISSION.com**. Professional judges will then review and score team entries and determine regional winners online. First-place regional winning teams are then invited to a National Judging and Educational Event in Washington, D.C., where they present their projects in person to a panel of judges. Both regional and national winning team members receive U.S. Savings Bonds and other exciting prizes. Shinseki will present these awards to the national winning teams May 30, 2003, at the closing ceremony.

Registration for the competition's second year begins in fall 2003. Next year's competition will expand to include sixth-grade students. For more information on eCYBERMISSION, go to **www.ecybermission.com** or contact **missioncontrol@ecybermission.com**. To volunteer for the Ambassador Program, contact **ambassadorprogram@ecybermission.com**.

ARMY MANUFACTURING TECHNOLOGY PROGRAM RESPONDS TO 21ST CENTURY CHALLENGES

Dr. Robert S. Rohde

Introduction

The Army Manufacturing Technology (MANTECH) Program has seen dramatic changes in project selection and technical direction since oversight responsibility was transferred to the Office of the Deputy Assistant Secretary of the Army for Research and Technology (DASA(R&T)) in the mid-1990s. Today, the Army's transformation path to the Future Combat Systems (FCS) and the Objective Force necessitates another shift in how Army MANTECH operates. That shift involves a strategic, top-down approach for defining MANTECH requirements as opposed to the bottom-up methodology used in the past.

The bottom-up methodology was adopted in August 1997 in response to congressional concerns of insufficient investment levels and Office of the Secretary of Defense Technology Area Review and Assessment guidance to focus on larger, higher impact projects. This substantially modified the approach and priorities of the MANTECH Program. (See "A New Approach To The Army Manufacturing Technology Program," *Army RD&A* magazine May-June 1998 and "Army MANTECH Community Recognized At Defense Manufacturing Conference 2001," *Army AL&T* magazine March-April 2002.) Today's accelerated pace of Army transformation requires the science and technology (S&T) base to transition technology with sufficient performance maturity for the program manager (PM) to enter into system development and demonstration with low to medium risk. The S&T response to the Army's accelerated transformation now requires a top-down identification of MANTECH projects to enable the affordable transition of critical technologies into FCS. This change is driven from the very top of the Army, and the Army S&T leadership is responding accordingly and forthrightly.

Addressing Risks

In addition to performance, several other factors must be taken into consideration. While a single demonstrator can achieve the performance required by the user, the PM is faced with delivery of multiple units on a timely basis at an affordable cost. Therefore, there is further inherent risk in manufacturing that must be addressed if the technology is to successfully transition to the FCS PM and enter into system development and demonstration. This requirement has led to a new feature of the revised Army program that is unique in the Services—that is, to meld, where appropriate, both exploratory and advanced development (6.2/6.3) funding with MANTECH (6.7) funding in a single project. Combining these resources enables achievement of both performance goals, as defined by the Technology Readiness Levels, and manufacturing goals, as defined by the descriptors relating to manufacturing. (See Figure 1.) This ensures that technology development achieves the user's needs, is mature enough to meet the PMs' needs, and is manufacturable and affordable in the quantities required to meet fielding goals and timelines. This approach has also required that the research and development and product engineering communities merge.

Assessment Panel

To validate the identification of the most critical areas of investment, the DASA(R&T)/Army Chief Scientist Dr. A. Michael Andrews II commissioned a blue-ribbon Independent Assessment Panel through the National Center for Advanced Technologies (NCAT). The panel identified and evaluated the manufacturing technologies necessary for affordable manufacturing and fielding of the Army's Future Combat Systems and other components to the Objective Force. Herm M. Reininga, Vice President of Operations, Rockwell Collins Inc., chaired the panel.

The panel made the following general suggestions:

- Incorporate manufacturing and affordability issues in advanced concept technology demonstrations (ACTDs), advanced technology demonstrations (ATDs), and other technology development programs;
- Exploit Integrated Product and Process Development in Army and Defense Advanced Research Projects Agency (DARPA) technology development programs; and
- Use manufacturing readiness level descriptors, similar to the currently employed technology readiness levels.

The panel also identified the following specific FCS issues:

- Advanced technologies likely to be critical to the Future Combat Systems Program,
- Capability gaps in the Army's MANTECH Program with regard to those critical technologies,
- An estimate of the funding needed to close the MANTECH capability gaps in a timeframe that was likely to meet the current schedule for FCS development (structured within specific technologies and technology areas), and
- Recognition of the strong relationship between overall FCS Program risk and manufacturing technology resources needed for the FCS Program.

The panel made two recommendations. First, existing requirements, including affordability considerations (especially manufacturing) in Service/DARPA, ACTD, and ATD programs, should be enhanced and

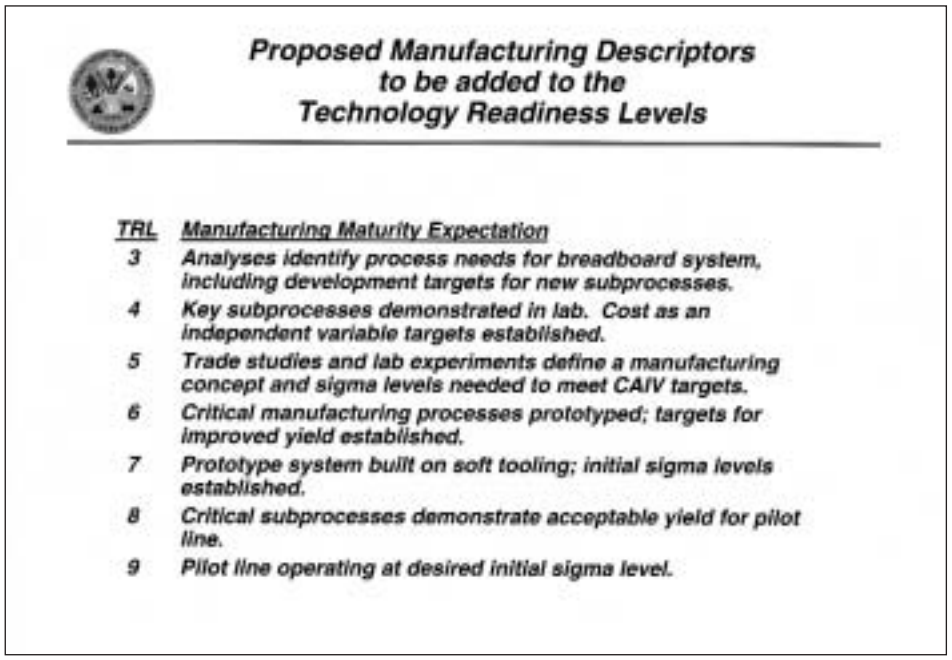


Figure 1.

enforced. Second, ATD and ACTD manufacturing technology issues should be identified so that that they can be effectively addressed, either within the ATD/ACTD or by a separate, coordinated, and focused MANTECH effort.

The panel's final report stated, "The collective experience of the members of the Independent Assessment Panel clearly indicate that the resources (time and funding) devoted to these efforts will be paid back manyfold both during the development of the system (e.g., reduced probability of schedule delays and financial overruns) and especially during their service lives."

As a result of this study, the DASA(R&T) initiated major changes to the Army's MANTECH Program. In the project selection process developed in 1997, Army Materiel Command labs and research, development, and engineering centers provided proposals for MANTECH projects in concert with PMs. Therefore, the Army was not anticipating systemic manufacturing problems that were surfacing either during the engineering and manufacturing development phase, production, or postproduction. The new approach resulting from the NCAT study focuses the MANTECH Program on earlier phases of development prior to handoff of technology to the PM. (See Figure 2.)

The new strategy concentrates the Army MANTECH investments in the following areas. These areas correspond to top priorities recommended by the NCAT panel. The Army is pursuing these technologies within the funded program.

