

# ARMY AL&T

April-June 2011



## BRINGING INNOVATION TO THE WARFIGHTER THROUGH ARMY SCIENCE

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EXCLUSIVE Q&A WITH  
DR. MARILYN M. FREEMAN

A KNOWLEDGE-BASED  
APPROACH TO ACQUISITION  
AND MODERNIZATION

ARMY OUTLINES  
NETWORK STRATEGY



## From the Army Acquisition Executive

# Bringing Innovation to the Warfighter Through Army Science



It is with great enthusiasm and vigorous dedication to our Soldiers in combat that I welcome you to this edition of the award-winning *Army AL&T Magazine*, an issue focused on the vitally important topic of “Bringing Innovation to the Warfighter Through Army Science.” I commend the magazine to our readers, as this topic is indeed close to my heart. For more than a year, I have been emphasizing that the Army needs to continue investing in and developing new technologies that help make the dismounted Soldier a decisive weapon. In order to accomplish this, we must continue to foster an increasingly agile acquisition system and increase our focus on helping the individual Soldier.

The Navy and Air Force enjoy significant technological advantages, compared with potential adversaries. No enemy wants to fly against the Air Force’s F-22, for example. If you’re the pilot of an F-22, the U.S. government wraps about \$200 million in stealth, mobility, and weaponry around you. In the Navy, the nuclear attack submarine has become one of the major deterrents to the development by potential adversaries of surface ships and submarines.

The dismounted Soldier and small tactical units on the move should have a commensurate technological “boost” or overmatch capability. Investing wisely in science and technology—harnessing the best available emerging technologies with the proven capability to help Soldiers in combat—is central to this effort. Once outside of a Ground Combat Vehicle, once outside of the Abrams tank, and once outside of a Black Hawk helicopter, what makes our Soldier different from the enemy hiding behind a rock?

Unfortunately, we are not fighting a buttoned-up or “linear” war; the current conflicts in Iraq and Afghanistan call upon small, dismounted tactical units to find and destroy an enemy who is dispersed, hiding, aware of the tactical situation, and often deliberately blended in with the local population. The fighting often takes place on a nonlinear, 360-degree battlefield where Soldiers need to get out of their vehicles and engage in intense combat for the last 100 yards or so to accomplish their objective. This critical distance is where we must focus much of our efforts.

We have to respond continually to the shortfalls and capability gaps that our Soldiers experience in low-intensity conflict. We maintain a decisive edge in all other areas of warfare. We have the best combat attack helicopters in the world, the finest rotary-wing aircraft, and world-class armored vehicles. Still, there is more work to do to make our Soldiers decisive weapons.

The idea is to wrap new technologies around the Soldier: state-of-the-art sensors, weapons, and protective gear. We are making progress. For instance, our forces in Afghanistan are receiving several thousand gunshot detection systems for the individual dismounted Soldier.

The Individual Gunshot Detector, or IGD, consists of several miniature acoustic sensors worn by the individual Soldier and a small display screen attached to body armor that shows the distance and direction of incoming fire. A small processor, about the size of a deck of cards, detects the supersonic sound waves generated by enemy gunfire and instantaneously alerts Soldiers to the location of the hostile target.

The Army plans to strategically disperse the systems throughout small, dismounted units to get maximum protective coverage for platoons, squads, and other units on the move.

In the future, the Army plans to integrate this technology with its Land Warrior and Nett Warrior systems, which provide networked situational awareness for dismounted units. The systems employ a helmet-mounted display screen that uses GPS digital-mapping-display technology.

We are also making great strides in assisting the dismounted Soldier with intelligence, surveillance, and reconnaissance capabilities from unmanned aircraft systems (UAS); small units on the move in rigorous terrain can now launch small, hand-held UAS such as the Raven, able to beam back images and video of the surrounding battlefield in real time to small, portable computer screens.

Another game-changing development in Soldier technologies is the new airburst XM25 grenade launcher, which can detonate rounds above or near an enemy in defilade. The XM25, prototypes of which have been fielded in Afghanistan, helps our Soldiers succeed against enemy fighters who are firing on our forces from behind a rock, tree, or ditch.

There are many other signs of progress in Soldier technologies. We are deploying the XM2010 sniper rifle with an increased range, fielding a wide array of uniforms with fire-resistant materials, deploying lighter-weight body armor, preparing to field a new Enhanced Combat Helmet, and launching a competition to build a new Improved Carbine while simultaneously upgrading the existing M4.

We are also working vigorously to “network” the dismounted Soldier for instantaneous, real-time access to combat-relevant voice, video, data, and images across the battlefield. We have a series of network evaluations and exercises planned at Fort Bliss, TX, and White Sands Missile Range, NM, which will place cutting-edge technologies in the hands of Soldiers to determine which IT and networking capabilities are best suited for our forces.

None of these efforts would be possible without the contributions of the top-notch Army acquisition, logistics, and technology community—the Materiel Enterprise—and my extremely talented and dedicated team members, to include GEN Ann Dunwoody, Commanding General, U.S. Army Materiel Command, and her staff; my Principal Deputy, Ms. Heidi Shyu, former chair of the Air Force Scientific Advisory Board; and my Principal Military Deputy, LTG Bill Phillips, former Commanding General, Joint Contracting Command, Iraq-Afghanistan. Our science and technology efforts, in particular, have been immeasurably enhanced by the arrival of Dr. Marilyn Freeman as our Deputy Assistant Secretary of the Army for Research and Technology and Dr. Scott Fish, the Army’s first Chief Scientist in more than two decades.

I thank you for your interest in these pressing issues as we advance together into the future with moral courage, dedication to our warfighters, and an abiding commitment to leveraging the best of what S&T has to offer our Army and our Soldiers.

**Dr. Malcolm Ross O’Neill**  
Army Acquisition Executive



From the DACM

## Professional Growth Through Continuous Learning

**C**ontinuous learning is a mind-set, a matter of professionalism as well as career progression.

The Army wants a professional, agile, versatile, and motivated Acquisition, Logistics, and Technology Workforce that consistently makes smart business decisions, acts ethically, “thinks,” and delivers warfighting capabilities when and where our Soldiers need them to maintain a decisive edge.

It’s a high standard to meet. For that reason, DOD and the Army set the bar high for continuous learning, but they also provide numerous tools to make it possible, make it interesting, and make it rewarding.

Per *DoD Instruction 5000.66*, AL&T Workforce members must acquire 80 Continuous Learning Points every two years from the date they enter the AL&T Workforce until they leave.

I encourage and challenge you to maintain a goal of 50 CLPs within any 12-month period, both to sustain your continuous learning and to avoid having to squeeze a larger requirement into a shorter period of time.

Especially in this time of war, there are many pressing demands on your time, but continuous learning must remain a priority.

There are myriad ways to learn, more than you may realize. Through the Defense Acquisition University (<http://www.dau.mil/clc/default.aspx>), you have access to training courses in 17 categories and more than 225 continuous learning modules. You can achieve CLPs through any of these.



In addition, you can earn CLPs by authoring published articles or by taking part in professional activities outside DOD. For example, you may participate in an organization’s management; attend, speak, or present at a professional seminar, symposium, or conference; participate in a workshop; take a professional examination; or earn a license or certification in an approved field.

You can even earn CLPs through a variety of online games and simulation programs. All CLPs should be gained through either acquisition or leadership-related activities.

### HOW CAN I ACHIEVE CLPs?

**Attend DAU training courses and learning modules**

**Author published articles**

**Take part in professional activities outside DOD**

**Partake in acquisition or leadership-related online games and simulation programs**

**Pace yourself: You need 80 CLPs every two years; aim for 50 CLPs per 12-month period**

The number of CLPs you earn varies with each approved continuous learning activity. But it’s equally easy to keep track of your CLPs, through the online Career Acquisition Management Portal (CAMP), <https://rda.altess.army.mil/camp>.

Your Individual Development Plan, located within CAMP, is your automated tool to track your CLPs and required or desired training.

If you have any questions about where to begin or what to do next, please review the Army’s Continuous Learning Policy and Implementation Guidance under the Career Development tab at <http://asc.army.mil>.

In addition, check out DAU’s Continuous Learning Blog at <https://dap.dau.mil/training/cl/blogs/default.aspx>.

You may find an answer from someone who’s had the same question!

With all these tools at your disposal, you have the means to be a well-educated, well-rounded, highly valued AL&T professional, ready to take on any challenge to serve our Soldiers.

**LTG William N. Phillips**  
Director, Acquisition Career Management

## FROM THE EDITOR-IN-CHIEF

This issue of *Army AL&T Magazine* is devoted primarily to Army Science and Technology and its mission to serve the Soldier. In an exclusive interview with *Army AL&T*, Dr. Marilyn Miller Freeman, Deputy Assistant Secretary of the Army for Research and Technology, provides an in-depth look at what “reinventing S&T” means: “Our new S&T vision talks about empowering, unburdening, and protecting our Soldiers. It talks about technology-enabled capabilities being the key product we deliver.”

Dr. Malcolm Ross O’Neill, Assistant Secretary of the Army for Acquisition, Logistics, and Technology, states in the opening article of this issue, *Science and Technology: The Key to the Future Army*, the importance of providing our Soldiers with materiel that has an “inherent advantage” against an adaptive and inventive enemy.

In total, 11 articles in this issue examine how the Army is innovating to serve the Soldier in the current and future theaters of operation—what the objectives are and how Army leaders plan to reach them in the face of global competition for resources, talent, and technology. Individual articles look at problems solved and as yet unsolved in modernizing the network, head protection and Traumatic Brain Injury, research on extremity injuries, micro-autonomous systems, data transfer, and body-cooling systems.

It is important to note that innovation in the Army relies heavily on S&T, but doesn’t stop there by any means. Innovation takes place throughout the acquisition and fielding processes, in ways that are visible to Soldiers—such as the simultaneous development process described in the article *Parallel Paths for Weapon Development and Training*—and ways that take place behind the scenes to maintain a well-trained, adaptable AL&T Workforce, such as *The Leaning of Lean Six Sigma* described in our Lean Six Sigma/Business Transformation section and the establishment of the U.S. Army Acquisition Center of Excellence, discussed in the column *From the Acquisition Support Center Director*.

Innovation in acquisition processes is the subject of additional articles in this issue, on topics including use of the “Other Transaction” approach to obtain a needed and hard-to-find capability, converting time and materials contracts for better buying power, and developing a two-phase design/build selection process to accelerate contract review.

I trust these topical articles will inform and guide you as you work to fulfill your responsibilities to Army AL&T and our warfighters. If you have any comments or suggestions, e-mail me at [USAASCWEBArmyALTMagazineLettertoEditor@conus.army.mil](mailto:USAASCWEBArmyALTMagazineLettertoEditor@conus.army.mil).

*Nelson McCouch III*  
Editor-in-Chief

# Write for Us!



Is there a challenge or a solution in AL&T that you’d like to bring to our attention?

**Consider writing an article.**

Articles should be kept to 1,600 words and will be edited for style and space. Please include your name, title, organization, and daytime contact information so that we can verify your article.

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Editor-in-Chief  
Army AL&T Magazine  
9900 Belvoir Rd., Suite 101  
Fort Belvoir, VA 22060-5567

E-mail: [USAASCWEB-AR@conus.army.mil](mailto:USAASCWEB-AR@conus.army.mil)



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ACQUISITION, LOGISTICS &  
TECHNOLOGY

**Cover Story**

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**Science and Technology:  
The Key to the Future Army**

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# ARMY AL&T

April-June 2011

# ACQUISITION, LOGISTICS & TECHNOLOGY

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**To contact the Editorial Office:**  
Call (703) 805-1034/1038 or DSN 655-1034/1038

Articles should be submitted to:  
DEPARTMENT OF THE ARMY  
ARMY AL&T  
9900 BELVOIR RD, SUITE 101  
FORT BELVOIR, VA 22060-5567

Our fax number is (703) 805-4218.  
E-mail: [USAASCWEB-Ar@conus.army.mil](mailto:USAASCWEB-Ar@conus.army.mil) or  
[USAASCWEBArmyALTMagazineLettertoEditor@conus.army.mil](mailto:USAASCWEBArmyALTMagazineLettertoEditor@conus.army.mil)

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*This medium is approved for official dissemination of material designed to keep individuals within the Army knowledgeable of current and emerging developments within their areas of expertise for the purpose of enhancing their professional development.*

By order of the  
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United States Army  
Chief of Staff

Official:  
  
**JOYCE E. MORROW**  
Administrative Assistant to the  
Secretary of the Army  
1108902

# Science and Technology: The Key to the Future Army

Jaclyn Pitts and Kellyn D. Ritter

**I**n the face of global competition for resources, talent, and technology, the Army science and technology (S&T) community must maintain its edge with the latest research and development, to ensure that our Nation's warfighters have the decisive edge in combat and can adapt rapidly to any operational situation.

The Army must make a critical shift in the S&T development process to keep technology relevant and get it into Soldiers' hands faster, according to senior leaders. (U.S. Army photo.)



The job of the S&T community is to maintain our S&T engineering and mathematics skills, knowledge, experience, and expertise and to use these to give our warfighters the most reliable, effective equipment and tools for conducting their diverse missions to make them the decisive edge.

— Dr. Marilyn Miller Freeman,  
Deputy Assistant Secretary of the Army for Research and Technology

This was the overarching message from Army leaders at the 27th Army Science Conference in November 2010.

“Our Soldiers must have a wide range of advanced and new capabilities,” said Dr. Marilyn Miller Freeman, Deputy Assistant Secretary of the Army for Research and Technology (See Q&A, Page 7). “These capabilities grow out of a broad spectrum of technologies for near-, mid-, and far-term applications. The job of the S&T community is to maintain our S&T engineering and mathematics skills, knowledge, experience, and expertise and to use these to give our warfighters the most reliable, effective equipment and tools for conducting their diverse missions to make them the decisive edge.”

The acquisition community must provide capabilities on time and within budget, according to Dr. Malcolm Ross O’Neill, Assistant Secretary of the



Army for Acquisition, Logistics, and Technology. “Our environment has to be open, transparent, and supportive, and we must support the Soldier as our most important customer,” he said. “Soldiers are our most precious asset.

“We have got to have something that our potential adversaries don’t have,” O’Neill said. “It is up to us to provide materiel that has an inherent advantage.”

### A Changing Environment

Freeman explained that the environment she entered as a young scientist 30 years ago differed greatly from what she sees today. “When I entered, I was told that I didn’t need to be so aggressive, that I didn’t need to be in such a hurry to develop anything in my lab because it would be 20 or 30 years before anything I did in S&T would ever touch the hands of Soldiers,” she said. “Not so today. I never accepted that premise, and I still don’t, and you shouldn’t either. Scientists and engineers today don’t sit at their computers all the time. They go into the field, and they interact with warfighters in theater



to share our solutions that provide the advantage we promise. Like our Soldiers, Army S&T must adapt.”