Sensors

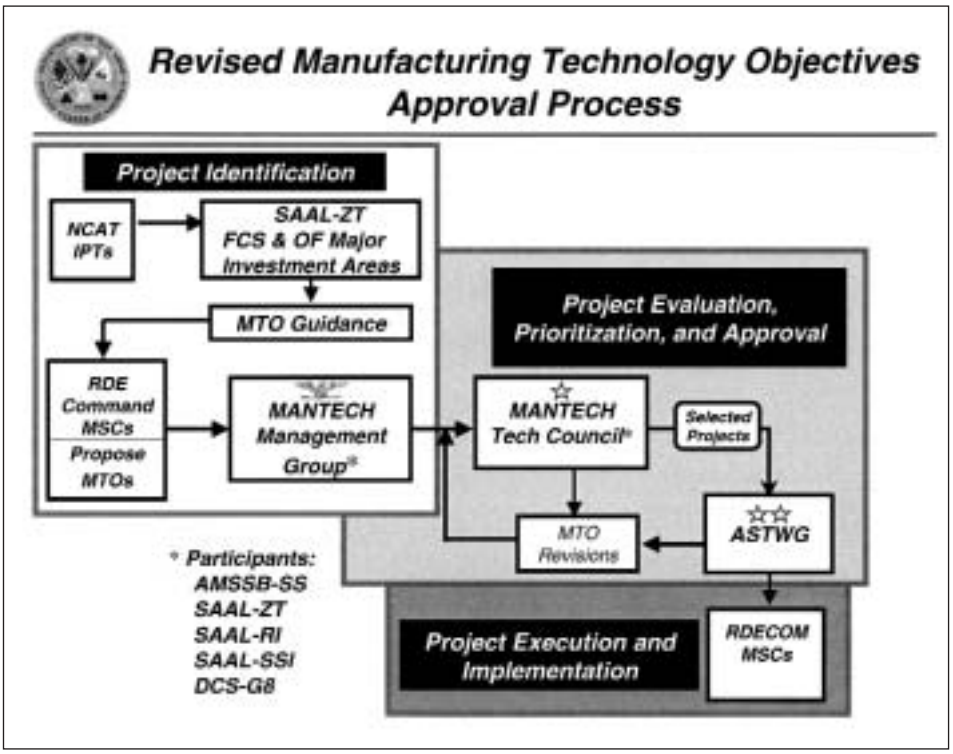
Low-cost uncooled infrared sensors are of paramount importance because of their many uses in seekers and other weapons, target detection and recognition, surveillance, robotic operations, dismounted operations, etc. The Army investment is in cooled dual-band focal plane arrays.

Laser pumping sources are required for solid-state lasers given the applications for solid-state laser radars and high-energy lasers. The Army investment is in laser diode arrays.

Electronics And Power Systems

Pulse power for advanced protection systems and weapons are a critical need for FCS and the Objective Force. Commercially available high voltage, fast rise time capacitors are too large and heavy for Army applications. The Army investment will be in high energy density capacitors.

Compact energy and power storage systems are required for hybrid platforms and for advanced protection systems and weapons. The Army investment will be in very high power lithium-ion batteries.



IPT: Integrated Product Team; MSC: Major Subordinate Command; MTO: Manufacturing Technology Objective; ASTWG: Army Science and Technology Working Group; OF: Objective Force

Figure 2.

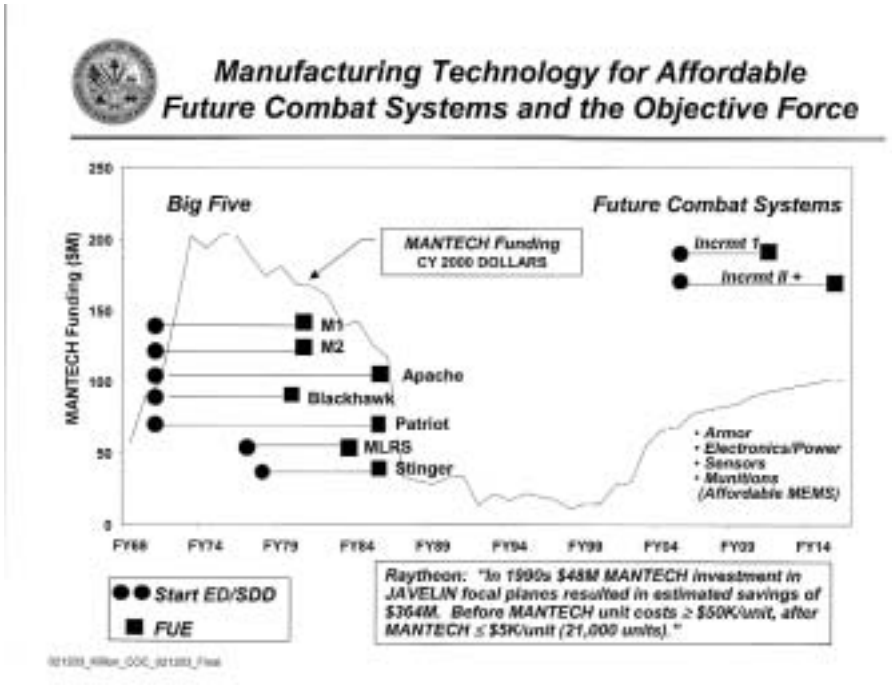


Figure 3.

Pulse power and compact power electronics for advanced vehicles, weapons, and protection systems also require the ability to switch high currents in high-voltage circuitry. The Army investment in this area is in silicon carbide switches.

The Army requires high-data-rate, on-the-move communications to meet the transformation goals of a lighter, faster, more lethal force. Affordable phase arrays provide the means to achieve these requirements. The Army investment is in microelectromechanical systems (MEMS) electronically scanned array antennas and ferroelectric phase shifters for affordable phased arrays.

The Joint Tactical Radio System (JTRS) is aimed at developing lightweight, low power network-centric tactical communications. The Army investment is in wearable software-defined radios that meet size, weight, and power requirements through modularization and the implementation of high-density packaging for embedded applications.

Display technology is particularly important for receiving and visualizing the information now available to the individual soldier. The Army investment is in flexible display technologies (transparent conductive and emissive materials) for soldier applications.

Armor

Affordable lightweight armor for lightweight combat platforms is a critical issue for FCS and the Objective Force. The Army investment in this area is low-cost composites and high-performance appliqué armor.

Signature management and low-observable technologies in all bands of interest are, in the words of the panel, "likely to be critical to the success of the FCS Program." The Army investment is in low-observable materials and structures.

Munitions

The accuracy of cannon-launched projectiles as well as advanced missiles can be significantly improved by the use of advanced guidance systems coupled to global positioning technology. The Army investment is in low-cost, high g-force, high accuracy, MEMS-based inertial measurement units. This was the first program to also combine both S&T development funding with MANTECH funding.

Current funding is not adequate to cover all of the NCAT recommendations, but the Army's MANTECH Program has responded within budget guidance. Manufacturing programs that are currently on the Band 1 Unfunded Requirement List include low-cost uncooled infrared focal planes, conformal optics, 3-D laser radar, energetics (propellants and explosives), durable barrel materials, and MEMS for safety, arm, and fuzing.

What should be the appropriate level of funding per year necessary for MANTECH to properly address FCS and the Objective Force? There are two sources of guidance available to us. During the development of the "big-five" weapon systems in the 1970s and the early 1980s, the Army's MANTECH investment peaked near $200 million per year and was consistently more than $150 million per year for a number of years, declining sharply in the mid- to late-1980s. (See Figure 3.) The NCAT panel also provided us an estimate for funding both Level I and Level II projects of $164 million per year. In the FY04 budget, MANTECH is funded at $66 million, about 40 percent of the NCAT estimate.

Conclusion

Finally, it is important to recognize that MANTECH is an investment for which there is a savings in production cost. There have been a number of studies over the years attempting to quantify this number. Our best estimates, both from industry and government studies suggest a 10-to-1 average return on investment. As stated by Raytheon, "In the 1990s $48 million MANTECH investment in Javelin focal planes resulted in estimated savings of $364 million. Before MANTECH, the unit cost was greater than or equal to $50,000 per unit; after MANTECH it is less than or equal to $5,000 per unit (21,000 units)." Clearly there are potentially significant savings in production cost through strategic MANTECH investments.

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MG William H. Russ, CECOM Commanding General

Reenergizing And Revitalizing . . .

2003 ARMY ACQUISITION WORKFORCE CONFERENCE

Cynthia D. Hermes

Introduction

"Reenergizing and Revitalizing the Army Acquisition and Technology Workforce (A&TWF)" was the theme of this year's Army Acquisition Workforce Conference, held Feb. 11-13, 2003, in Atlantic City, NJ. The event was co-sponsored by the Acquisition Support Center (ASC), Fort Belvoir, VA, and the U.S. Army Communications-Electronics Command (CECOM), Fort Monmouth, NJ. Edward G. Elgart, Acquisition Career Management Advocate (ACMA) and Director, CECOM Acquisition Center, hosted the conference; Kelly L. Terry, Director, Northeast Region, ASC, served as emcee and Janice Kurry, Acquisition Career Manager (ACM), Northeast Region, was chairperson.

CECOM Commanding General MG William H. Russ welcomed participants and urged them to take advantage of this great opportunity to address the many issues confronting today's Army acquisition community. He said that these are challenging times because the operational tempo is tremendous, the threat of terrorism is real, and many Armed Forces personnel (both military and civilian) are now deployed in support of Operation Enduring Freedom. These personnel need the services that members of the acquisition workforce provide them, he said. Given the great challenges and the pressures that we face in today's environment, Russ said, it is imperative to maintain a vital, professional A&TWF, especially as we look to the future.

If the Army is to continue to provide cutting-edge technology and superlative services and systems to its warfighters, it is time to revitalize and reenergize the acquisition workforce. To achieve this, Russ emphasized that we must stay focused on supporting the goals of hiring, training, and sustaining superior personnel. In addition, he affirmed that we must develop a cadre of leaders to ensure that the skills, professionalism, and leadership of the acquisition workforce are honed. Further, Russ reminded attendees to remember that the correct measure of success is in the eye of the customer.

Remaining focused on the long term by creating a professional development strategy will ensure that workforce personnel move toward the future as leaders who will react flexibly, positively, and knowledgeably when unusual situations arise. To accomplish this, we must develop job analysis techniques to help develop the right objective criteria for that broad, flexible leader. Because we have an aging workforce, managers must prepare for succession; however, current workforce members must participate in this succession plan. In addition, career responsibility must be placed on individuals.

COL Mary Fuller, Director, Acquisition Support Center

Now is the time to set the stage, make the decisions, and do the right thing to ensure that the Army is ready for the future, Russ said. And it's time for acquisition professionals to seize the day and channel their skills and energies toward a more efficient operation to provide warfighters the equipment needed to perform their jobs, he added.

ASC Director and Deputy Director, Acquisition Career Management COL Mary Fuller thanked Russ and Elgart for co-sponsoring the conference and Principal Deputy Under Secretary of Defense for Acquisition, Technology, and Logistics Michael W. Wynne and Assistant Secretary of the Army for Acquisition, Logistics and Technology (ASAALT) Claude M. Bolton Jr. for attending. This is the most important conference she has ever hosted, she said, because it provides her the opportunity to touch the acquisition workforce.

According to Fuller, people must make a difference every day, whether personally or professionally. She challenged attendees to leave the workshop

reenergized to make a difference by doing the best job possible.

Fuller also suggested that attendees use the conference to network and discuss the tough issues facing the workforce. She said ASC must be made aware of problems in the field. Although ASC may not be able to immediately solve all the problems, it can at least identify them and put a process in place so they can be solved. The acquisition workforce exists to support the soldier, and she asked attendees to reflect on how they can contribute to the mission of those sent into harm's way. She urged all to stay connected to warfighters, understand their requirements, and fulfill those requirements as quickly as possible.

Featured Speaker

ASAALT Bolton presented the 2002 Acquisition Career Management Advocate of the Year Award to Philip Brandler, U.S. Army Soldier and Biological Chemical Command, Natick, MA. (See related article on Page 41.) Afterward, Bolton discussed how far the Army has come in its transformation, including the Stryker vehicle, Comanche helicopter, and the Future Combat Systems (FCS) programs. He said we must determine how to write requirements and tests for the systems that are the first increment of FCS, whose soldier as a system is the centerpiece.

He touched on a number of topics, including an overview of programs (Stryker and Objective Force and how to proceed), people (key to the Army's success), production (the Defense industrial base—ammunition plants and arsenals), and improvement (the Army Acquisition Workforce Campaign Plan and its objectives, business case analyses, acquisition and logistics excellence, and changes in the way that DOD does business). During a question and answer session, Bolton discussed the activities of the Program Manager (PM) Post Utilization Taskforce and the importance of building the civilian acquisition workforce and grooming individuals to become future leaders.

Claude M. Bolton Jr., ASAALT

Keynote Speaker

Wynne discussed the importance of knowledge sharing and providing a common operating picture. For example, he said, ground soldiers and the pilot flying overhead must both be looking at the same picture—they can't be arguing over symbology. Shared knowledge is the backbone of what the Army is trying to accomplish.

The objective of the next war is to trade the enemy's high-value target without presenting ours, said Wynne. Acquisition professionals must understand this because they are the buyers who ensure that warfighters have what they need. Wynne said that they would really like to empower program managers to "just say no" in terms of requirements. To accomplish this, horizontal communication must take place. For example, a one-star general should not be arguing with a four-star general about requirements. Communication should take place between a four-star general and the four-star general who oversees the one-star.

Wynne said that we must develop individuals capable of managing entire life cycles of systems. He said that transformation is about three things: leadership, systems, and business. In addition, there are actually two customers relative to systems: the warfighter and the logistician/maintainer. By increasing reliability, we make the warfighter our major customer.

The Army must transform the way it does business, Wynne said. For instance, the Defense Acquisition University (DAU) has transformed itself to a virtual university and partnered with universities across America. This allows people entering the workforce to take courses at 50 universities nationwide. Another example of transformed business is having credibly priced programs. The purpose of the change to the DOD 5000 series, he said, is to empower innovation in program managers and contract staff. We are creating incentives to restore systems engineering work because scientists and engineers must get connected. In conclusion, Wynne reminded attendees that they are the Army, and if it doesn't start with them, it doesn't start. He said to take possession of their product acquisition and, more importantly, take advantage of the flexibility the new DOD 5000 offers. Remember, he said, transformation is about leadership first. He then thanked attendees for providing the warfighters the best equipment that the world has ever seen and for the work that they do every day.

Claude M. Bolton Jr. (left), ASAALT, presented the ACMA of the Year award to Philip Brandler, Director of the Natick Soldier Center, SBCCOM; along with COL Mary Fuller, Director, ASC.

ASC Update

An Acquisition Support Center update was provided by Kevin Maisel, Chief of the ASC Career Management Plans, Policy, and Program Development (ACMP3) Division; LTC Edison L. Hammond, Chief of the ASC Force Structures Division; and LTC Peggy R.

Carson, U.S. Total Army Personnel Command's (PERSCOM's) Chief of the Acquisition Management Branch (AMB).

Maisel described ACMP3 initiatives such as human resource strategic planning, the U.S. Army Acquisition Workforce Campaign Plan, the Army Acquisition Qualification Course, the Uniformed Army Scientist Program, and Program Manager Post Utilization. He concluded with a discussion of the challenges ahead for the acquisition workforce.