Included in that adaptation is what Freeman calls “reinventing Army S&T.” “We need to step back and take a look at ourselves in this environment, and figure out what we should keep, how we should do business better, what we should throw out, and what in particular is the most important aspect of our job,” she said.

“We need to get more knowledge earlier in the [acquisition] process,” said LTG Michael A. Vane, Deputy Commanding General, Futures, and Director, Army Capabilities Integration Center, U.S. Army Training and Doctrine Command (TRADOC). “More knowledge from across our various elements of acquisition, ... from testers, PMs, engineers, and users who represent not only TRADOC but actual returning Soldiers from various activities” (See related article, Page 14).

We have got to have something that our potential adversaries don’t have. It is up to us to provide materiel that has an inherent advantage.

— Dr. Malcolm Ross O’Neill,  
Assistant Secretary of the Army for Acquisition, Logistics, and Technology



In the acquisition process, S&T comes before Milestone A, leading many involved in the acquisition process to think, “We don’t count toward acquisition” said Freeman. “We support this whole acquisition process, but we’re not perceived as supporting it. We are an integral part of the acquisition process. ... It’s not about the color of the money. It’s about the contribution and result,” she said.

New metrics may help the S&T community prove its value. Measuring aptitude in the technical capabilities S&T provides to warfighters, the data and information S&T provides to decision makers, and the quality of the research, development, and engineering conducted in S&T laboratories and centers will show that S&T is a vital part of the acquisition process supporting Soldiers, said Freeman.

This will be imperative during budget discussions, Freeman said.

### Faster and Affordable Acquisition

On the topic of ensuring that the acquisition process keeps pace with current technology, Vice Chief of Staff of the Army GEN Peter W. Chiarelli cited the development of the new

ground combat vehicle as an example of acquisition innovation. “The ground combat vehicle represents one of the most important combat and acquisition decisions we’ll make over the next seven years,” he said. “We are building a vehicle that will be capable of operating in all environments, across the full spectrum. ... How we’re trying to build it will also make it revolutionary.”

Chiarelli said that the Army is aiming to accelerate the timeline of the ground combat vehicle from the traditional 10- to 12-year cycle to 5-7 years, recognizing that the key to doing so is designing a platform that is versatile, able to accommodate a wide range of configuration and capability changes and incremental improvements over time.

Cost and schedule constraints should be established early for all programs, said Vane. There are advantages, he said, to “buying fewer, more often”—purchasing for a deploying unit and targeting the next increment for the next deployments two to three years later. This approach allows for technology improvements and changes in threat and political leadership along the way, Vane said. “If we were to account for that, perhaps we could get ahead of where we’re at in developing systems.”

DOD’s Efficiency Initiatives, which require that the Army save 2-3 percent by “doing more without more,” are another way DOD will save money. The savings will then be used for capability, O’Neill said.

### The Global Picture

Key S&T concerns include cyber warfare, biotechnology, bionics, and nanotechnology. Cyber crime is a threat not only to the U.S. economy, but also to the Nation as a whole. “Biotechnology, bionics, and pharmacology create massive potential for convergence and bio-interfacing between humans, enhanced computers, and cognitive power,” said Vane. “Nanotechnology offers revolutionary capabilities in materiel, medicine, manufacturing, and food production. Technology can make flawed, injured brains work better.

“Humans are our most adaptive systems,” Vane said. “They adjust, they gain advantages, and they want to survive. ... How can we help to get that human to have the overmatch advantage needed on the battlefield of tomorrow in this era of persistent conflict?”

S&T development is vital to addressing these challenges, “not only to make that human more efficient and effective, but also across the board to maintain the overmatch if our country wants to retain the position it has within the world in areas of diplomatic, informational, military, and economic power,” he said.

Vane emphasized the importance of knowing not only what our enemies are developing in S&T, but also what our allies are developing.

Based on global trends and operational lessons learned, TRADOC produced



The ground combat vehicle represents one of the most important combat and acquisition decisions we’ll make over the next seven years. How we’re trying to build it will also make it revolutionary.

— GEN Peter W. Chiarelli,  
Vice Chief of Staff of the Army

S&T is an integral part of everything we do, all the programs we're working on. It is critical for increasing knowledge, and we must have the right S&T investments to link to program outcomes better than we have in the past.

— LTG Michael A. Vane,  
Deputy Commanding General, Futures, and Director, Army Capabilities  
Integration Center, U.S. Army Training and Doctrine Command



the Army Capstone Concept (<http://www.tradoc.army.mil/tpubs/pams/tp525-3-0.pdf>) in December 2009, describing what the Army needs to do. The Army Operating Concept (<http://www.tradoc.army.mil/tpubs/pams/tp525-3-1.pdf>), released in August 2010, describes Army forces from 2016 to 2028, emphasizing the operational and tactical levels of war.

“The key to realizing this concept includes decentralized operations through mission command and developing situations through action, not just passively or trying to sense through technology,” Vane explained. “We must do that to act faster than the enemy.”

### Competitive Education

One of the biggest challenges is understanding human activity and performance, Vane said. Proficiency in S&T areas among the Nation's youth is necessary for future development of the Nation's S&T scientists and engineers.

“According to 2006 data from the U.S. Department of Education, the math literacy scores of 15-year-olds in the United States are lower than average scores in 23 of 29 Organisation for Economic Co-operation and Development [OECD] countries,” Vane said. Science literacy is lower than the average scores in 16 of 29 OECD countries. “With a decline in student scores in math and science, does that give us a weak signal we should be tracking? Is that a leading or lagging

indicator or metric ... and how that might be directed at S&T?”

Vane also said that while the United States is making progress in S&T developments, “we are not necessarily keeping pace with the leaders in the international community.” Between 1989 and 2001, patent applications in the United States grew by 116 percent, but in East Asia (including China, India, Singapore, South Korea, and Taiwan), they grew by 750 percent, he said. The U.S. high-tech sector also doubled during that time, growing from \$423 billion to \$940 billion, but that of China grew more than eight times, from \$30 billion to \$257 billion, according to a February 2005 report from the Task Force on the Future of American Innovation, titled “The Knowledge Economy: Is the United States Losing Its Competitive Edge?” (available at <http://www.futureofinnovation.org/PDF/Benchmarks.pdf>).

### Conclusion

Global trends for S&T include increasingly mobile networks, declining education levels, secure energy sources, and continuous information flow, 24/7. To adapt to these trends, Army S&T must produce integrated products, not stovepipe solutions, by focusing on the five warfighter outcomes, Vane said:

- Training
- Mission command
- Countering improvised explosive devices

- Power and energy
- The human dimension

Vane stressed the importance of making a critical shift in the S&T development process to keep technology relevant and get it into Soldiers' hands when they need it. “S&T is an integral part of everything we do, all the programs we're working on,” he said. “It is critical for increasing knowledge, and we must have the right S&T investments to link to program outcomes better than we have in the past.”

*Presentations from the Army Science Conference are available at <http://www.armyscienceconference.com>. Audio speeches are available at [http://www.youtube.com/view\\_play\\_list?p=2398CDA824AC2470](http://www.youtube.com/view_play_list?p=2398CDA824AC2470).*

**JACLYN PITTS** provided contract support to the U.S. Army Acquisition Support Center through BRTRC Strategy and Communications Group. She holds a B.S. in journalism from West Virginia University and a B.S. in criminal justice from Kaplan University.

**KELLYN D. RITTER** provides contract support to the U.S. Army Acquisition Support Center through BRTRC Strategy and Communications Group. She holds a B.A. in English from Dickinson College.



# Interview with Dr. Marilyn Miller Freeman, Deputy Assistant Secretary of the Army for Research and Technology

The new vision for Army science and technology (S&T) is focused on identifying and promptly addressing the key areas where S&T can provide the Soldier with a decisive advantage, in partnership with other stakeholders. Here, a Soldier with Troop B, 1st Squadron, 113th Cavalry Regiment, Task Force Redhorse scans a nearby hilltop during a search of the Qual-e Jala village, Afghanistan, in February. (U.S. Army photo.)



**Army AL&T:** You spoke at the AUSA Winter Symposium about “turning things upside down” in Army S&T. In terms of execution, what are the first concrete steps needed to accomplish this at your level?

**Freeman:** The process of doing strategic planning and strategic change is well-known. The starting point is a good foundation, built on core values, mission, and fundamental business processes that we already have.

Next, we have to create a vision. It has to be clear and one that everyone can understand and get behind. A vision is a top-level thing. Our new S&T vision talks about empowering, unburdening, and protecting our Soldiers. It talks about technology-enabled capabilities being the key product we deliver. My point is: We are no longer just focused on delivering individual “widgets,” individual technology—partial solutions to things. We are focused on making the S&T product more robust and capability-relevant.

TRADOC [U.S. Army Training and Doctrine Command] does the warfighter capabilities. We are focused on providing technology-enabled

capabilities. Going forward, we will strengthen our partnership with TRADOC and work closely with their leadership to make sure that our technology deliverables enable the kinds of capabilities they envision.

The next thing leadership must do is set goals. I show a set of nine goals for Army S&T, which include things like, “world-class S&T.” The words sound great, a big aspiration and all. But what is behind the words? From my perspective, it means having the people, skills, and competencies you need in the right areas to do the job that you’re asking them to do. That doesn’t just mean we need a lot of Ph.D.s. We also need a lot of people throughout our S&T enterprise who understand what it is that the Army needs and how to apply their skills, their competencies, and their knowledge to solve those problems.

Timely transition of the right technologies is another extremely important goal. What do we transition? We transition ideas and concepts; we transition what works and what doesn’t. We transition information. There are a lot of things we transition other than just widgets. Of course, sometimes

we’re going to look at a set of things and say, let us show you how these several technologies work together to give you the capability that you want. Then it becomes a system or a subsystem that we transition. That’s a small part of what this goal is talking about. We’re talking to our PMs and PEOs to inform them about what technologies will work, and what won’t.

Every one of these nine goals is purposeful and meaningful. What I expect the community to do, starting with my office and my staff, is to understand what is behind them. They need to internalize these and figure out, in their responsibility realm, what they need to do to achieve the desired outcome.

**Army AL&T:** Is there a timetable attached to that?

**Freeman:** Yes. The timetable for my staff is the end of the fiscal year. I’ve asked them each to develop their roles and/or areas of responsibility—to tell me which of these nine goals they are primarily going to work on this year, and what their own goals, vision, and objectives are against these goals for their part of their technology or business portfolio. That’s the first step. At the end of this fiscal year, I’ll be expecting that our center and laboratory personnel will focus on understanding how they can contribute to achieving these goals. Of course, there’s nothing that precludes them from doing that ahead of time.

When you talk about goals, the logical next step is to talk about objectives. If you’re going to reinvent something, if you’re going to reinvigorate it, you have to look at scope, timeframe, and risk, which ultimately enables you to establish priorities. If you look at the set of my nine goals, there are three that are fundamental and are the underpinnings for everything else: timely transition of technologies, balanced S&T investment portfolio, and strong internal/external partnerships.



### Strategy for Change Value Proposition for Army S&T



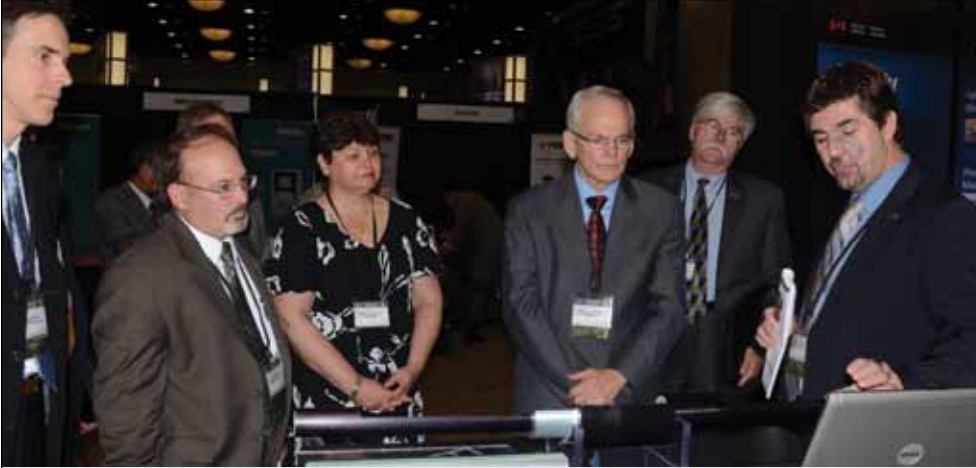
**Vision**  
Provide technology enabling capabilities that Empower, Unburden and Protect our Soldiers and Warfighters in an environment of Persistent Conflict

**Strategic Perspective for Success**  
Timely delivery of capabilities fostered by effective partnerships in synchronization with Army Force Generation and fiscal processes in accordance with the priorities of the Chief of Staff and Secretary

Respond Rapidly to Technological Evolution

#### New Metrics for Value of Army S&T:

- The technical capabilities we provide to Warfighters
- The data and information we provide to decision makers
- The quality of the research, development, and engineering conducted in our laboratories and centers
- The contributions of our subject matter experts who participate in decision making activities
- The number of times we are called upon to provide innovative solutions to big Army/ DoD problems
- Our ability to effect positive change



Dr. Freeman (center left) views the latest S&T at the 2010 Army Science Conference with Dr. Malcolm Ross O'Neill (center right), Assistant Secretary of the Army for Acquisition, Logistics, and Technology. (U.S. Army photo courtesy of RDECOM.)

The transition goal represents the essence of what we are here to do in S&T, so its priority becomes clear and it becomes one you have to work on first. To address the transition goal, you must have clear programmatic objectives and resources in place to enable you to achieve them. Those resources comprise the balanced portfolio. And transition implies there are people ready to take the hand-off; thus the importance of partnerships—within my office, among all the people who work the different parts of the program, with the other parts of the Army and the people who execute the programs, including the lab directors; the different commands; the end user represented by the PEO and PM community; and the requirements community represented by TRADOC.

**Army AL&T:** What is the process for carrying out these priorities?

**Freeman:** Those are my priorities, which therefore become my staff's priorities, which I hope become the priorities for the whole S&T workforce. This really represents a top-down approach, which is a significant change from how we did business before when programs and priorities were established from the bottom up. Bottom-up is not a bad thing; but in this environment, especially when you're financially constrained, what you're lacking is the

ability to have impact. That has to be driven from the top, and that's what we're looking to do.

You have to have processes and tools to establish Armywide priorities. We had an approval process for the major programs in Army S&T, called the ASTAG and ASTWG process. That was the Army S&T Advisory Group, a senior leader four-star group, and the Army S&T Working Group at the two-star level. This process has been around for a long time. Army ATOs [Army Technology Objective programs] were the way we executed. This also was a bottom-up process that did not have

the full benefit of senior leadership influence until the end of the ATO selection process.

The outcome was that this process had gotten so out of sync with the fiscal decision-making processes, and we were planning programs in the June-July timeframe and getting approval for those programs in the September timeframe at the two-star level, and in a January timeframe, at the four-star level for the fiscal year we were in. By the time we got to Army leadership, they asked, "Why am I even looking at this? We've already put a budget for the next fiscal year on the street, and we're working on the one two years out."

So now we're not going to have ATOs. Not that management by objective is a bad thing. It is a good thing, but the process everybody associates with ATOs is not going to happen anymore, because it was so out of sync with everything else. An ATO was a piece of a puzzle. The objective was a component, a subsystem, a system—6.1, 6.2, or 6.3. It was not a concept that would enable a capability. At the end of the day, you have just a bunch of piece-parts and a very hard puzzle that may or may not fit



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together. Instead, we will now focus on technology-enabled capabilities, and that substantially changes the structure of how we put together programs.

Let's start with looking at the puzzle that we're trying to put together. What is the capability we're looking at? Technology Enabled Capabilities [TEC] programs will still be objective-oriented, have milestones, and constraints; but they're going to be focused on delivering capabilities by a predetermined timeframe, and we are going to bring those ideas and programs to the Army leadership in a timely fashion.

To generate the ideas around which the TEC programs will be formed, we're going to have a "Big Ideas" workshop. We're going to have top-down leadership, from TRADOC, PMs and PEOs, G-8, and the Army S&T community participating in that workshop. Our objective is to generate five to 20 big ideas. The question will be, "What are the big problems the Army can't solve today, that technology can help us solve?"

The focus will be on closing gaps—not just addressing them. I use the example of lightening the load as one potential big problem. We know this is a problem. We've got Soldiers carrying 130 pounds. So, in this Big Ideas workshop, we might come out with something that says, I want you to give me a program that lightens the load for a Soldier or a small combat team through offloading or load redistribution, achieving a reduction of, for example, 25 to 30 percent for certain team positions and/or specific scenarios where loads may be extreme. We might set a goal of three years to demonstrate decreased load for equal or

better capability than they have today, against a preselected baseline. This sets a quantifiable goal or challenge around which a program can be constructed.

**Army AL&T:** Are you saying that improved capability is to be fielded in three years?

**Freeman:** No. This is to have things at Technology Readiness Level 6; however, we're going to get together a list of about 20 of these things, and we're going to say to the senior leadership, "Here's our list. Do you agree that these are the Army's top priorities, the big issues that you'd really like to have solved? If so, we ask that you prioritize them 1 to *n*." We have never created a prioritized list of big S&T issues before, nor focused on delivering new capabilities in a specified timeframe. I believe we have to do this to be relevant in this environment. It will give the S&T community what we need to focus our efforts for the near- and mid-term.

**Army AL&T:** The community being all the labs, all of your experts, your staff, everybody in Army S&T?

**Freeman:** Yes. My director for strategic plans and program planning is going to help the community come together to come up with viable solutions. For the example I just gave you, you're going to have to have people who know how to work Soldier weapons, communications, power and energy, armor, and other pieces of Soldier gear whose origin could be any number of facilities across the Army S&T enterprise. I expect them to work together to bring four or five pieces of this puzzle together in a synchronous manner to achieve the

goal. If they cannot meet the desired end state (because of technological challenges or funding shortfalls), they plan a program to get as close as possible in the timeframe set, and the remaining challenges become those we must work in other parts of the portfolio.

That starts setting up the next set of things, the enabling technologies, which are typically our applied research (6.2-type efforts) that we need to be working on. It also gives them a prioritization. In this case, we may need a breakthrough in science, and it helps us establish a guide and direction for future investment.

If funding shortfalls are the problem, then because we have leadership buy in on the priorities, we now have an opportunity to go into the POM [Program Objective Memorandum] process and more effectively compete for dollars. We have never had this capability before. We'll be better prepared, ahead of the game, because we won't just be looking one year out, and we will have Army leadership awareness and support. So when I say turning S&T upside down, this is what I mean. You have activities that are generating ideas and getting ahead of the "bow wave." Now we really can have a strategic view and a road map of where we need to go.

**Army AL&T:** Is there a single factor, or multiple factors, in modern warfare that drive the concern about closing gaps? What's the picture of warfare that you're working against?

**Freeman:** What we're really working against is persistent conflict and full-spectrum operations. You don't want to fight the last war all the time. But you have to be able to fight the last war and be able to figure out where you're going in the future war. That, frankly, is our partners' job to figure out, which is why we have to be working with them.



Whether we're out of Iraq, in or out of Afghanistan, or engaged in any other place in the world, this cornucopia of missions and mission skills and the burden it places on our Soldiers will continue.

Counterinsurgency-type operations are not going to go away. We have not done that very well, in terms of what we have given our Soldiers. We've got good equipment out there, but in the process, we have increased both the cognitive and physical loads on our Soldiers significantly.

Stability operations are going to continue. So our challenge is to look at this and understand other types of warfare where the biggest gaps are and will continue to be, the kinds of environments where Soldiers and small combat teams have to perform operations that change very rapidly. These are the missions where one minute a Soldier is in a vehicle getting all kinds of information—maybe engaging with the enemy or looking for IEDs—then the next minute is on foot engaging with the local population, having to adapt to multiple roles that may include being a friend, teacher, negotiator, diplomat, or a warfighter engaging the enemy.

Part of what our scientists in the “softer sciences” understand is that when you train a warfighter to be a warfighter, you're developing a certain set of skills. The softer sciences include cognition and cognitive training, part of which includes how we process information. Information is coming so fast and from so many directions, and many decisions have to be close to instantaneous. Soldiers will have to deal with this, and S&T can help ameliorate this burden, which by the way is another example of turning things upside down. The skills, knowledge, and attributes you need to do other noncombat parts of the mission are what the human dimension is all about. We are working very closely with TRADOC to achieve a better understanding of the human dimension.

We were very materiel-focused in the past. We had the Corps of Engineers, the medics, Army Research Institute, and training folks doing great research, but it was not integrated into a unified effort. The new approach is to focus on these big challenges and problems and not just the materiel things, encouraging the bigger community to work together to make a real capability impact.

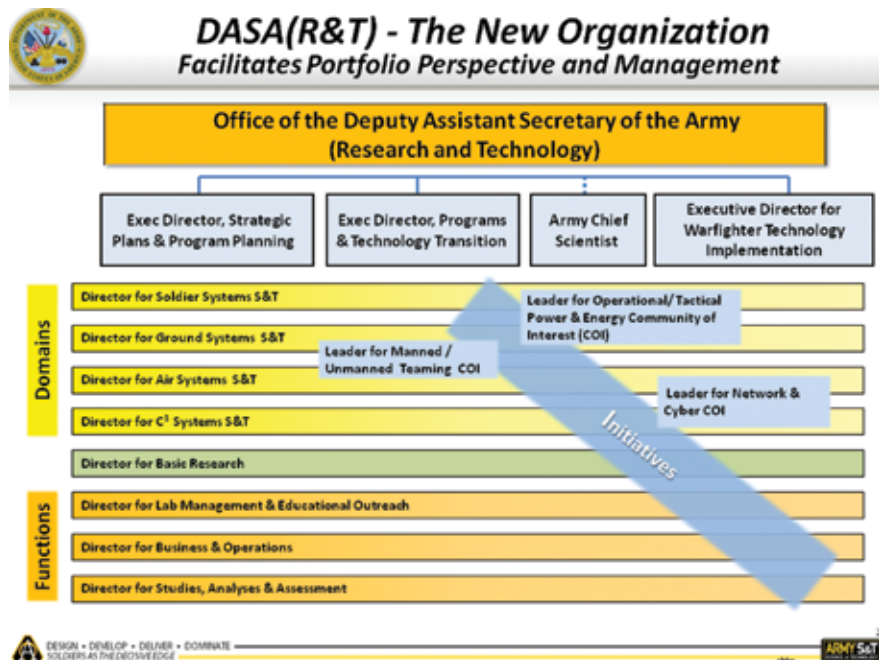
This brings me to the war-gaming aspect. You have to understand what Soldiers are doing. We send a lot of scientists and engineers to both training installations and to theater, but we can't send everyone. So one of the things we have had to do was create opportunities and venues for people to get together, focus around a problem or a mission, and, with Soldiers in the same venue, understand what they're thinking, how they're operating, and what their concerns are in a mission environment. That's what the war-gaming activities do. That's what a well-designed experimental venue will do.

For example, let's look at the battle at Wanat. What went wrong? The military has analyzed it, and the S&T community needs to understand the problem. In this scenario, we have

a small combat team that needs to establish a remote Forward Operating Base. We needed to understand the things they had to do, what they were thinking: What did they need, what did they take with them, and what can we give them to make them successful?

If we play this war game with Soldiers, scientists, and technologists in the room along with people from TRADOC who have to write new requirements and folks from industry who know how to transform ideas into materiel, we can start understanding what Soldiers think and how they equip to do their job. We get a baseline for what they're already doing and how their training and experiences influence their actions.

Then we say, OK, let's give you a new capability, for example, maybe an Exoskeleton or an equipment-carrying robot to improve your ability to carry or offload equipment. Or maybe I give you a lot more information that you didn't have before and then ask you, how would you execute your mission now? If we observe and interact with this process, we begin to understand the possibilities and potential impacts of technology on the warfighter and their mission. Context is important and is



another key aspect of reinvention, providing a virtual hands-on experience to understand the world of the warfighter.

Another part of this paradigm shift is focused on developing the platform. You put the stuff in and make it run, you make it mobile, you make it survivable—which means you put armor on it, maybe you put active protection systems on it, and all that's good. You design it. You build it. You test it, and then you put a Soldier in it. Then you have HRED [Army Research Laboratory's Human Research and Engineering Directorate] and the human factors people saying you've got to change it because they can't push that reset button there.

The sequence of events was linear. You've got to turn all that upside down and start with a Soldier operating as part of a team and the requirements associated with keeping that team intact. Now, when I design this vehicle, I'm trying to build it from the perspective that I want to have that squad operate all together, and their survivability and mission effectiveness take priority.

The bottom line is we have to understand all of those relationships. That's what S&T does as well—it helps you to understand the risks you're taking against the tradeoffs you inevitably have to make, and you're going to get a very different vehicle if you start developing from the Soldier, the squad perspective, versus that of the platform.

**Army AL&T:** Do you have any specific war-gaming events planned?

**Freeman:** Yes, we have several that started as a pilot effort when I was up at Natick. We used to do this same type of activity during the Army After Next initiative with TRADOC, but it was at a very high level: brigade and force-on-force. This experimentation is at the Soldier/small combat team level. Natick



developed a repeatable methodology to do this and worked with TRADOC to get multiple scenarios.

The latest experiment is still in the planning phase. We're going to be running a war-game, tabletop-type event. It will be focused on individual mobility platforms to examine several contractor-developed concept alternatives.

**Army AL&T:** Are there any detractors to this reinvention, besides inertia and tradition?

**Freeman:** One of the biggest detractors is that it is not natural for people to work together. It really isn't. Not just scientists—all people. Collaboration and cooperation are really not natural tendencies, especially when you're threatened by declining resources.

I liken it to playing cards. You never want to show your hand, because you're afraid if the other guy knows what you're doing, you'll lose the game. The higher the stakes in the game, the more closely you hold your cards. Right? The fact of the matter is, that is exactly the wrong thing to do in the world that we live in.

This is not a card game. This is not all about individuals or organizations themselves winning. It is about a bigger goal; it is about bigger survival. Therefore, the way you win this game is by laying your cards on the table and exposing it all, and being willing to share what you've got and the talents and capabilities that you bring to the table to solve the problem. So it is a difference between being in a card game and being an individual or an organization trying to win, and being in a problem-solving mentality. You've got to be in a problem-solving mode to win this game. Either everybody wins or everybody loses in this game, as I see it.

**Army AL&T:** So how do you overcome the tendency to not collaborate?

**Freeman:** You force it. You ask for results. I'm focused on results, not on activity. Activity is good; activity is the venue. But the demand for accountability, transparency, and responsibility has to be demonstrated through results, and people have to be held accountable for those results.

**Army AL&T:** Speaking of resources, what level of funding, short- and longer-term, will you need to

successfully reinvent Army S&T? Do you expect to obtain the funding?

**Freeman:** The interesting thing is, we have a \$2.3 billion budget. Every year Congress, up to this point, has been increasing that by giving an average of \$1.3 billion per year. They've been increasing the budget by 60-70 percent over the last six years with congressional adds. We've been working very hard to make those adds meaningful to the Army mission. Some organizations have been able to do it better than others. The fact of the matter is, in effect, our budget is actually going to dwindle, as opposed to grow.

I can't give a number for what the level of funding is until I've gone through the process to see what the big ideas are, build the programs to deliver the capabilities, cost them out, and so forth. Part of the strategy is that as you're doing this, you're also working on a growth strategy. But before you can do that, you've got to figure out what's important and establish priorities.

**Army AL&T:** Who are the customers?

**Freeman:** I prefer the word "partners." Partners are in the game with you, not shopping around for products like customers. Our partners are other DOD organizations like the PMs and PEOs, the Defense Advanced Research Projects Agency, and the Defense Threat Reduction Agency, for whom our scientists and engineers are matrix support and/or performing reimbursable work.

In this current environment, there is a real threat that if PEOs or PMs get budget cuts, and as Other Procurement, Army, funding goes away, and supplementals go away, these organizations will likely reduce their matrix support before they get rid of their in-house capabilities. That's why partnerships and value added are extremely important.

What do we add in terms of our skills, capabilities, and knowledge? What should they rely on us for? Again, it's not just widgets. It's people, it's knowledge, it's programs. We've got to look at the balance. We're facing some pretty tough things here, not the least of which is being held to the FY10 funding levels or less.

I believe we need more money. I believe \$2.3 billion, if we are going to have the impact that the Army S&T community should have, is not sufficient. I can't tell you we need to double it. I can't tell you what the magnitude is. I believe we need more. The way to get more is to plan the process of the POM and take these things that are priorities, and identify if we don't have enough money. Here's where a trust factor comes into play that says, "Can you deliver?" It is going to be very important to me that whatever this first set of programs are, these technology-enabled capabilities demonstrations, we deliver on them. If we don't deliver on those, this will all fall apart.