Hammond outlined the Force Structures Division's mission to provide budget, manpower, and personnel support to program executive offices, acquisition commands, and the Army Contracting Agency. He also discussed the division's core functions such as managing acquisition positions and Army transformation, strategic planning, etc. The bottom line, Hammond said, is to provide customer support to get the right answers to assist the warfighter. ASC's future challenges include increased requirements with reduced assets, Army transformation realignment, Military Acquisition Position List (MAPL) review, and organizational development.

Carson discussed AMB's customer support mission, where AMB fits in the Army chain of command, its key acquisition relationships, and its functions relative to military and civilian personnel.

Luncheon Briefings

The first day's working lunch speaker was Richard K. Sylvester, Deputy Director, Defense Procurement and Acquisition Policy for Acquisition Workforce and Career Management, Office of the Under Secretary of Defense for Acquisition, Technology and Logistics (OUSD(ATL)). He primarily focused on promoting an innovative workforce. He said that the Army is determining which jobs are inherently governmental, and what is the content of those jobs. The Army is also trying to determine how to measure and increase performance. The Army's mission is to have the right people, with the right skills, at the right place, at the right time, and with the right pay. The key to achieving this, he said, is human capital strategic planning. What must the workforce of the future look like, and how are we going to get there? What kind of people and skills are needed in the future? Congress, the

Keynote speaker, Michael Wynne, PDUSD (AT&L)

General Accounting Office (GAO), and science boards are asking these questions. We must find a way to encourage people to do business and create a relationship with us. This will involve sending age-appropriate people to college career fairs and other recruiting events, getting involved with professional societies (i.e., Society of Logistics Engineers and the Project Management Institute), and reaching out to people in industry. We must have a new tagline (along the lines of "Army of One") that our civilian workforce can relate to and understand. We must also take advantage of 21st century technology to recruit and develop intern programs and apprenticeships.

One reason people leave a job is lack of growth or challenging opportunities, Sylvester said. It is necessary, therefore, to establish more Web-based training and learning centers and provide more interesting work, he added. In addition, personnel must be paid based on their work performance, not on their grade level. Paybanding is one practice identified to achieve this goal. He added that a central referral system is being developed to allow people to apply for positions in different geographic locations. Other initiatives include developing a journeyman-level position, creating a government-industry exchange program, and obtaining a better certification process with alternative accreditations. In concluding, he said that supervisors must make each job challenging so their personnel will want to stay.

Day Two

The second day's working luncheon was an open forum with the theme "Ask The ASC Director." Fuller answered a range of questions such as the status of a new AAC patch, ongoing efforts for placing civilians in PM positions, the wisdom of creating a facilities engineering career field, the impact of the third-wave initiative on the AAC, the possibility of creating an additional greening course, continuous learning points, and recruiting young people. More detailed information on the question-and-answer session is located on the ASC Web site at **http://asc.rdaisa.army.mil**.

Workshops

A separate pre-workshop meeting for ACMAs included charter presentations and a discussion on topics such as new career development initiatives, the assimilation process, the need for an A&TWF handbook, clarification of the ACMA role, continuous learning, and AAC membership. The names and organizations of the ACMAs who received charters were Leah Treppel, Program Executive Office (PEO), Simulation, Training, and Instrumentation; Harry Hallock, U.S. Army Tank-automotive and Armaments Command; Elizabeth Wise, PEO, Tactical Missiles; George "Jerry" Orlicki, White Sands Missile Range, NM; Steve Mapley, Operations Support Command; Duane Inoue, Army Contracting Pacific; Gregory Kee, PEO, Enterprise Information Systems; James Wymer, Yuma Proving Ground, AZ; and Beverly Stevens, Army Contracting Agency.

In addition, five select interactive workshops on major topics of interest within the Army acquisition community were conducted. Each workshop is highlighted below. Workshop briefings can be found online at **http://asc.rdaisa.army.mil**.

PM Post Utilization Taskforce. ASC's Kevin Maisel led a workshop focusing on the post utilization of civilian PMs. Civilian applicants are not faring well on PM selection boards. A DA Staff Sensing Session identified root causes for this, such as the lack of a meaningful civilian career model, misunderstanding of the board process among civilians, and quality of applicant Senior Rater Potential Evaluations (SRPEs) and Acquisition Career Record Briefs (ACRBs). Categories noted for action include leadership, career model, PM post utilization,

personnel policy and procedures, training, environment, incentives, and selection boards. Maisel discussed options to resolve the problem of providing follow-on positions at the conclusion of a PM tour. We must have a cultural change before we can successfully mix and match civilian and military counterparts, he said. In addition, the process must recognize and respect civilians in certain PM leadership positions. The AAC is the only area of the Army where military and civilian personnel compete for positions. Beginning in 2004, the Army plans to institute a post utilization policy ensuring that Senior Service College graduates are placed in assignments that are commensurate with their education.

Shaping The Future Workforce. Peggy Mattei, Office of Acquisition Education, Training and Career Development, Defense Procurement and Acquisition Policy, OUSD(ATL), led this workshop, which primarily focused on human capital strategic planning. This planning is comprised of four separate processes: cultural shaping, organizational design, workforce planning, and performance planning. Because people are enablers of transformation, human capital strategic planning is a hot topic in DOD. Its purpose is to identify the types of programs, policies, and systems needed to ensure that the future workforce meets its strategic intent. GAO is pointing other agencies to DOD AT&L for lessons learned in human capital strategic planning. In conclusion, Mattei said that there is no proven method to follow in pursuing this initiative. Human capital strategic planning requires a huge cultural change that requires participation at every level.

ASC—Communicating Openly And Effectively. Larry McDonald, Vice President, BRTRC, opened this workshop, which identified methods of internal and external communication. Participants provided comments and suggestions relative to ASC's outreach activities. Issues discussed included recruitment, eye-catching acquisition logos or mottos, Web page design, mentorship, retention, and analyses of *Army AL&T* magazine and ASC's *The Army Acquisition, Logistics and Technology Workforce Newsletter.*

DAU/Acquisition, Education, Training And Experience Updates. Randy Williams, ASC Career Development Specialist was the facilitator of this workshop, which presented the required tools needed for each phase of career development including planning, execution, and tracking. He emphasized that you are the only one who manages your career. The ACMs can only assist you. He added that the Individual Development Plan is a tool to identify career goals over a 5-year period in the areas of education, training, and developmental experiences. He also talked about how the Army Training Requirements and Resources System (ATRRS) Internet Training Application System (AITAS) is used for the execution phase and ACRBs are used for the tracking phase of career development. Additional topics included continuous learning points and other acquisition education, training and experience opportunities.

Army Acquisition Workforce Campaign Plan. MAJ Marko Nikituk, ASC 51R Proponency Officer, facilitated this workshop to inform participants of the status of strategic objectives and initiatives for developing and sustaining the Army's acquisition workforce. The number one objective of the U.S. Army Acquisition Workforce Campaign Plan is to have a strengthened relationship with the warfighter. The complete campaign plan, with a detailed history and points of contact for individual initiatives, is available on the ASC Web site at **http://asc.rdaisa.army.mil/**.

DACM Address

Army Director of Acquisition Career Management (DACM) LTG John S. Caldwell Jr. was unable to attend the conference; however, COL Fuller spoke on his behalf. She said that Caldwell asked her to thank the workforce for the great job they do every day. Times are tough right now and Caldwell knows he's asking a lot of everyone. Because of his concern about the future of the acquisition workforce, Caldwell developed the idea of the Army Acquisition Campaign Plan and has remained very involved with it. It's an exciting time to be in the acquisition workforce because never before have we seen such a tremendous change—not only in the equipment that we build and field—but in the way we do business. Caldwell remains focused on getting closer to the warfighter. As acquisition career managers, we are responsible for getting people trained, educated, and experienced; but we can't lose sight of the warfighter. Caldwell feels that closer relationships between warfighters and acquisition professionals will make us a stronger Army, facilitate transformation to the Objective Force, and transition to whatever challenge is next. In closing, Fuller said that people are our most important resource. We must take care of that resource, be flexible, be ready to meet the next challenge, and be part of the solution.