**Army AL&T:** You'll have lost your relevancy battle.

**Freeman:** That's exactly right. If you lose that relevancy battle, then I believe that it is going to be very hard to defend keeping the laboratories and the scientists and engineers in the Army. In addition, we have to look at the demographics in the workforce and ask ourselves if we have the right skills. Until we have a strategy, we can't make that determination.

To make things worse, we also have an aging and crumbling infrastructure, and we do not play well in the world of Military Construction. Part of this is, how do we fund the kinds of improvements that we need where we need them? The BRAC [Base Realignment and Closure] process gave us a lot of nice facilities up at Aberdeen [Proving Ground, MD] and other

places where we've had BRAC. That is not a long-term solution.

One of my nine strategic goals for Army S&T is a highly skilled and motivated workforce. Well, if you don't have a reasonably good infrastructure, you don't have good laboratories to work in, and you don't give scientists and engineers the kinds of facilities and equipment they need, it is hard to attract them.

**Army AL&T:** If you had one message to get across to the Army AL&T Workforce, what would you want to say?

**Freeman:** I'd really like them to embrace these goals and understand from different perspectives, including their own, what this means—really understand what we're trying to do, to broaden their horizon and start thinking more about the overall results that we're trying to achieve.

I would really like them to internalize what it takes, at all levels, to achieve this vision and these goals. This is not a ship-sinking message of "get on board or get off." This is an "understand what we're trying to do" message. Once you understand what we're trying to do, be a piece of the puzzle and go figure out the other pieces of the puzzle you should work with to make this happen.

We have such wonderful scientists and engineers who are smart and capable—and not just the scientists and engineers. All of our people, all of our administrative staff, all of the people who make this whole enterprise run need to understand this.

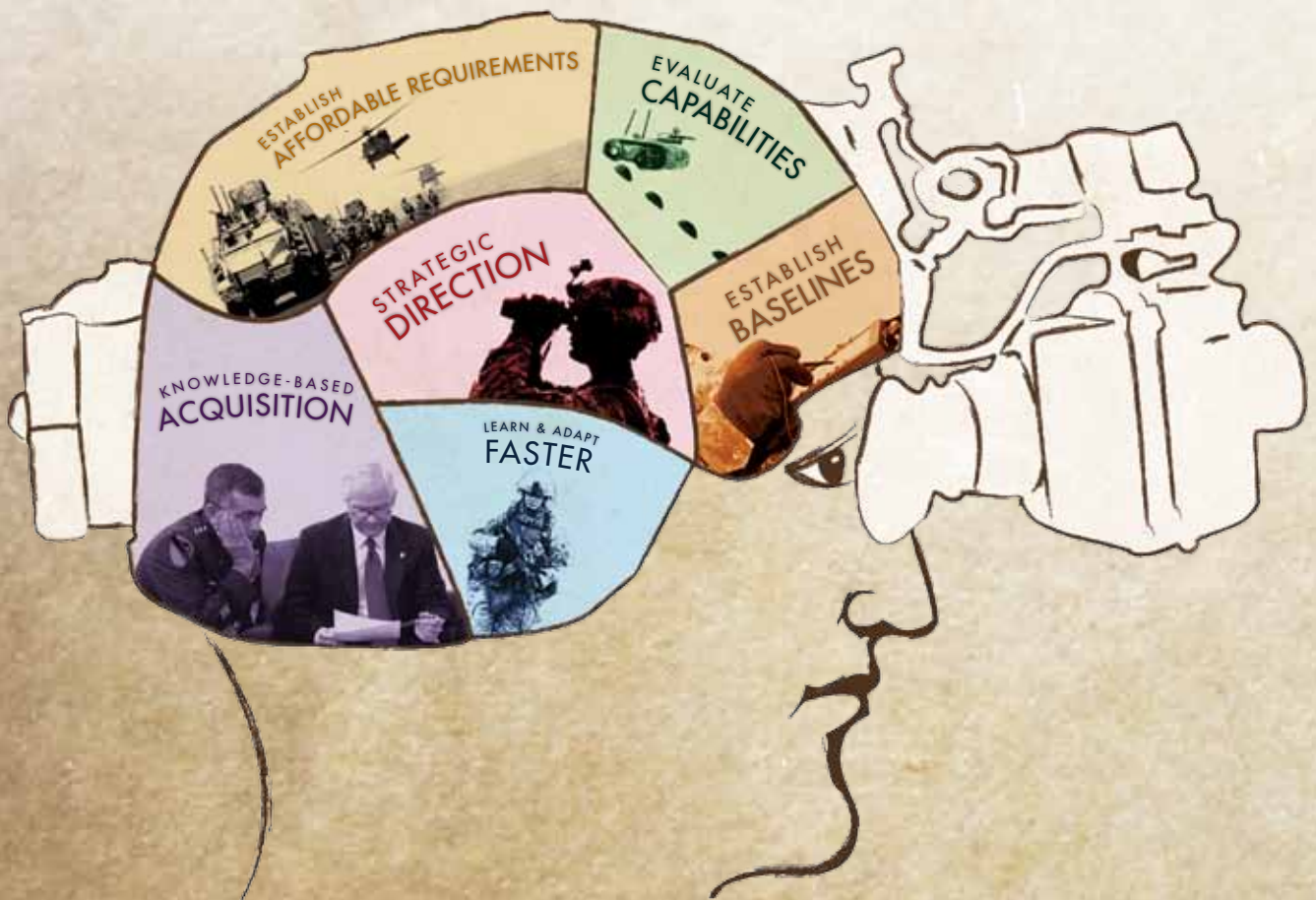
Everybody is a leader. Everybody is somebody who can make a difference. Everybody has a part in this. We talk a lot about the scientists and engineers, but it is all the people who make the laboratory system run. They all need to get this. They all need to get involved and get fired up. That's what I want.



# Embracing a Knowledge-Based Approach to Acquisition and Force Modernization

LTG Michael A. Vane

**S**ecretary of Defense Robert M. Gates recently noted that the armed services must accelerate their development and acquisition processes. Adapting their methods will require continued close involvement with industry and the adaptation of their best ideas and initiatives to help us become more efficient while improving operational effectiveness. We, in the Army Capabilities Integration Center at U.S. Army Training and Doctrine Command (TRADOC), Fort Monroe, VA, understand that to accelerate the Army's operational requirements and acquisition processes, it is imperative to incorporate the many industry lessons learned and best practices to more quickly and effectively place capabilities in the hands of our Soldiers.



A knowledge-based approach—getting more information earlier on operational requirements, costs, technical feasibility, and trade space—is key to achieving affordable force modernization and one that industry leaders have found to be highly successful.

To use a knowledge-based approach, you need to have a good understanding of where you are. Force modernization really starts by establishing baselines.

Baselines must be more than just the numbers and types of organizations and their associated personnel, equipment, and materiel. The baseline also must establish what organizations or warfighting functions were designed to do; their current and projected ratios of boots-on-the-ground to dwell time; how they train and to what standard; how they employ their “how to fight” doctrine and execute their battlefield functions; what the Soldiers, training, sustainment, and equipment life-cycle costs are; and the one-time procurement costs.

Another essential component of the baseline is describing what dependencies the organization or warfighting function relies on from other organizations or warfighting functions to accomplish its missions.

It is from this baseline that one begins to establish the force modernization strategy of potential improvements and determines whether the capability improvements justify the associated costs.

### Setting a Strategic Direction

Once you know where you are, it is important to know where you are going. Army concepts and their associated implications for doctrine, organization, training, materiel, leader development and education, personnel, and facilities (DOTMLPF) are critical to framing the strategic direction for force modernization.

But you must also stay linked to what Soldiers in the current fight need. These Soldiers at the “edge” provide the best feedback, lessons learned, and insights into where the Army needs to go.

This is also the hotbed for innovation, where opportunity, demand, and feedback from the edge need to be linked in real time. Here, opportunity is clearly associated with the pace of technological change, and the demand is dictated by a very adaptive adversary.

Those engaged in the close fight have some of the best ideas for the needs. This means the Army must also stay closely linked to the technology community so that we can lead innovation by keeping needs linked to opportunities. And these needs and ideas must be quickly incorporated into the mainstream of emerging concepts and developments, to make them relevant to today’s fight while moving us closer to the force envisioned in our force modernization strategy.



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The Army does this through warfighting forums, such as those led by U.S. Army Forces Command on Brigade Combat Teams; TRADOC Centers of Excellence on the other warfighter functions, signal, and aviation; and close cooperation with the U.S. Army Research, Development, and Engineering Command labs.

### Closing the Gap, Affordably

We are now at a point where we want to close the gap between where we are and where we are going. We want to make the Army more operationally adaptive and effective, but we must do it in a way that is affordable in the long run.

We must take a hard look at the quality of our acquisition personnel and increase the number and quality of contracting officers and civilian analysts; improve services contracting; and invest in generating contracting expertise at the general-officer level.

We must also increase our numbers and expertise in systems engineering, quality assurance, operations research and systems analysis, and cost estimating and contracting throughout the Army.

What we have learned from industry is that we must strive for more knowledge earlier in the acquisition cycle. Knowledge is power, and knowledge earlier is more power. A knowledge-based approach accelerates development and reduces the time required to produce and field solutions.

For potential materiel gaps, this requires the Army to assemble multidisciplinary teams upfront and to form better and broader partnerships across the user, developer, and acquisition communities. The multidisciplinary teams should consist of scientists; engineers; costing, pricing, and purchasing experts; operators; testers; legal reviewers; and users (Soldiers). The assembling of this team during the initial design phase allows for greater fidelity and

confidence in the identification of requirements and costs.

It is our intention to achieve 70 percent or more requirements identification and definition for each capability, ensuring that they are resource-informed earlier and in-house before we issue requests to industry for proposals.

### Examining Requirements

As part of this effort and in addition to establishing threshold requirements, we also see the need to identify sub-threshold requirements, to set the stage for trades during the development and design process and to support high-fidelity modeling or virtual prototyping.

Design engineers have to deal with many competing requirements and performance parameters or criteria. We have to define the acceptable trade space within which they will operate. These must be well-defined with metrics, and we must be able to use the metrics and the cost/benefit to make affordable trades across warfighting functions and the DOTMLPF. Analyzing these criteria using modeling and virtual prototyping will reduce time, energy, and money.

All this will provide more cost and performance data than what is currently required at the defense acquisition Milestone A and as prescribed by the *Weapon System Acquisition Reform Act of 2009*; DoD Directive 5000.01, *The Defense Acquisition System*; and DoD Instruction 5000.02, *Operation of the Defense Acquisition System*.

True success in this process will require the Army to develop in-house expertise to better understand what we need and to identify the associated technical risks to better guide and support industry efforts. Obtaining greater knowledge of requirements upfront will drive down costs, risks, and time to production, particularly when this knowledge is coupled with affordability targets in dollars and force structure.

### Learning and Adapting Faster

One of the challenges in a knowledge-based approach is trying to determine when you know enough to go forward, while not letting the learning rigor develop into rigor mortis. Understanding that learning is a continuous effort, the Army must adapt to a shorter, faster “learn, adapt, learn, adapt” cycle. The Army must move away from an over-reliance on necessary long-term, sequential planning and become flexible enough to include emergent learning and innovation, to evolve capabilities as opposed to pursuing long-lead, high-risk, leap-ahead technologies.

Lessons from the current fight continue to show that a faster cycle of change is needed, along with the ability to field in increments to support the operational Army’s battle rhythm, the Army Force Generation (ARFORGEN) cycle.

The pace of change, the deployment cycles, and the need to learn and adapt mean that the Army may not buy the same item for every unit. This leads to a strategy requiring the Army to equip to mission and to buy fewer, more often. The Army is already seeing pressures to buy for those units that must be ready in the ARFORGEN cycle, set up decision points for the next cycle, adjust contracting to reflect incentivizing competition through that next decision, and insert technology as it becomes available.

Force modernization needs to be related to readiness. This includes forcing ourselves to look at the cost of maintaining operational availability versus a new start: What is the crossover point of upgrading or modernizing a current system with component parts, compared with a new program? We need a long-term, informed strategy that has frequently established decision points.

All of these factors give the Army a tremendous incentive to get more knowledge earlier, to more effectively execute the development and

acquisition of capabilities by the most rapid, efficient, and affordable means.

With the current resource constraints and the demand to drive continuing relevance of sometimes lengthy institutional processes, TRADOC has shifted from a five-year to a two-year cycle to examine and update operational and functional concepts. As stated earlier, these documents are key to developing the force modernization strategy, as they identify the gaps from the baseline.

These shifts allow for more frequent submissions to keep up with the pace of change, incorporate lessons learned, and support critical budget and program decisions.

From a process standpoint, this cycle leverages warfighting-focused concepts as the basis for Capabilities Based Assessments to inform Program Objective Memorandum development. With a faster concept cycle and more knowledge earlier, we can provide budget input that gives us higher confidence in executing an affordable force modernization strategy.

### Evaluating Capabilities

Experimentation, testing, and exercises are valuable venues for gaining knowledge earlier in the process. But today these venues are too sequential, with very little sharing nor a collaborative building of the knowledge base earlier and throughout their execution. Separate, sequential events mean longer time and increased costs.

The Army must move to converge its experiments, evaluations, and testing. This convergence has the greatest potential to accelerate the delivery of capabilities without sacrificing necessary learning. To speed up testing, all known and emerging test issues, test criteria, and all earlier test results must be made available and used to inform all follow-on experimentation, testing,



and evaluation. This will require testers to credit the programs in concert with experiments and exercises with these early results.

We must adjust our thinking about testing and deciding based only on the requirement, and get to evaluating the potential capability. When possible, virtual prototyping should replace physical prototype modeling to further accelerate learning.

High-fidelity modeling or virtual prototyping is a true trademark of how industry converges ideas and simulations, and a practice we can learn from. Industry uses these methods to identify performance and cost-informed trade assessments upfront. As demonstrated by the auto industry, this may reduce costs by as much as 25 percent and decrease production time by 8–14 months.

Valid test data must be included earlier and throughout, aligned and compared to a growth curve tied to eventual critical operational issues and criteria. Testing over the shoulders with industry and at various developmental

activities and experiments must be leveraged. This, in turn, delivers more specifics to the design engineers and teams building the prototypes.

Today, the Army has demonstrated the ability to converge experimentation, exercises, and training with the Army Evaluation Task Force (AETF) and the Army Expeditionary Warrior Experiment. There is great opportunity to have all of the essential elements and to execute complex tasks in parallel, while retaining the independence required by law for our test community.