Richard K. Sylvester, Deputy Director, Defense Procurement and Acquisition Policy for Acquisition Workforce and Career Management

Conference Wrap-Up

Fuller stated that this conference was the most successful one to date. She urged attendees to return to their commands and reflect on managing expectations, helping ASC set priorities to meet the immediate needs of individuals and the Army, becoming more flexible and changing with the times, and establishing and maintaining positive relationships with warfighters. The bottom line, Fuller said, is that we want everyone in the Department of the Army to be successful—there isn't one person who shouldn't have the opportunity to excel. Finally, she asked participants to be the ones who set the example and continue to be great spokespersons for the acquisition workforce.

CYNTHIA D. HERMES is Managing Editor of Army AL&T magazine. She has more than 20 years of federal government service with both the Army and the Navy.

A PRODUCT ASSURANCE PERSPECTIVE OF ACQUISITION REFORM

Billy D. Glover

Introduction

Major changes in U.S. Army missile programs resulted when acquisition reform (AR) initiatives called for use of performance-based specifications rather than military specifications. In addition, the government role transitioned from one of oversight to one of insight, which was a change from the watchful care of government requirements to that of understanding contractor requirements and operations.

One thing that did not change, however, was the independent role of product assurance (PA) on the Javelin weapon system and the complete support provided by the Project Office management. PA functions—quality control engineering, quality assurance, quality management, reliability/maintainability engineering, and component engineering PA functions—continued to perform as they did before AR, ultimately trying to ensure that soldiers and Marines receive the best possible equipment. This goal was met and is being sustained through a government-contractor team effort involving the Close Combat Missile Systems (CCMS) Project Office; the U.S. Army Aviation and Missile Research, Development and Engineering Center (AMRDEC); the Redstone Technical Test Center; and the U.S. Marine Corps System Command and its technical representatives from the Naval Surface Warfare Center, Dahlgren Division; and the Javelin Joint Venture partners, Raytheon and Lockheed Martin.

Since AR, improved partnerships with the contractor team have helped Javelin meet and maintain reliability and availability requirements that were established for system maturity. As with any weapon system, problems have occurred; however, the product assurance focus is to ensure that factory problems are corrected and not sent to the field.

This article addresses the impact AR has had on the Javelin Program from a PA perspective and also looks at a recent experience with another CCMS program, the Tube-launched, Optically-tracked, Wire-guided (TOW) Improved Target Acquisition System (ITAS). Lessons learned are presented and recommendations made relative to future acquisition excellence efforts.

Background

The contract for the Javelin weapon system is being carried out through a joint venture (JV) consisting of Raytheon and Lockheed Martin personnel. Javelin is in full-rate production (FRP) and is comprised of a round command-launch unit and training devices. When AR was initiated, Javelin had completed the engineering and manufacturing development (EMD) phase and was just beginning low-rate initial production (LRIP). Additionally, Javelin began AR with a PA team strong in government and industry experience, with several team members formally trained in PA disciplines at the Red River Army Depot, Texarkana, TX. A strong components engineering group as well as soldering experts supported the PA efforts. This product assurance team laid a solid PA foundation during EMD and had established a qualified baseline for design and processes.

This qualified baseline documented all product designs, drawings, performance specifications, materials, and processes that were used by each contractor and its suppliers for hardware that successfully completed qualification testing. These were the actual production designs and processes that were then used for manufacture of production hardware.

Following AR and based on the qualified baseline in place, language was incorporated into production contracts to prevent reliability degradations from occurring as the program transitioned to performance specifications from the traditional technical data package. Major PA disciplines established during EMD and in place at the beginning of LRIP were subsequently continued throughout the LRIP phases and into FRP. A closed-loop Failure Reporting, Analysis and Corrective Action System (FRACAS), which was considered paramount to ensuring high reliability for the Javelin, was also continued, as was the use of failure review boards (FRBs). An FRB was required for failures occurring during qualification, flight, and lot-acceptance testing.

The Environmental Stress Screening (ESS) Program, developed to detect latent, intermittent, or incipient failures, was also continued. An agreement between the contractor and the government was and is still required prior to any change to the ESS program. The government and contractor team continued to stress root-cause determinations and the establishment of effective recurrence control actions. These actions (ESS, FRACAS, and FRBs) have proven to be key in keeping Javelin's reliability at desired levels.

Prior to acquisition reform, government PA personnel established contractual data requirements that reported PA status. However, following AR, few contract data requirements were allowed. Subsequently, a teaming relationship between the contractor and the government evolved. Teaming has fostered consensus relating to qualification testing or verification for changes to the established baselines for designs and processes.

One year into AR, several disturbing and unacceptable process-related problems occurred within the Javelin Program. The root cause of these problems was unauthorized process changes to the qualified baseline of JV subcontractors. This violated a contractual JV quality assurance clause to subcontractors concerning process change control. Subsequent production problems led the Javelin Project Office to request that government-led product oriented surveys (POSs) be conducted at prime and subcontractor facilities. Based on the type of problems that were noted during these POSs, the JV PA recognized the need to continue this type of survey with government participation. A process oriented quality audit (POQA) then contractually evolved, and contractor-led teams, with government participation, began to annually audit the prime and subcontractor facilities. A supplier management process survey (SMPS), which incorporated the best of the POS and POQA checklists, resulted.

Acquisition Reform Benefits

FRACAS. Assurance of a closed-loop FRACAS has been a major government PA focus throughout the life of the Javelin. After AR, improved teamwork and communication between government and contractor PA personnel resulted in a mutual desire to drive failures back to the lowest production level. By driving failures to the lowest level (sub-tier suppliers), problems are solved earlier with less rework at the higher levels, thus saving costs. In October 2000, comprehensive FRACAS reviews were conducted at prime and subcontractor facilities to determine the health of each manufacturing system. If problems were found, management commitment was obtained to implement recurrence control actions. Management was informed that no repercussions should result from this type of review because the purpose was solely to improve the system. Subsequently, a FRACAS checklist was developed for contractors to conduct a self-evaluation and assessment of their FRACAS Program prior to a review.

Javelin product assurance personnel were given a complete database of factory failures for evaluation prior to the arrival of the review team. This effort was a direct result of AR and the teaming approach to improve the FRACAS at all production levels. Prior to AR, a complete factory database could not have been obtained as a contract data requirement. Obtaining a complete factory database and comparing field failures to factory failures enables the team to determine the effectiveness of the military ESS.

To date, FRACAS reviews have resulted in significant findings that have led to continuous product improvements. This has resulted in better identification of trends, hardware and test problems, and resolution of failures classified as "cannot verify" (hardware that fails at a higher assembly level and the failure cannot be verified or duplicated at a lower level). The FRACAS reviews have brought about an increased awareness of failures at contractor facilities and have helped drive root-cause evaluations and recurrence control to the supplier level. This is a direct result of AR and demonstrates how government and contractor teamwork improved the FRACAS.

Parts Management. Without AR, the use of plastic encapsulated microcircuits (PEMs) and commercial parts would have probably taken many years for incorporation into missile applications. However, with AR, government and contractor personnel were able to work on integrated product teams to resolve the challenge of using PEMs in missiles. This resulted in a parts management program to ensure that only long-term reliable parts would be used.

A Sequential Environmental Test Program of highly accelerated stress testing and temperature cycling was also developed by AMRDEC component engineers. This testing could be applied at the piece-part, circuit card assembly, or subassembly levels. Subsequently, it was determined that this testing could identify problems for materials and processes as well as for PEMs and hermetically sealed microcircuits. This program is now a standard method of qualification and confidence testing for the Javelin missile and for other Program Executive Office, Tactical Missiles programs. Without government PA participation in this process, a large number of failures could have been passed to the field if the initially recommended PEMs had been used in missile applications without further testing and evaluation.