### Obtaining Soldier Feedback

Another key element of more knowledge earlier is to get customer feedback upfront and throughout. With the AETF, our user battle labs, and the Army’s research and development centers in mind, we must get actual, experienced Soldiers on equipment earlier in the development and testing processes. Designs for Army equipment and vehicles should be developed to meet Soldiers’ needs from the “inside out,” not the “outside in.” Soldiers’ needs and expectations must be at the forefront of new designs. These include

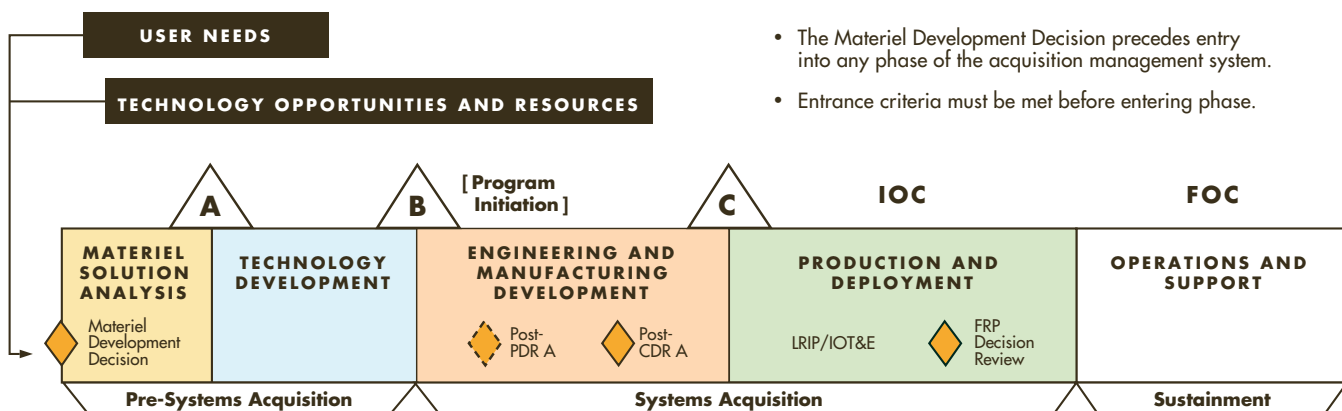
Soldier basic loads, power needs, Soldier access to network information, and safety concerns.

This is simply a smarter, better, and, in the long term, more effective way to operate. The later Soldiers engage on equipment, the harder it is to go back down the development curve when they identify problems. Adjustments made later in development are costly in time and dollars.

The Army Manpower and Personnel Integration (MANPRINT) program is also used to influence design so that materiel and information systems can be operated, maintained, and supported in the most cost-effective manner, consistent with available manpower, personnel aptitudes and skills, and training. The result is to optimize total system performance.

The MANPRINT program ensures that Soldier performance is the central consideration in system design, development, and acquisition. It is the technical process of integrating the interdependent elements of human factors engineering, manpower availability, personnel skills and

## DEFENSE ACQUISITION MILESTONES



- The Materiel Development Decision precedes entry into any phase of the acquisition management system.
- Entrance criteria must be met before entering phase.

CDR: Critical Design Review  
FOC: Full Operational Capability

FRP: Full-Rate Production  
IOC: Initial Operational Capability  
IOT&E: Initial Operational Test and Evaluation

LRIP: Low-Rate Initial Production  
PDR: Preliminary Design Review

abilities, training design, system safety, health hazards, and survivability.

### Understanding Resource Constraints

Another key challenge in using a knowledge-based approach to support an affordable force modernization strategy is knowing what the Army's resource constraints are and how to work within them.

Specific priorities must be established within and across force modernization strategies, for both operational and resource targets, to help make trades and find redundancies. Every capability we put into the force must have a clear cost/benefit associated with it. Cost and benefit must drive the decisions.

Strategic planning and programming guidance from senior leadership and staff should reflect the dollar and manpower constraints early in the development process.

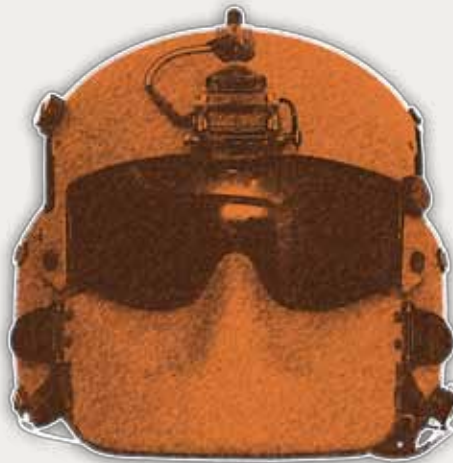
As part of a knowledge-based approach, these procedures hold great potential for the Army. Program managers will know more before they contract. They will know more about costs, thereby driving down costs; they will know more about performance, thereby driving down risks; and vehicles are produced sooner, perhaps within a 4- to 5-year window by increasing knowledge at Milestone A that is now required at Milestone B.

But, at the end of the day, speed matters—speed in terms of responding to the current fight, synchronizing all elements of DOTMLPF for simultaneous delivery, and adapting the force overall.

The Army is at war; 8.5- to 11-year production cycles are too long. The threat changes, technologies change, and political leadership changes.

Although the Rapid Equipping Force fielding timelines for existing

**Knowledge is power, and knowledge earlier is more power. A knowledge-based approach accelerates development and reduces the time required to produce and field solutions.**



off-the-shelf equipment such as the Mine Resistant Ambush Protected Vehicle and Counter-Rocket, Artillery, Mortar averaged 1 to 2 years, the development and fielding of the M2 Bradley Infantry Fighting Vehicle took 17 years, and our Patriot Air Defense Artillery system, 21 years. The Army has continuously lagged behind the civilian sector regarding new equipment acquisitions when compared with recent industry achievements of a 5.8-year average for commercial aircraft, 2-year average for automobiles, or 1.5-year average for commercial spacecraft.

The Army can do better, and must motivate and incentivize the workforce to deliver warfighter outcomes for the Soldier, and not just to achieve process gates. At the same time, we need to clearly understand the risks we are mitigating and those we are accepting as we make the necessary trades to sustain an affordable force modernization strategy.

### Conclusion

The Army is improving and creating a more viable and responsive acquisition program.

Embracing a knowledge-based approach to acquisition accelerates development and reduces the time required to produce. By using a multidisciplinary team upfront, the process incorporates more knowledge earlier, thus allowing for high-fidelity modeling or virtual prototyping and performance and cost trade decisions to help drive down costs and risks.

The realities of conflict compel the Army to become mentally and physically adaptable, able to outthink, outwit, and outperform adversaries.

The character of conflict also places more demands on research, development, and procurement. These include the ability to integrate new and innovative commercial technologies without burdening the receiving unit.

The Army must learn from industry and adopt more effective best practices. A knowledge-based approach to acquisition is a way to increase effectiveness and move toward more affordable force modernization.

**LTG MICHAEL A. VANE** is the Deputy Commanding General, Futures, and Director, Army Capabilities Integration Center at TRADOC. He holds a B.S. from the U.S. Military Academy and an M.S. in joint command, control, and communications from the Naval Postgraduate School. Vane is a graduate of the U.S. Army Command and General Staff College and the U.S. Army War College. He commanded the 11th Air Defense Artillery Brigade, 32nd Army Air and Missile Defense Command, and the U.S. Army Air Defense Artillery Center and Fort Bliss, TX.

# LTG Susan S. Lawrence, New Army Chief Information Officer, Calls for Cultural Shift

Margaret C. Roth

**T**he Army's new Chief Information Officer (CIO)/G-6, LTG Susan S. Lawrence, says the Army's sweeping network modernization effort, its number one priority in modernization, will require a fundamental cultural change.

LTG Susan S. Lawrence is the Army's new CIO/G-6. (U.S. Army photo.)





## LTG SUSAN S. LAWRENCE

LTG Susan S. Lawrence, a native of Iowa, has served in the Army since 1972.

She was an enlisted Soldier until 1979, when she received her commission as a second lieutenant. Since then, Lawrence has held a variety of command and staff positions at all levels.

Before her appointment on March 3, 2011, as the Army Chief Information Officer (CIO)/G-6, Lawrence was the Commanding General (CG), U.S.

Army Network Enterprise Technology Command/9th Signal Command (Army), Fort Huachuca, AZ.

Lawrence also has served as the CG, 5th Signal Command, while also serving as the CIO/Assistant Chief of Staff, G-6 for U.S. Army Europe and Seventh Army. She commanded the 7th Signal Brigade, 5th Signal Command, before serving as Chief of Staff and Vice Director, J-6, Joint Chiefs of Staff at the

Pentagon. She also served as the Director, Command and Control, Communications and Computer Systems, J-6, U.S. Central Command.

Lawrence holds a B.S. degree in psychology from Campbell University and an M.B.A. in information systems management from the University of Georgia. She is also a graduate of the U.S. Army Command and General Staff College and the Army War College.

Lawrence, who was promoted to lieutenant general and on March 3 was appointed as the Army CIO/G-6, previously headed a comprehensive review as special assistant to Vice Chief of Staff of the Army GEN Peter W. Chiarelli. The review looked for information technology (IT) efficiencies in the areas of personnel, processes, requirements (including technology, evolution, and testing), and policy.

She shared her perspectives on IT efficiencies during a panel discussion Feb. 24 on "Network Enabled Mission Command" at the Association of the United States Army (AUSA) Institute of Land Warfare's Winter Symposium and Exposition in Fort Lauderdale, FL.

"We run into a unique environment called culture," she told the audience of military and industry. "We're really going to have to change our thinking," she said, to make the most of the opportunities in network modernization.

Among other findings, the IT efficiencies group identified more than 70 regulations governing the network, many of them in conflict. "Most were from the Industrial Age, not the Information Age," Lawrence said. The review's findings will feed into an overarching network strategy document that the Army is preparing.

### The Path Forward

"Right now, the network is the Army's number one modernization effort," said Lawrence in an Army statement announcing her appointment. "We want a network that can provide Soldiers and civilians information of all categories and forms, as well as a means to collaborate in real time, at the exact moment required, in any environment, under all circumstances."

As the CIO, Lawrence reports directly to the Secretary of the Army. She is responsible for setting strategic direction and objectives, and supervises all Army command, control, communications, and computers and IT functions.

As the G-6, Lawrence supports the Chief of Staff of the Army and the Army Staff in the areas of information management, network operations (including computer network defense), force structure, and the equipping and employment of signal forces. As CIO/G-6, she oversees a \$10 billion annual budget for IT.

Lawrence succeeds LTG Jeffrey A. Sorenson, who retired from the Army in November.

### Encouraging Results

Network modernization necessarily involves multiple players, Lawrence said. Asked during a

question-and-answer session at the AUSA meeting who ultimately would be responsible for its success, she said, "This is clearly a team sport, and the picture's getting clearer every day."

Lawrence was optimistic about the prospects for success, noting that the Army has already demonstrated the capability to connect network mission planning in Afghanistan and in CONUS. MG James L. Terry, Commanding General of the 10th Mountain Division (Light) and Commander of Regional Command South, NATO International Security Assistance Force in Afghanistan, was able to access mission planning documents developed in CONUS as soon as he arrived in theater in November, Lawrence noted.

"We're there. We've just got to be able to get this executed globally. We're going to put a battle system command in the cloud in the very near future," she said.

**MARGARET C. ROTH** is the Senior Editor of *Army AL&T* Magazine. She holds a B.A. in Russian language and linguistics from the University of Virginia. Roth has more than a decade of experience in writing about the Army and more than two decades' experience in journalism and public relations.

# Army Outlines Network Strategy

Kris Osborn, Patricia Rice, and Margaret C. Roth

**O**ver the past year, the Army has developed a holistic network strategy that fundamentally changes how network technologies are integrated and deployed, said GEN Peter W. Chiarelli, Vice Chief of Staff of the Army.

Army Evaluation Task Force Soldiers check network connections on their network-equipped Mine Resistant Ambush Protected All-Terrain vehicles at the Tactical Operations Center (TOC) before deploying to support Company Situational Training Exercises at White Sands Missile Range, NM. During testing last year, these vehicles relayed critical sensor data from the field to the 2nd Combined Arms Battalion TOC, often from company outposts up to 20 kilometers away. (U.S. Army photo.)



“The network is now the Army’s highest modernization priority. Having every Soldier plugged into the tactical network and giving them means to access and distribute information would give the Army a tremendous advantage [over our adversaries],” Chiarelli said.

In the past, the Army fielded network systems independently and on their own acquisition timelines, said COL John Morrison, Director, G-3/5/7 Land-WarNet. The Army’s new approach is to leverage mature technologies through integrated network “capability sets” aligned with Army Force Generation requirements, whereby equipment is delivered and synchronized to deploying forces, Morrison added.

The most important component of the strategy is to deploy network capability sets that will provide an integrated, seamless network capability, from a tactical operations center, to the commander on the move, to the dismounted Soldier, Morrison explained. Beginning in FY12, the Army will align resources to field these capability sets to as many deploying or available formations as possible.

### Exercises and Evaluations

With these goals in mind, the U.S. Army plans a series of network developmental exercises and evaluations this summer at Fort Bliss, TX, and White Sands Missile Range, to examine technologies and integrate multiple programs into a larger tactical network capable of transmitting voice, data, images, and video faster, farther, and more efficiently across the force in real



CW5 Leslie Cornwall (left) and MAJ Marcus Odom from the U.S. Army Training and Doctrine Command Capabilities Manager Networks and Services examine Warfighter Information Network-Tactical (WIN-T) equipment during the WIN-T Increment 2 Engineering Field Test at Fort Huachuca, AZ, in December 2008. (U.S. Army photo by Richard Mattox, Program Executive Office Command, Control, and Communications-Tactical.)

time, service officials said (See related article, Page 25).

This large-scale evaluation “gives us the line-of-sight challenges that we need to deal with, and the distance that we have to deal with,” said MG Keith C. Walker, Commanding General of the Brigade Modernization Command at the U.S. Army Training and Doctrine Command’s Army Capabilities Integration Center. “The priority for our testing is the network,” Walker said, speaking during a panel discussion Feb. 24 on “Network-Enabled Mission Command” at the Association of the United States Army Institute of

Land Warfare’s Winter Symposium and Exposition in Fort Lauderdale, FL.

By integrating Programs of Record and non-Programs of Record, the Army is striving to extend a robust network down to the dismounted Soldier, thus providing key situational awareness and mission command at the platoon and company levels. The idea is for a terrestrial tactical network using non-proprietary high-bandwidth waveforms such as Soldier Radio Waveform and Wideband Networking Waveform, a mobile satellite network such as Warfighter Information Network-Tactical, and various battle command applications to work seamlessly as part of a broader battlefield network, connecting dismounted Soldiers, command posts, and vehicles on the move.

To help meet the challenge of dependent, synchronized network engineering and integration, the Army will conduct synchronized network test and evaluations, helping to align Programs of

By integrating Programs of Record and non-Programs of Record, the Army is striving to extend a robust network down to the dismounted Soldier, thus providing key situational awareness and mission command at the platoon and company levels.



Using the AETF events to help integrate and synchronize Programs of Record prior to deployment will give us the ability to incrementally upgrade the network capability sets, reflect changes in technology, and bring in the best of industry to help support this effort.

Record and other technical solutions in a holistic network that mirrors the complexity in theater today. Structured tests for record such as Limited User Tests will be synchronized, while ongoing Brigade Combat Team Integration Exercises (BCTIEs) will serve as integration evaluations for tactical network development. BCTIEs allow Soldiers, through the Army Evaluation Task Force (AETF) at Fort Bliss, to provide valuable doctrinal feedback to combat and materiel developers before the network capability is integrated into the operational force. The 2nd Brigade, 1st Armored Division has the AETF mission to evaluate about 20 candidate systems during the exercises this summer.

The AETF will now serve as the network's primary test unit with a twofold intent: to remove the integration burden from the operational units and to provide an operational venue to evaluate new technologies and network capabilities before they are fielded. The new capabilities that Soldiers integrate and assess will ultimately provide the impetus for future acquisition and equipping decisions.

"We're going to do a bunch of evaluations of capability using the AETF. We are talking about bringing software and computers together to provide network capabilities," said COL Michael Williamson, Deputy Program Executive Officer Networks within Program Executive Office (PEO) Integration. "These BCTIEs are not tests for record, but instead an evaluation and integration process with Soldier input. We have a series of exercises and evaluations

in 2011 and 2012, with a culminating event in late 2012, which will allow the Army to make decisions about what capability gets deployed."

The evaluations will also help the Army shape tactics, techniques, and procedures, said Morrison.

"These are not just technical evaluations, but they are also operational assessments designed to get feedback from Soldiers. By putting these

capabilities into their hands, we expect to see product improvements coming out along with tactics, techniques, and procedures. This is a fundamental shift, because now at the front end and throughout the entire process, Soldiers will be touching the equipment, giving the acquisition community an indication of whether they are headed in the right direction," Morrison said.

"The quicker we get a candidate system in Soldiers' hands," through collaboration among Soldiers, engineers, materiel developers, and industry, "the sooner we will get a bad idea out [of the running] or get a good idea going," Walker said. Evaluations of this scale and scope cannot be done through simulation or modeling, he noted.

The BCTIE approach allows more flexibility during the acquisition process

**Soldiers monitor input from the TOC at White Sands Missile Range during the 2010 Limited User Test. The Army is planning several network integration tests and evaluations in 2011 to further define the emerging tactical network. (U.S. Army photo.)**





Photos, video, and text are fed to Soldiers in the TOC during an exercise conducted by the Army Evaluation Task Force at White Sands Missile Range. The network allows Soldiers to communicate with different units at various levels of command. (U.S. Army photo.)

and enables the Army to acquire network capability more efficiently and effectively, service officials said.

“Using the AETF events to help integrate and synchronize Programs of Record prior to deployment will give us the ability to incrementally upgrade the network capability sets, reflect changes in technology, and bring in the best of industry to help support this effort,” said Paul Mehney, PEO Integration spokesman.

### Common Operating Environment

As part of this endeavor, the Army is transforming the way it acquires and develops networking capabilities, applications, and information technology systems. It is working to establish a common operating environment (COE) wherein multiple systems can work together simultaneously through common Internet protocol standards,

messaging formats, and operating systems, service officials said.

“For years we built great logistics. We built mapping products and fires systems. All of those were great programs, but the reality was we had to move the data back and forth between them. We built some of those things with different underlying architectures. Now we are working to get the underlying infrastructure, the operating systems, and operating environment standardized. What you want to do is make sure you can operate all of your technologies in the same environment,” Williamson said.

Additionally, availability of the COE and the nonproprietary waveforms will give industry a baseline from which to build, helping to ensure integration-ready network solutions, Mehney said.

In the coming months, Army developers plan to reach out to industry

partners and solicit ideas for innovative technologies that can be integrated into the network and deliver better capability to Soldiers. This effort will invite Army laboratories, academia, and industry partners to further develop Army Programs of Record and to locate commercial-off-the-shelf technologies that might prove useful to the network, Williamson said.

“We intend to make announcements out to industry to get them to bring their technology. There are some capability gaps, things that we know we want somebody to build for us. There are technological opportunities where innovative companies come up with ideas,” said Williamson. The idea behind this approach is to give the Army the opportunity to leverage emerging technologies and take proper advantage of new developments, he said.

“It’s about speed. At the end of the day, this is about how I can bring that capability to Soldiers faster,” said Williamson.

**KRIS OSBORN** is a Highly Qualified Expert for the Assistant Secretary of the Army for Acquisition, Logistics, and Technology Office of Strategic Communications. He holds a B.A. in English and political science from Kenyon College and an M.A. in comparative literature from Columbia University.

**PATRICIA RICE** is a Strategic Communications Analyst for HQDA, G-3/5/7 LandWarNet Directorate. She holds a B.S. from the University of Mary Washington and an M.B.A. from Simmons School of Management.

**MARGARET C. ROTH** is the Senior Editor of *Army AL&T* Magazine. She holds a B.A. in Russian language and linguistics from the University of Virginia. Roth has more than a decade of experience in writing about the Army and more than two decades’ experience in journalism and public relations.

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# Army Plans Combined Limited User Tests for Network

Kris Osborn

**T**he Army is preparing an Integrated Network Baseline Evaluation (INBE) exercise for this summer at White Sands Missile Range, NM, to simultaneously conduct several Limited User Tests (LUTs) for key Programs of Record and to assess the capability of a host of technologies to work in tandem in a larger integrated cohesive network, service officials said.

A convoy of future on-the-move platforms, including three Point of Presence vehicles (front), takes part in the Warfighter Information Network-Tactical (WIN-T) Increment 2 Engineering Field Test at Fort Huachuca, AZ, in December 2008. (U.S. Army photo by Richard Mattox, Program Executive Office Command, Control, and Communications-Tactical (PEO C3T).)





“This is a monumental undertaking, and it requires a new level of integration and synchronization,” said COL John Wendel, Project Manager Infantry Brigade Combat Team, part of Program Executive Office (PEO) Integration. “The purpose is to seek efficiencies and synergies. The idea of combining events forces integration, so what we will do is synchronize the technologies into a singular network brigade formation.”

The first four weeks of the exercise, slated for this June with the 2nd Brigade, 1st Armored Division at Fort Bliss, TX, adjacent to White Sands, will include the concurrent LUTs.

“If you combine the events, you are going to get better answers that cut across programs, systems, and agencies. It will also make us more agile going forward,” Wendel said.

### An Integrated Network

The last two weeks of the INBE will include an exercise aimed at synchronizing the systems into an integrated combat network. The idea is to facilitate a series of annual evaluations that will serve to expedite the developmental process and better inform the Army’s tactical network acquisition decisions.

“By beginning to conduct exercises that look at an integrated network, the Army intends to lessen the in-field integration burden on our operational units by providing relevant operational environments in which to evaluate new technologies and capabilities that make up capability packages and sets, prior to fielding the new systems to operational units. This will ensure that the important integration work is done upfront,” said Paul Mehney, PEO Integration spokesman.

Having the Army incrementally develop network technologies best suited to serve Soldiers in combat is designed to combine Army Programs of Record with commercial-off-the-shelf solutions

If you combine the events, you are going to get better answers that cut across programs, systems, and agencies. It will also make us more agile going forward.

from industry. The desired result is an affordable, technologically mature tactical network that can move combat-relevant information across the force in real time, using high-bandwidth waveforms such as Soldier Radio Waveform (SRW) and Wideband Networking Waveform (WNW), Wendel said.

“In the past, we have spent years building requirements and products. Now we will conduct these evaluations every year, testing technologies from industry and Programs of Record to gain some economies of scale and make smarter acquisition decisions on a more frequent basis. The important part is

transitioning these objective waveforms to Programs of Record,” Wendel added.

The systems undergoing LUTs are:

- Joint Tactical Radio System (JTRS) Ground Mobile Radio, a multi-channel, vehicle-mounted, software-programmable radio able to transmit voice, video, data, and images using high-bandwidth waveforms such as SRW and WNW.
- JTRS Hand-held Manpack Small Form Fit, a multi-channel, Soldier-mounted, software-programmable radio with the same transmission capabilities as the Ground Mobile Radio.

A Tactical Communications Node vehicle (right) and a generator were among the assets used in the WIN-T Increment 2 Limited User Test at Fort Stewart, GA, in March 2009. (U.S. Army photo by Jason Bock, PEO C3T.)





A Soldier uses Force XXI Battle Command Brigade and Below to plot the position of friendly forces. (U.S. Army photo courtesy of PEO C3T.)

- Joint Capabilities Release, next-generation software for Force XXI Battle Command Brigade and Below display screens featuring Army-Marine Corps interoperability and advanced mapping tool kits.
- Mounted Soldier System, a combat vehicle Soldier ensemble that integrates advanced gear such as a helmet-mounted display.
- Spider, a remote munitions delivery system.

In addition to laying the groundwork for subsequent integration into a broader network, the concurrent LUTs will help facilitate logistical and financial efficiencies, said LTC Darby McNulty, Integration Trail Boss, PEO Integration.

“We spend an enormous amount of resources to coordinate single program tests at multiple locations each year, so from a funding and resource management perspective, there’s certainly some efficiencies with combining these LUTs,” McNulty said. “There is an upfront investment required to get us to a baseline network, then you

The LUTs will place the Program of Record technologies into operationally relevant scenarios to collect data, answer questions, and validate requirements for the individual systems.

save money by combining testing and inserting technologies.”

The LUTs will place the Program of Record technologies into operationally relevant scenarios to collect data, answer questions, and validate requirements for the individual systems, McNulty explained.

“We will build the scenarios so that they are able to validate their requirements and then validate their performance,” he added.

The combined LUTs will be followed by the integration exercise during the INBE, McNulty and Wendel said. “If you integrate upfront and deliver technologies as part of a larger tested

and evaluated network, these network technologies will ultimately work better for the Soldier,” said McNulty. “The entire Army Network Modernization Strategy is predicated upon building a robust Brigade Combat Team [BCT] baseline configuration. The INBE is the first of four major steppingstones on the road to executing a fully integrated BCT Network Evaluation at the end of 2012.”

**KRIS OSBORN** is a Highly Qualified Expert for the Assistant Secretary of the Army for Acquisition, Logistics, and Technology Office of Strategic Communications. He holds a B.A. in English and political science from Kenyon College and an M.A. in comparative literature from Columbia University.



# Head Protection: While Equipment Advances, Questions Remain

Margaret C. Roth and Robert E. Coultas

**A**s the Army prepares to field an improved combat helmet and develops the next generation of protective headgear, it is also taking stock of what is known and not known about the signature wounds of the conflicts in Iraq and Afghanistan: traumatic brain injury (TBI) and post-traumatic stress disorder (PTSD).

The Advanced Combat Helmet, currently used worldwide, is scheduled to be replaced this fall for deployed and deploying Soldiers with the Enhanced Combat Helmet, which offers even more protection. (U.S. Army photo.)





Scientists, combat developers, health care professionals, and leaders in head protection painted a complex picture of mixed progress at the 27th Army Science Conference from Nov. 29 to Dec. 2, 2010; a Head Protection Summit sponsored by Program Executive Office (PEO) Soldier Feb. 16-17; and the Association of the United States Army (AUSA) Institute of Land Warfare's Winter Symposium and Exposition Feb. 23-25.

Their reports illustrate how far the Army has come since 2008, when Secretary of Defense Robert M. Gates issued his June 26 memorandum, "Caring for Our Wounded Personnel and Their Families," calling for a plan of research and development investments to advance state-of-the-art solutions for world-class medical care for PTSD, TBI, and other conditions afflicting Soldiers as a result of their combat service.

About two-thirds—64 percent—of Soldiers who have returned from fighting in Iraq or Afghanistan have TBI or PTSD, noted GEN Peter W. Chiarelli, Vice Chief of Staff of the Army, at the AUSA Winter Symposium. "The fact



The ECH is a joint U.S. Marine Corps/U.S. Army developmental effort that will provide increased protection against ballistic and fragmentation threats. It uses advanced thermoplastic materials that require different manufacturing processes than those associated with resin-impregnated para-aramids. (U.S. Army photo courtesy of PEO Soldier.)

We're about to take a big step with the ECH. The ECH was expected to provide 35 percent greater fragmentation protection than the ACH, but testing showed the improvement to be 50 percent or more.

remains, these wounds are not well understood," he said.

Dozens of research and development initiatives are underway to measure the many variables involved in prevention, detection, and treatment of TBI and PTSD, from how best to quantify the effects of blast on Soldiers' helmets and their brains, to how best to treat the injuries, which can have long-term, potentially devastating impacts on day-to-day functioning and quality of life.

"There's been an unprecedented level of investment ... in traumatic brain injury, post-traumatic stress, and suicide," said MG James K. Gilman, Commanding General of the U.S. Army Medical Research and Materiel Command (MRMC) and Fort Detrick, MD, at the Army Science

Conference. Gilman noted that MRMC is overseeing some 535 active projects representing about \$750 million in investment.

### Building a Better Helmet

In the area of Soldier equipment, the Marine Corps and Army are preparing to field the next-generation combat helmet. Meanwhile, the Army is leading an initiative that looks ahead to the succeeding generation of helmets, an integrated headgear system that would protect the skull, face, eyes, and ears.

This fall, deployed and deploying Soldiers can expect to trade the Advanced Combat Helmet (ACH), introduced in 2002, for the Enhanced Combat Helmet (ECH).

The two helmets look nearly identical, but the ECH, a Marine Corps-led program, represents a major improvement in performance. The ECH is a little thicker and weighs 1 to 4 ounces less than the ACH, depending on the size. (The ACH, now in sustainment with more than 1 million fielded, weighs 3.06 pounds in a size medium.)

But there are much more significant differences in protection. "We're about to take a big step with the ECH," said MAJ Jason A. Morneault, PEO Soldier's Assistant Product Manager for head protection systems, at the PEO Soldier-sponsored conference, where head protection experts from medicine, industry, sports, and academia gathered to discuss, collaborate, and coordinate on preventing and mitigating head injuries from ballistic and nonballistic (blast and blunt impact) threats.

The ECH was expected to provide 35 percent greater fragmentation protection than the ACH, but testing showed the improvement to be 50 percent or more, Morneault said. In fact, stronger test guns will be needed to figure out exactly how good the fragmentation protection is. The ECH also provides increased ballistic protection against select small-arms threats.

The improved protection stems from a new material, an ultra high molecular weight polyethylene (UHMWPE) fiber composite. UHMWPE is a class of advanced thermoplastic materials that require different manufacturing processes than those associated with the thermosetting resin-impregnated para-aramid fibers used in the ACH.