Initial testing demonstrated that failures as high as 25 to 30 percent could be experienced because of parts problems. Subsequently, testing at all levels identified quality defects applicable to both ceramic and PEMs, which are representative of 2 to 20 percent of the problems that can occur in a lot based on fabrication defects, lack of burn-in, packaging problems, etc. Lessons learned have helped our contractors develop procurement strategies and parts management programs to minimize the impact of parts problems during production.

SMPS Process. Without AR, it is doubtful that an SMPS process could have been developed. Acquisition reform provided the freedom to develop comprehensive and value-added surveys. These contractor-led surveys allowed the contractor and government to gain valuable insight into supplier processes and helped ensure that good hardware is produced. In November 2001, the SMPS concept was applied to the ITAS, except that an "opportunities-for-improvement" format was followed. In lieu of surveying to specific contract or documentation requirements, opportunities where improvements could be made were documented for all areas associated with ITAS production and FRACAS. This proved to be very beneficial in improving the quality and reliability of the ITAS.

Conclusion

There is no doubt that acquisition reform had a major positive impact on the Javelin weapon system. The efforts of a government team dedicated to quality assurance regarding all hardware purchased from the contractor has been critical in preventing quality and reliability problems being sent to the field. The team efforts of the contractor must also be emphasized. Without the effective partnerships between the government and contractors, the success of the Javelin weapon system would not have been achieved.

Lessons learned from the Javelin and other CCMS programs can be applied to other military programs. These include the importance of a closed-loop FRACAS, conducting comprehensive FRACAS reviews, the use of an ESS program and reaching consensus for any changes, employing an SMPS to ensure processes are maintained and changes are authorized by the contractor, and the inclusion of properly trained government PA professionals on the government team.

In conclusion, I want to also emphasize that I have a concern that dedicated, trained PA personnel are disappearing from the Army's acquisition workforce. In this author's opinion, the success of the Javelin weapon system demonstrates the need for a dedicated government product assurance staff. Acquisition professionals must re-examine and stress the role of PA professionals in the acquisition process. Government training programs are again needed to provide a supply of PA professionals.

BILLY D. GLOVER is a Lead Product Assurance Engineer in the CCMS Project Office. He has a B.S. in physics from the University of Alabama in Huntsville and is also a certified Quality Control Engineer. He can be contacted at ***billy.glover@msl.army.mil****.*

FROM THE DIRECTOR ACQUISITION SUPPORT CENTER

This issue of *Army AL&T* is dedicated to the Research, Development and Engineering Command (RDECOM), a new major subordinate command established by the Army Materiel Command. RDECOM's vision is to be recognized as the world leader in research, development, and engineering of systems, and transitioning that technology quickly to our soldiers.

Speaking of short transition times, one of this issue's articles illustrates how the Aviation and Missile Research, Development, and Engineering Center took only 5 months to design, develop, and field the weaponized Predator, after it was approved. Another story discusses how Fort Monmouth conducted command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR) on-the-move technology demonstrations.

As we saw almost every night on the news, new technologies recently transitioned to the field are crucial to the success of our troops. The weapon systems, communications systems, soldier systems, etc., that so many of you were responsible for developing and fielding have proved very successful in the harsh desert environments of Iraq and Afghanistan. We must provide critical and timely support to our troops as they take part in operations around the world and at home.

Here at *Army AL&T* magazine, we are going through our own transition. Editor-In-Chief Harvey Bleicher retired in March after 35 years of dedicated service to the Army and our magazine. He will be missed very much by all of us at ASC headquarters and by the loyal readers of this publication. Thank you, Harvey, for a job well done and best wishes for a long and happy retirement.

When individuals in our workforce retire or move on, it reinforces our need to recognize the importance of successful recruitment and to work on one of the Army Acquisition Workforce Campaign Plan's initiatives: Ensure that we provide a clearly defined environment that encourages and offers career opportunities and leadership development at all levels. Be sure to read about the Army Enlisted Acquisition Workforce Program, an initiative that brings noncommissioned officers into the acquisition field, in the article below.

As warm weather approaches we will begin to spend more time outside. Let's not forget to keep safety a paramount concern in our daily lives. Have a terrific summer.

COL Mary Fuller
Director
Acquisition Support Center

Enlisted Acquisition Workforce Accession

Enlisted soldiers continue to increase the effectiveness of the Army acquisition contracting community. The Army Enlisted Acquisition Workforce Program was established in 1999 to support the Army's transformation in the 21st century and to enhance the effectiveness of the warfighter and combatant commanders on the battlefield. Contracting noncommissioned officers prepare and execute contract support plans for sustainment and retrofit of Army forces during joint and combined exercises, contingencies, war, and humanitarian assistance operations. These highly skilled soldiers serve as warranted contracting officers responsible for purchasing, renting, and leasing supplies and equipment, and often deploy to austere locations. The enlisted acquisition workforce members constantly demonstrate the value of being force multipliers for the warfighter.

Key Army Staff leaders CW2 Cevilla Mosby, Enlisted Acquisition Proponent Officer; newly assigned Enlisted Acquisition Assignment Manager MSG Terry Graves; and SGM Ethan Jones, Army Contracting Agency, continue their untiring efforts to establish a separate military occupational specialty (MOS) for the Army acquisition workforce.

Updated information concerning the enlisted program may be found on the Acquisition Support Center's home page at **http://asc.rdaisa.army.mil**.

From The ASC FA51 Proponency Officers . . .

Informal feedback is needed from Acquisition Corps captains and majors on the importance of the following potential initiatives with respect to retention and/or professional development:

• Incentive pay for Acquisition Corps command select list commanders.

• Is the role of fully funded Advanced Civil Schooling an issue? Should it be extended to all officers?

• The importance of "regreening" to overall professional development.

If what is important to you is different from the above initiatives, we need to hear from you. Please respond by July 15, 2003, to FA 51A Proponency Officer MAJ John Lemondes at (703)704-0103, DSN 654-0103, Fax (703) 704-0103, or e-mail **john.lemondes@us.army.mil**. Results will be compared to other populations and published in a later issue of *Army AL&T* magazine. Anonymous responses are acceptable.

PERSCOM Notes . . .

Acquisition Candidate Accession Board Results

The annual U.S. Total Army Personnel Command Acquisition Candidate Accession Board was held recently, and the Director, Officer Personnel Management Directorate approved the following officers for accession into the Army Acquisition Corps (AAC). Assignment officers will contact these new officers to discuss their future opportunities in the AAC.

NAME	BASIC BRANCH
Aiken, Terry J.	AV
Babbitt, Joel D.	SC
Baker, John T. Jr.	TC
Barnes, Jackquiline M.	CM
Belden, Kevin A.	AV
Benzing, Andrew E.	AV
Berg, Cory N.	OD
Bliss, Mark A.	AV
Boswell, Clarence O. Jr.	FA
Briggman, Rodney O.	MI
Brown, Joseph D.	AV
Buck, John M.	QM
Burbey, Douglas W.	OD
Burton, Donald L.	MI
Casher, Raymond C.	SC
Cochie, Kevin S.	AV
Collier, Tijuana D.	OD
Collins, Michael J.	SF
Costasolivera, E.L.	IN
Craft, Paul G.	SC
Dake, Christopher G.	TC
Draper, Derek J.	QM
Duda, John A. Jr.	TC
Dunne, Michael E.	CM
Edmonds, James F.	EN
Finch, Kevin E.	FA
Flint, Amanda H.	FI
Ford, Christopher M.	OD
Forrest, Brian D.	AV
Frank, Michael P.	FA
Garner, Benjamin C. Jr.	AD
Garrison, Allen B. Jr.	QM
Gray, Nathan M.	IN
Guess, David T.	QM
Hauenstein, Michael R.	AV
Henry, Gerard	EN
Hernandez, Delisa L.	SC
Hiatt, Wayne F.	TC
Hodge, Matthew S.	AD
Holland, Thomas J. III	EN
Holmes, Frank L.	AV
Hopkins, Paul T. Jr.	FA
Hosna, David J.	AR
Isper, Eric M.	FA
Jackson, Shannon C.	IN
James, Stuart M.	AR
Jenkins, Glenn E.	MI
Johnson, Benjamin F.	FA
Kang, Theophile	MP
Keeton, Chester L.	EN
Kingston, Daniel C.	MI
Klenske, Timothy W.	CM
Kuenzli, Michael J.	AV
Lackovic, Christopher J.	FA
Linderman, Karl S.	TC
Lundy, Jacques S.	AR
Luse, Carey G.	MI
Luttrell, David E.	TC
Maneri, Anthony T.	IN
Martin, Daniel P.	FA
Martin, Misty L.	MI
McIntosh, Scott W.	AV
McLarnon, Hugh P.	IN
Meinshausen, Brian A.	FA
Mitchell, Robert A.	OD
Moody, Charlotte H.	EN
Moore, Frank A.	AD
Morgan, Keith S. L.	IN
Murray, Felecia D.	OD
Murray, Shawn R.	IN
Newman, Leonard J. III	MI
Nguyen, Thomas H.P.	MI
Nicholson, Jennifer A.	EN
Norberg, Seth A.	OD

Parker, John P.	IN
Patrick, Jonathan M.	TC
Pettengill, Edmund K.S.	IN
Phelps, Matthew A.	TC
Pillado, Christine M.	SC
Redfield, Richard M.	FA
Root, Jason P.	AR
Ryan, Thomas J.	FA
Saltysiak, Thomas I.	MI
Schramm, Matthew F.	SC
Scola, Dominic M.	AV
Scott, Stanley	MP
Seiger, Stephen R.	AR
Shannon, Michael P.	SC
Stehle, Brian C.	AV
Stevens, Jonathan A.	IN
Stocks, Thomas V.	OD
Stringer, David B.	AV
Stuckey, Rodridguez L.	FA
Sublett, Charles E.	FA
Taylor, Horace D.	SC
Threat, Edward W. K.	QM
Tremlett, Michael L.	AV
Urbanic, Matthew S.	QM
Vancuren, Jeffery P.	QM
Vega, Michael A.	MI
Warnick, David A.	AV
Weems, Lisa L.	QM
Weigner, Heather E.	AV
Whitmark, Christopher W.	AD
Woodbury, Cleo J.	OD
Woodbury, Harvey L. Jr.	OD

Senior Service College Slate

A number of Army Acquisition Corps officers have been selected to attend Senior Service College (SSC) at the schools listed below during academic year 2003–2004. Congratulations to the following officers selected for SSC.

Air War College, Maxwell Air Force Base, AL
Dever, Douglas A.
Walters, Stephen

Army War College, Carlisle Barracks, PA
Callahan, Michael O.
Ellis, Carl M.
Hazelwood, Donald A.
Leisenring, Stephen B.
Parker, William E.
Ralph, James R. III
Sears, George A. II
Shufflebarger, Newman D.
Wheeler, Kenneth A.
Wolfe, Daniel G.

Industrial College Of The Armed Forces, Fort McNair, VA
Bryant, Thomas H.
Burke, Kyle T.
Doyle, Norbert S. Jr.
Eberle, Nathan R.
Hoppe, William C.
Hughes, Daniel P.
Lepine, Paul R.
Shipe, Richard T.

Acquisition Fellowship, University Of Texas-Austin
Cook, David A.
Hollingsworth, Larry D.
Knudson, Ole A.
Paquette, Derek J.
Williamson, Michael E.

Brandler Named ACMA Of The Year

An exemplary performer whose efforts propelled the workforce, programs, and initiatives to new heights, Philip Brandler, U.S. Army Soldier and Biological Chemical Command at Natick, MA, was selected as Acquisition Career Management Advocate (ACMA) of the Year for FY02. Brandler's responsibilities include research, development, and engineering, with the aim of maximizing the individual warrior's survivability, combat effectiveness, and quality of life in the field.

Brandler was recognized on Feb. 11, 2003, at the Army Acquisition Workforce Conference in Atlantic City, NJ, where Claude M. Bolton Jr., Assistant Secretary of the Army for Acquisition, Logistics and Technology, presented his award. Acquisition Support Center Director COL Mary Fuller said that Brandler "can be counted on to be resourceful and a team player, understands the value of outstanding customer service, and is known among his peers as a leader." Brandler's achievements include the establishment of the Objective Force Warrior Program, sponsorship of a newly redesigned local training facility, and the establishment of a local ACMA board as a forum to highlight Army Acquisition Corps (AAC) accomplishments and address the complex and controversial issues of the acquisition workforce. Brandler has been a member of the AAC since 1994.

Understanding Information Age Warfare

David S. Alberts, John J. Garstka, Richard E. Hayes, and David A. Signori

Command and Control Research Program, Washington, DC; 2001

Reviewed by Geoffrey French, a Counterintelligence Analyst with Veridian and former Logistics Specialist for the U.S. Marine Corps Reserve.

There is no shortage of authors who offer their views of the strategic direction and shape the U.S. military will take in the 21st century. Some books capture the imagination by providing an artistic portrayal of the future military. *Understanding Information Age Warfare* is not one of them. It is academic in nature and dry in parts, delving into the nature of learning and the complex math of measuring intangibles. But it is also important, and for those who want to understand how the U.S. military is changing as it enters the new century, it is one of the better books available.

Understanding Information Age Warfare was written by David Alberts, John Garstka, Richard Hayes, and David Signori, and published by the Command and Control Research Program (CCRP). CCRP is a DOD program that focuses on command and control (C2) theory, doctrine, and practice, especially with regard to technological change. Alberts—the lead author and program director—has an ideal blend of experience with technology, Defense policy, and academia to address such complex topics. He is the lead author of many of CCRP's publications, most of which are available at **http://www.dodccrp.org/**.

The book reflects CCRP's goals as it describes the potential for technology to revolutionize U.S. warfighting capability. It begins with clear definitions and explanations of the concepts the book will explore, such as collaboration, information superiority, and synchronization. Just as the program identifies theories that can be measured and proven, the book supports its arguments—even the most basic—with experiments and exercises that demonstrate how information technology improves decisionmaking, lethality, and survivability on the battlefield.

This is exactly what separates *Understanding Information Age Warfare* from so many other publications about the same topics. Whereas many other authors never take the time to define their terms, or rely on pure theory to support an argument for change, Alberts and his colleagues are meticulous in the academic rigor of making their case. Their devotion to detail also causes the book to lack color in parts because they define seemingly basic words such as knowledge, awareness, and understanding. For those who enjoy an in-depth discussion of the advantages and disadvantages of the observe–orient–decide–act loop as a model for complex C2, the book will prove a joy. Others may quickly lose interest.

For those whose interest holds, however, the book is well worth the invested time. Although it falls short of making revolutionary recommendations for military C2 organizations, it establishes the fundamentals of network-centric warfare and the goals for and advantages of information superiority. The authors argue that multiple, rich information technology connections throughout an operational force will have two related results. The first is that the *command intent* will saturate the C2 structure so that all involved understand the goals and objectives without a detailed, micromanaged plan. The second is that operations will be highly synchronized and mutually supporting. Ideally, the force will attain *self-synchronization* where warfighters share awareness and respond to each other's needs as they emerge, constantly adapting to the changing environment. These concepts will become increasingly important in the next decade as the next generation of weapons, information systems, and doctrine are implemented.

Not only does the book provide a vision for future warfighting, the authors also describe the way logistics will support the fast-tempo operations considered a key facet of network-centric warfare. They depict logistical systems as part of a "ring of fire," a series of information systems that help integrate battlefield monitoring and management. Furthermore, logistical maintenance may be embedded in systems, automatically reporting location, support needs, and operational status. These concepts can have an immediate impact because they can influence investments in acquisition or research, allowing managers, for example, to identify compatibility issues prior to building a system. For those looking to give themselves a solid foundation for understanding future military operations and the role technology will play, *Understanding Information Age Warfare* is required reading.