The U.S. Army Research Laboratory (ARL) found that some of the technologies that it was developing for other applications had potential use in helmet technology to protect Soldiers from the combat threats in Iraq and Afghanistan. ARL scientists and engineers also pioneered a molding process to pre-form the thermoplastic material, combining layers of the material into lightweight helmet shells. This new methodology, in turn, has transformed the U.S. industrial base for the manufacture of ballistic helmet material.

The Army is working with numerous partners, including the Marine Corps and industry, on the future-generation helmet for mounted and dismounted Soldiers. The system takes a “holistic approach” to protecting the head, face, and neck, said Donald R. Lee II of the Natick Soldier Research, Development, and Engineering Center (NSRDEC) at the Head Protection Summit. NSRDEC is managing the initiative, a four-year effort through FY13.

The Helmet and Electronics and Display System-Upgradeable Protection (HEaDS-UP) Army Technology Objective incorporates ballistic and



The Helmet Sensor Program provides small, lightweight, low-power sensors that mount to Soldiers' combat helmets. The sensors detect, measure, and record impact and blast overpressure associated with IEDs and other events that may cause concussions in an operational environment. (U.S. Army photo courtesy of PEO Soldier.)

nonballistic protection with greater fragmentation protection for the lower face, situational awareness, interoperability with night vision equipment, and improved hearing protection. The objective is a well-balanced, modular system that reduces neck fatigue and increases mission performance and situational awareness in all environmental conditions without sacrificing mobility, agility, or weapon compatibility.

Ultimately, HEaDS-UP will yield a package of design options and guidelines based on manufacturing best practices, lessons learned, and mature technology, Lee said.

### Gathering Data in Theater

Another element of combat helmet development—the helmet-mounted sensor program—is also undergoing improvements, even as the medical community evaluates the potential and limitations of its early results.

The Generation II Helmet Sensor, to be fielded in August, features upgrades

in power management, storage capacity, and data exchange compared with the first-generation sensor, almost 7,000 of which were mounted on helmets in Iraq and Afghanistan to collect data from March 2008 to March 2009.

The sensors measure and record impact and blast overpressure associated with improvised explosive devices (IEDs) and other blast incidents, as well as impact events, that may cause head trauma in combat operations.

The helmet sensor “is not a field diagnostic tool, as some people assume,” Morneault cautioned. “It’s a data-gathering device for the medical community.” The data collected can be used “to better understand what’s going on in IEDs and different blasts and blunt impact trauma we’re seeing downrange.”

While the information gathered has the potential to improve the prevention and mitigation of TBI, the data collected from the first deployment of helmet sensors has unexpected limitations, Gilman

said. Of 250,000 events recorded by the sensors in theater, “only 60,000 of those probably represented some sort of blast or impact,” he said. “The sensors were actually very, very sensitive.”

MRMC attempted to correlate the sensor recordings to actual injury data or to data found in post-deployment health reassessments, to develop a model of blast injury, and found that “the sensor data correlated very, very poorly,” he said.

It will help, Gilman said, that the Generation II sensor will allow for wireless download of data, versus plugging the earlier sensor into a USB port. “I do understand that the job of a young leader is to go downrange and bring Soldiers home, and it’s not primarily to collect data from helmet-mounted sensors.”

### TBI Research Challenges

TBI can be caused by injuries to the head from bullet fragments and shrapnel, blunt impact injuries such as from a collision, or blast events such as the detonation of an IED. Blast, ballistic, and blunt impacts are separate phenomena, with different characteristics. The least understood are blast injuries.

What is known is that blast injuries can result in long-lasting neurologic and psychological problems. Body armor allows the lungs to tolerate blast effects, but the brain is exposed to blast levels in ways that medical experts are still trying to measure.

Experts from the military medical community agree that correctly understanding the biomechanics of blast injuries is vital to the Army’s operations, readiness, and health.

“The term itself causes a lot of confusion. ... It’s a very, very broad spectrum of injury types,” said Michael J. Leggieri Jr., Director of DOD’s Blast Injury Research Program Coordinating Office within MRMC.

“We have a vast medical TBI research portfolio ... focused on knowledge gaps,” Leggieri said at the Head Protection Summit: “How do we prevent injury? How do we quickly diagnose that injury? How do we reset? How do we return that person [to active duty]?”

“There’s a lot we don’t know about this injury,” he said, although “there are many, many hypotheses about how this injury occurs. If we don’t understand the mechanism, there’s no way we can develop effective protection strategies.”

### Continuum of Research

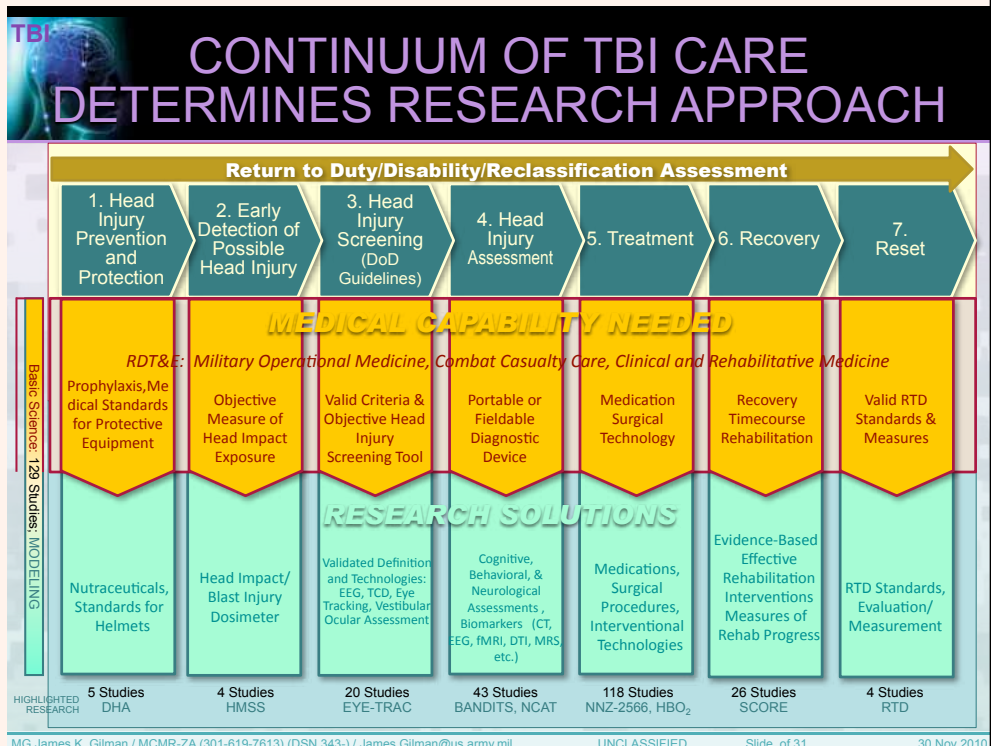
The diverse body of TBI and PTSD research can be organized, as MRMC has done, along a continuum of care for the Soldier or patient, from prevention through assessment and finally, return to duty or long-term care.

TBI in particular “is still a very unique problem in our estimation, because we still don’t have a full, clinically well-accepted diagnosis,” said Gilman at the Army Science Conference. Instead, a diagnosis of TBI “is based on the subjective report of an exposure to an

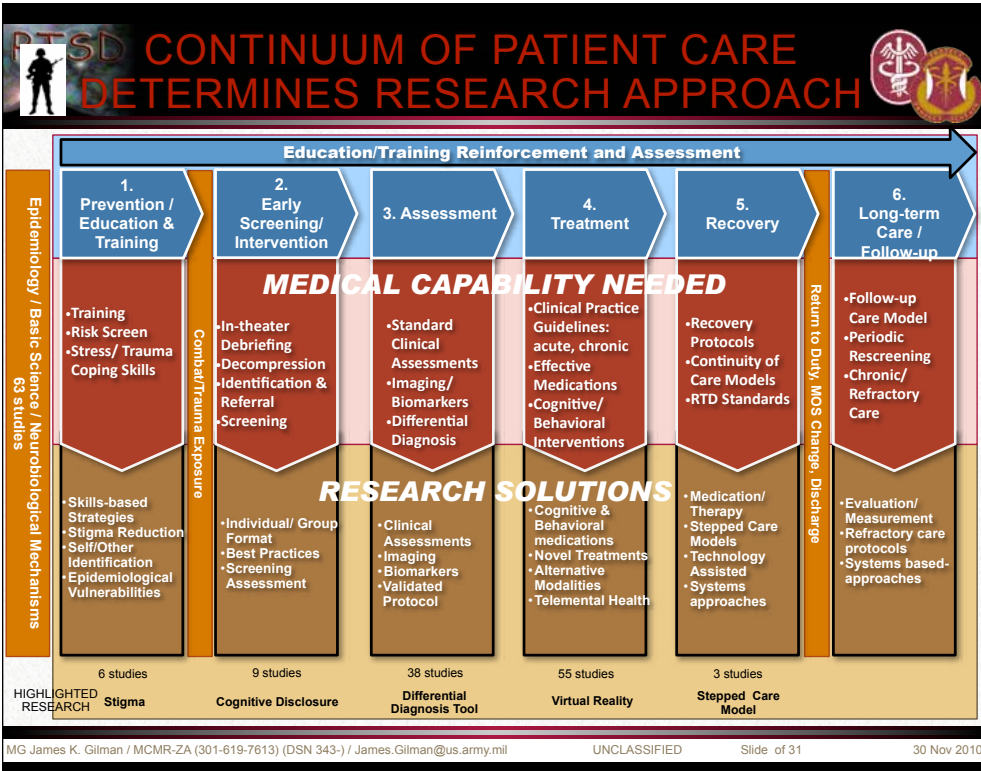
event, and some reported or estimated proximity thereto, and then some symptom that occurs soon, or immediately after that event. And that symptom can be nothing more than disorientation. So right now we are still struggling to find the gold standard, and this is impacting every one of our efforts in terms of traumatic brain injury.”

Following the continuum (see chart below), these efforts include:

- Prevention and Protection—At least three pharmaceutical or nutraceutical products, including the omega-3 fatty acid docosahexaenoic acid (DHA), hold promise for protecting the brain from injury. “If effective, then we can supplement rations with [DHA] and perhaps mitigate or ameliorate the consequences of exposure to blast,” said Gilman.
- Early detection—Ultimately, the helmet-mounted sensor may be able to provide this capability, which could improve the outcome of a Soldier’s exposure to blast.
- Screening—Deficits in visual tracking performance are one manifestation of diffuse axonal







- Recovery—The ongoing Study of Cognitive Rehabilitation Effects seeks to determine, through randomized treatment of military patients who have mild TBI, the effectiveness of methods that ask them to exercise their brains, such as by calculating or remembering, and so to strengthen their cognitive abilities.
- Reset—The Army is developing objective, repeatable assessments that can help determine if a Soldier is ready to return to duty. These assessments look at weapon utilization, physiologic measures, balance, and other factors.

There is evidence that repeated head injuries require special attention. One type of TBI is Chronic Traumatic Encephalopathy (CTE), a progressive degenerative disease found in patients who have been subjected to multiple concussions and other forms of head injury.

Dr. Ann McKee, a neural pathologist from the Center for the Study of Traumatic Encephalopathy at Boston University, told the audience at the PEO Soldier conference that the symptoms of CTE have a slow, insidious onset and tend to develop in midlife. Symptoms include memory loss, “irritability, agitation, and a short fuse.” McKee said CTE develops in military veterans and has been described in many different types of mild traumatic injury.

“It’s less important how you get the injury,” in her view. What’s important is the repetitive injury. “This is the challenge, I think, with any discussion about helmet and equipment: How do we protect the brain from the long-term damage we are seeing in these players [athletes] and Soldiers?”

**PTSD Challenges**

One of the challenges of research into PTSD is that the same roadside IED that causes blast TBI can also cause PTSD, and both can produce the same

injury in the brain, a measure of TBI. Eye-tracking devices can measure eye movement as a subject tracks and predicts the movement of an object.

- Assessment—A program called Biomarker Assessment for Neurotrauma Diagnosis and Improved Triage System is exploring objective measures of cellular damage through blood testing of nerve cell proteins, much as cardiologists measure enzymes or proteins as one indicator of cardiac damage. Gilman called the blood test “very promising, because that has probably the earliest hope to get us to an actual objective measure of some exposure to traumatic brain injury.” Large-scale clinical trials are planned that hopefully will lead, three or more years from now, to U.S. Food and Drug Administration (FDA) approval of this diagnostic test, which could then be used in fixed medical facilities. The ultimate goal is to develop a hand-held device for use in the field.
- Treatment—For acute or more severe TBI, there is currently no effective pharmaceutical treatment, but

multiple drugs have shown promise in pre-clinical tests, including NNZ-2566 from Neuren Pharmaceuticals of New Zealand. It is a molecule that is part of a naturally occurring hormone in the brain with the potential to reduce the effects of a brain injury by preventing further damage.

“The FDA has agreed to an expedited approval process if studies show the positive benefit in humans that was seen in pre-clinical studies,” Gilman said. However, it may take up to five years to complete the studies.

For the treatment of milder and moderate TBI, research is focusing on treating chronic symptoms. One possibility is hyperbaric oxygen, the delivery of pure oxygen in a pressurized room. DOD has established a tri-service effort to evaluate hyperbaric oxygen therapy. The problem with treating chronic or mild TBI, Gilman said, is that “over time, the symptoms ... tend to improve. And so, if you provide any treatment during the time when improvement is likely to occur, it looks like the treatment worked.”

symptoms—irritability, insomnia, impaired attention, and headache, for example. More than a dozen research projects are devoted to distinguishing between mild TBI and PTSD.

With PTSD, too, a complicating element is “co-morbidities,” simultaneous health problems such as depression, substance abuse, and the prescribed use of strong pain medications. All of these can influence which treatment option to use, Gilman said.

The Army’s continuum of PTSD research (see chart on Page 32) includes

development of a validated animal model of trauma exposure to evaluate pharmacological treatments for PTSD, as well as:

- Prevention/education and training—The Navy and Army are working together to tackle the stigma associated with seeking help for PTSD or other mental health issues, by developing a media-based stigma reduction program for Soldiers and Marines that targets the factors influencing the decision to seek treatment and identifies barriers to care. As a cultural issue, stigma “will require

a period of sustained intervention before we make a dent,” Gilman noted. “We can’t wait until the stigma is gone before addressing other aspects of PTSD.”