CONFERENCES

OUSD(AT&L) Sponsors 2003 Business Managers' Conference

The Business Managers' Conference, sponsored by the Office of the Under Secretary of Defense for Acquisition, Technology and Logistics (OUSD(AT&L)) in cooperation with the Business, Cost Estimating, and Financial Management Functional Advisory Board, will take place May 14-15, 2003, at Fort Belvoir, VA. The conference theme is "Changes and Challenges."

This yearly event brings together senior DOD acquisition and comptroller executives as well as Service headquarters business staff and Program Executive Office (PEO), Program Manager (PM), and Systems and Materiel Command business managers for wide-ranging discussions and presentations on current acquisition and business initiatives.

The target audiences for the conference are:

- DOD business, cost estimating, and financial management acquisition workforce community;
- Office of the Secretary of Defense comptroller and Program Analysis and Evaluation staff;
- Headquarters financial management staff;
- PEO/PM staff;
- Defense Finance and Accounting Service;
- Defense Contract Management Agency;
- The contracting community; and
- The industry and business communities.

Visit the ASC home page at **http://asc.rdaisa.army.mil** for additional information.

51st Defense Working Group On NDT

The 51st Defense Working Group (DWG) on Nondestructive Testing (NDT) will be held Nov. 4-6, 2003, in Fort Walton Beach, FL. The U.S. Air Force's 361st Training Squadron/Detachment 2, will host this year's meeting.

Attendance is restricted and tightly controlled, with the focus on information exchange and problem solving. This annual meeting of engineers, scientists, and technicians, provides the only forum for military, Defense Logistics Agency, and Defense Contract Management Agency representatives to freely exchange information related to NDT methods, equipment, and applications.

Because of declining resources for maintenance, repair, and acquisition of new systems, it is imperative that DOD maximize the useful life of present assets while developing economical maintenance strategies. NDT plays a significant role in this process by providing 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.

Additional information on the 51st DWG meeting is available at **http://hometown.aol.com/dodndt**.

LETTERS

Dear Editor,

Thank you for a fine magazine that keeps us abreast of the latest and greatest. I would like you to know, however, that I was stunned when I saw the cover of the November-December 2002 issue in my mailbox.

On the cover, there is a picture of two people sitting on the hood of a HMMWV. This is a big no-no. HMMWV hoods are marked "No Step" for a reason. As someone who has tested and been around HMMWVs for more than 10 years, I must stress that walking and sitting on a HMMWV hood can damage it. That's why it states "No Step."

I, and others, know that people walk on HMMWV hoods all the time, but the practice is unacceptable. The fact that you published a picture with not one, but two people on the hood, only reinforces this behavior.

I would ask that in the future, you refrain from showing pictures like this.

By the way, I just finished a test for a small Marine Corps vehicle. I found it very interesting that the Marine Corps specified in the vehicle's purchase description that the vehicle's hood had to withstand, without damage, a 95th percentile Marine (large male) walking on it. I have never seen a requirement like that in an Army purchase description.

Thanks for letting me vent my spleen on a pet peeve of mine, but HMMWV hoods cost too much to replace or fix.

Sincerely,

Brian E. Frymiare
Senior Test Director
U.S. Army Aberdeen Test Center
Aberdeen Proving Ground, MD

ARMY AL&T WRITER'S GUIDELINES
http://asc.rdaisa.army.mil/

Army AL&T is a bimonthly professional development magazine published by the Office of the Assistant Secretary of the Army for Acquisition, Logistics and Technology. The address for the Editorial Office is DEPARTMENT OF THE ARMY, ARMY ALT, 9900 BELVOIR RD, SUITE 101, FORT BELVOIR, VA 22060-5567. Phone numbers for the editorial staff are as follows:

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Purpose

To instruct members of the AL&T community about relevant processes, procedures, techniques, and management philosophy and to disseminate other information pertinent to the professional development of the Army Acquisition, Logistics and Technology Workforce (AL&TWF).

Subject Matter

Subjects may include, but are not restricted to, professional development of the Army's AL&TWF, AL&T program accomplishments, technology developments, policy guidance, and acquisition excellence. Acronyms used in manuscripts, photos, illustrations, and captions must be kept to a minimum and must be defined on first reference. **Articles submitted to *Army AL&T* will not be accepted if they have been scheduled for publication in other magazines.**

Length of Articles

Articles should be approximately 8 double-spaced typed pages, using a 20-line page, and must not exceed 1,600 words. **Articles exceeding 1,600 words will not be accepted.** Do not submit articles in a layout format or articles containing footnotes, endnotes, or acknowledgement lists of individuals.

Photos and Illustrations

A maximum of 3 photos or illustrations, or a combination of both, may accompany each article **in files separate from the manuscript**. Please ensure that artwork is accessible for editing and not embedded in the manuscript. Photos may be black and white or color. **Illustrations must be black and white and must not contain any shading, screens, or tints. All electronic files of photos must have a resolution of at least 300 dpi (JPEG or TIFF). If they do not meet this requirement, glossy prints of all photos must be submitted via U.S. mail, FedEx, etc.** Photos and illustrations will not be returned unless requested.

Biographical Sketch

Include a short biographical sketch of the author/s that includes educational background and current position. Please also include acquisition certifications and AAC membership if applicable.

Clearance

All articles must be cleared by the author's security/OPSEC office and public affairs office prior to submission. The cover letter accompanying the article must state that these clearances have been obtained and that the article has command approval for open publication.

Individuals submitting articles that report Army cost savings must be prepared to provide detailed documentation upon request that verifies the cost savings and their reinvestment. Organizations should be prepared to defend these monies if higher headquarters has a higher priority for them. All articles are cleared by the Acquisition Support Center Director.

Submission Dates

Issue	*Author's Deadline*
January-February	15 October
March-April	15 December
May-June	15 February
July-August	15 April
September-October	15 June
November-December	15 August

Submission Procedures

Article manuscripts (in MS Word) and illustrations/photos (300 dpi JPEG or TIFF) may be submitted via e-mail to **army.alt.magazine@asc.belvoir.army.mil**, or via U.S. mail to the address in the first paragraph at the top of this page. All submissions must include the author's mailing address and office phone number (DSN and commercial).

Army AL&T Editor-In-Chief Retires

The editorial staff of *Army AL&T* magazine recently bid farewell to our long-time Editor-in-Chief and dear friend, Harvey Bleicher, who retired after more than 35 years of federal service. He came to the magazine—then *Army Research and Development*—in 1972 as Editorial Assistant. Harvey served as Assistant Editor, Associate Editor, and Managing Editor before he became the Editor-in-Chief in 1992.

Assistant Secretary of the Army for Acquisition, Logistics and Technology (ASAALT) Claude M. Bolton Jr. wrote to OASAALT and Harvey, saying, "We are all going to miss you. You have done a truly outstanding job and have served us all well. Oh behalf of the entire OASAALT, I wish you the very best in your retirement."

At Harvey's retirement ceremony, COL Mary Fuller, Director, Acquisition Support Center (ASC), presented him with an Army Superior Civilian Service Award and an official Army Certificate of Retirement. Harvey and his wife, Marla, each received a Department of the Army Certificate of Appreciation. ASC Deputy Director Craig A. Spisak and numerous other staff members also attended the ceremony.

Harvey will be missed by those of us who remain in the editorial office. We thank him for the years of mentorship, leadership, and friendship. We even thank him for his extensive green-pen edits!

COL Mary Fuller, right, presents an award to Harvey Bleicher, who is shown here with his wife, Marla.

ARMY AL&T
ISSN 0892-8657

PERIODICALS

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