- Early screening and intervention—A nearly completed study called Enhanced Resilience Training Through Cognitive Disclosure used emotionally expressive writing as an early intervention for Soldiers who have returned recently from combat. It found this approach to be unsuited to Soldiers with high levels of combat exposure, however.
- Assessment—A multimodal diagnostic approach is needed that distinguishes between TBI and PTSD with adequate sensitivity and specificity. Researchers are seeking the best combination of techniques including imaging, neurophysiological biomarkers, and neuropsychiatric testing. While health care practitioners may not place a high priority on the distinction, it is “a very big deal” in the military’s consideration of whether and how to award the Purple Heart to Soldiers with TBI, Gilman said.
- Treatment—The Army is exploring virtual reality (VR) technology and cell phone platforms to assess PTSD treatment options, and the use of VR to administer treatment, particularly for service members located far from medical facilities.
- Recovery—Given that PTSD tends to be chronic and causes recurring problems, a randomized trial is underway to compare management of follow-up behavioral therapy over the telephone and Internet, continuous care management by a nurse supervised by a psychiatrist, and computer-guided care management based on patient preference and the severity of symptoms, all ways to make effective care more accessible and appealing to patients. The results of this research will feed into other initiatives to expand military medical care using cell phones and the Internet, Gilman said.

**This instrumented head form is used for helmet testing, which itself is an area with unanswered questions. (U.S. Army photo courtesy of ARL.)**



## Advances in Helmet Testing

Modeling of blast impact is in itself an area of extensive study. Different head-forms are suited to different blast tests in the laboratory. Scientists are working on a matrix of head forms, as scientists elsewhere develop metrics for injury.

“There’s not a lot of consensus on what the metrics are that we should be gathering,” said Dr. Dixie Hisley of ARL.

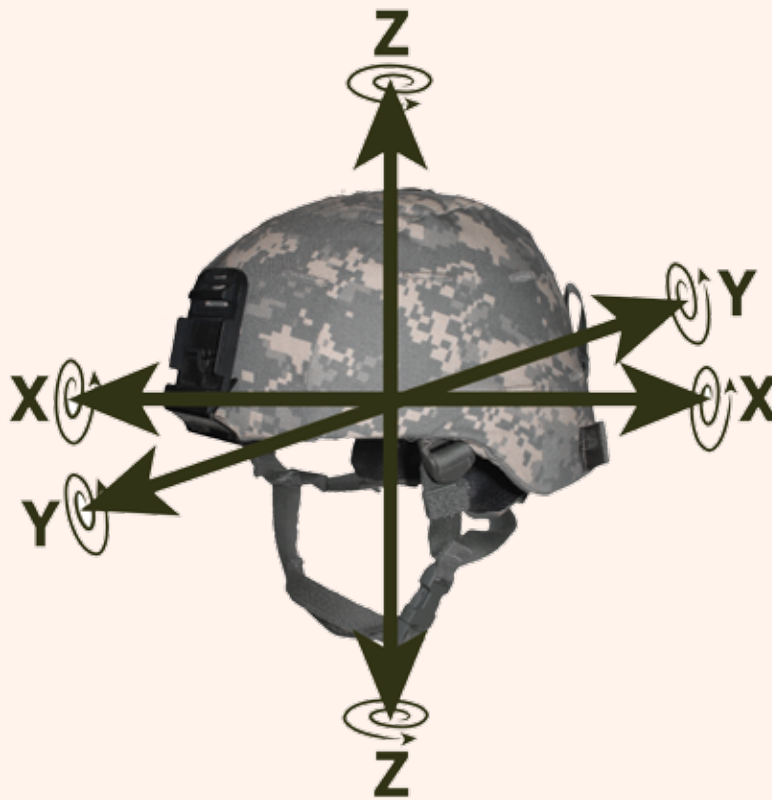
When a projectile hits a Soldier’s helmet, it deforms inside as it absorbs the energy, creating “helmet backface deformation.” The absorption of energy typically results in a bulge that could grow two to three inches or more toward Soldiers’ heads, which equates to “the potential for a pretty good impact on a Soldier’s head,” Hisley said.

But inside the helmet, there may be 1/2 to 3/4 inch between the helmet and the Soldier’s head. “What we at the ARL would like to do is come up with the one to two experimental techniques that would allow us to replicate and measure this phenomenon very accurately,” Hisley said.

Ideally, scientists should be able to correlate the velocity of impact, force applied, and the area of contact with the metric for injury, she said, using a method developed at ARL called Digital Image Correlation. “That’s the area that we should really be interested in: What available energy is going into the Soldier’s head?”

## Next Steps

The PEO Soldier Head Protection Summit sought to establish a body of experts from the academic, sports, defense, and medical communities to focus on the prevention and mitigation of head injury from blast, ballistic, and impact threats to the head. The follow-on is an Integrated Concept Team to develop solutions and improve Soldier head protection from threats encountered in combat conditions.



The Generation II Helmet sensor will expand the data gathered in theater by recording both linear and rotational accelerations. (U.S. Army photo courtesy of PEO Soldier.)

“The experts have identified where we need to learn: a valid mathematical model of blast-induced TBI,” Leggieri said. “We’ve got lots and lots of models of traumatic brain injury. We don’t have any validated models.”

Through the Johns Hopkins University Applied Physics Laboratory, an expert panel is working to develop criteria for valid models, including capabilities, state of the science, validation to date, and availability to the DOD community. Validated models will be independently reviewed and, ultimately, submitted to the Assistant Secretary of Defense for Health Affairs for approval.

“This brings some standardization. It brings some assurance that whatever criteria are being used by DOD, those criteria are the best available,” Leggieri said. “We all have the same objective in mind. We want to protect the warfighter.”

*Leggieri’s office, at <https://blastinjuryresearch.amedd.army.mil>, seeks to be*

*a clearinghouse for blast injury research information. Gilman’s presentation at the Army Science Conference is available at <http://www.armyscienceconference.com/pdf/Tuel/Gilman.pdf>.*

**MARGARET C. ROTH** is the Senior Editor of *Army AL&T Magazine*. She holds a B.A. in Russian language and linguistics from the University of Virginia. Roth has more than a decade of experience in writing about the Army and more than two decades’ experience in journalism and public relations.

**ROBERT E. COULTAS** is the *Army AL&T Magazine* Departments Editor and an *Army AL&T Online* Editor. He is a retired Army broadcaster with more than 35 years of combined experience in public affairs, journalism, broadcasting, and advertising. Coultas has won numerous Army Keith L. Ware Public Affairs Awards and is a DOD Thomas Jefferson Award recipient.



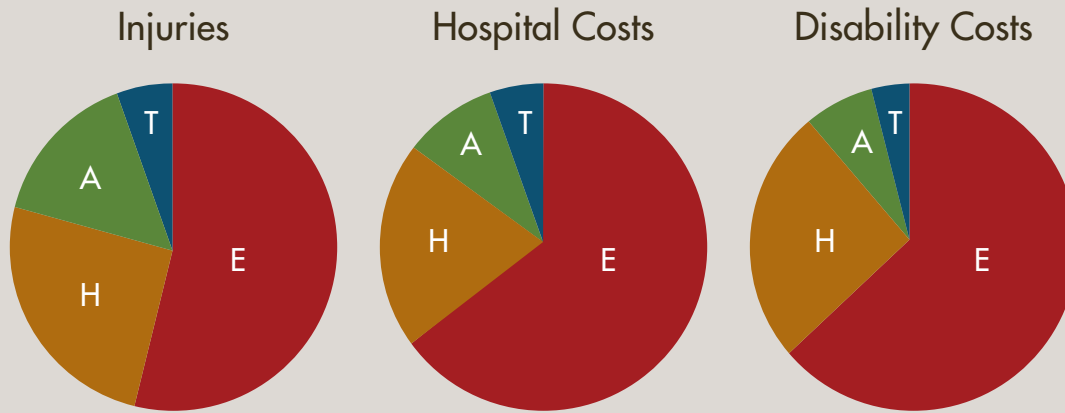
# Extremity Injury Research Targets Quality of Life, Return to Function for Wounded Warriors

Jack Meikrantz

**T**he Army took an important step toward helping wounded warriors with extremity injuries on Sept. 29, 2010, when the U.S. Army Medical Research Acquisition Activity (USAMRAA), working with the U.S. Army Institute of Surgical Research (USAISR) and the Combat Casualty Care Research Program, awarded \$38.6 million to the Center for Injury Research and Policy of the Johns Hopkins Bloomberg School of Public Health to continue critical research on the treatment and outcomes of major, battlefield-sustained, orthopedic injuries.

COL Dallas Hack, Director of the Combat Casualty Care Research Program in the U.S. Army Medical Research and Materiel Command, and Aaron Wade, Contracting Officer, USAMRAA, review the assist agreement to advance extremity injury research. (U.S. Army photo by Larry Sorcher, Fort Detrick Directorate of Plans, Training, Mobility, and Security.)





Distribution of injuries, resources, and disability costs by body region:

A, abdomen; E, extremity; H, head; T, thorax.

The DOD-mandated award, funded by a Congressionally Directed Medical Research Program agreement to expand the Major Extremity Trauma Research Consortium, demonstrates the U.S. military’s commitment to the post-injury treatment, rehabilitation, quality of life, and return to duty for warriors with significant extremity trauma.

“Funding this consortium is the most significant event in orthopedic research in the past 50 years,” said Dr. Michael Bosse, Orthopedic Trauma Surgeon and Director of Orthopedic Clinical Research at the Carolinas Medical Center, Charlotte, NC. “For the first time in history, we have the organizational structure and medical and technical resources as well as the body of traumatic extremity injury data required by researchers to address critical research needs, accelerate quality-of-life outcomes, and establish ‘best practice’

treatment guidelines in clinical practice areas ranging from bone infections and pain management to bone regeneration.”

“I have no doubt that within five years, this research will redefine serious extremity injury treatment practices and deliver life-changing outcomes,” said Joseph C. Wenke, Ph.D., Consortium Program Manager for USAISR at Fort Sam Houston, TX.

COL James Ficke, M.D., agreed. Ficke chairs the Department of Orthopedics and Rehabilitation at the San Antonio Military Medical Center in Texas and is Orthopedic Consultant to the U.S. Army Surgeon General. “Within five years,” said Ficke, “we will be able to routinely regenerate four or five inches of new bone in patients with open [compound fracture] wounds. This staggering accomplishment will significantly lower rehabilitation costs, virtually

eliminate disability costs, and improve quality of life by reducing the need for orthotics and prosthetics and doubling the return to duty/function rates of patients with open-extremity fractures.”

USAISR and USAMRAA are part of the U.S. Army Medical Research and Materiel Command (MRMC), headquartered at Fort Detrick, MD.

### A High Priority for Military Medicine

Since the beginning of World War II, if not before, the treatment, rehabilitation, and return to function of extremity-injured Soldiers have pushed the limits and tested the collective resolve of medical, technical, psychosocial, and financial institutions.

During the past nine years of *Operations Enduring* and *Iraqi Freedom* and *Operation New Dawn*, the percentage of service members who have sustained significant extremity trauma, often to multiple limbs, exceeds 80 percent. In one roughly three-year period ending in January 2005, 1,281 Soldiers sustained a total of 3,575 extremity combat wounds. Half of the extremity-wounded warriors injured in the current conflicts have not returned to active duty.

I have no doubt that within five years, this research will redefine serious extremity injury treatment practices and deliver life-changing outcomes.

According to Ficke, the total burden of treatment, rehabilitation, and disability costs of significant extremity trauma is far greater than that of any other specialized medical injury. “In fact,” Ficke said, “the burden of cost for extremity injuries is greater than the combined costs of treating Traumatic Brain Injuries and Traumatic Stress.”

Compared with injuries of the head and neck, abdomen, and thorax, extremity injuries require the longest average inpatient stay (10.7 days), and account for 65 percent of total inpatient resource dollars and 64 percent of total projected disability costs (see figure on Page 36).

### Focusing and Expanding Resources for Research

The DOD Peer Reviewed Orthopaedic Research Program’s Clinical Consortium Award mechanism was offered for the first time in FY09 with the twofold intent of funding clinical studies focused on improving the outcomes of severe musculoskeletal injuries commonly associated with military combat, and challenging the scientific community to explore new directions and address relevant issues that had not received sufficient attention and funding. The overarching intent was to find solutions in the field of combat-related orthopedic injuries.

The award is designed to establish large, multisite clinical trials by combining the population of military orthopedic trauma patients and the combat-relevant expertise of military treatment facilities with the patient populations and research expertise of civilian trauma experts.

The original Major Extremity Trauma Research Consortium, established in 2009, was a network of 12 core Level I civilian trauma centers and four military treatment facilities: the Naval Medical Centers in Portsmouth, VA, and San Diego, CA; San Antonio Military Medical Center, Fort Sam

Houston; and Walter Reed Army Medical Center, Washington, DC.

Anchored by the Data Coordinating and Research Center at the Johns Hopkins Bloomberg School of Public Health, the consortium works with USAISR to conduct multicenter clinical research studies relevant to the treatment and outcomes of orthopedic trauma sustained in the military.

“The initial \$18 million in funding from DOD and the Orthopaedic Extremity Trauma Research Program was critical to establishing the consortium and providing the resources required to address some of the military’s immediate research needs in the acute management of severe limb injuries,” said Ellen MacKenzie, Ph.D., Principal Investigator and Chair of the Bloomberg School’s Department of Health Policy and Management.

“The new \$38.6 million in funding,” said Wenke, “will support efforts to double the number of core civilian trauma centers from 12 to 24; coordinate a group of 30 satellite trauma centers from across the country that have agreed to support the consortium through their participation in one or more consortium-sponsored studies; and conduct research in areas that have historically hindered optimum treatment and rehabilitation outcomes.”

Research targets include, but are not limited to: bone regeneration in patients who have suffered severe bone loss; bone infection; nonnarcotic alternatives to the management of chronic pain; and the challenges associated with

Within five years, we will be able to routinely regenerate four or five inches of new bone in patients with open [compound fracture] wounds.

reintegrating Soldiers and civilians into their respective “units” in society.

“Textbook teamwork,” responded COL Dallas Hack, Director of MRMC’s Combat Casualty Care Research Program, when asked to describe the collaboration by his office, USAISR, Johns Hopkins University, and USAMRAA to make this award. “Our team, led by USAMRAA, was united by its common mission to support the warfighter and driven by the compelling need to deliver extremity injury outcomes that we all believe will have an immediate quality-of-life impact on Soldiers’ lives.

“When USAMRAA, after several funding and programmatic delays, received our Procurement Request, they had less than two months of the fiscal year in which to make an award. In that time, USAMRAA’s White Team worked tirelessly to review nearly 30 business proposals with a total value of \$38.6 million; analyze, negotiate, and approve 30 separate budgets; and obtain the necessary in-house, command and Department of the Army-level approvals.

“This is the way program offices and their acquisition activity counterparts are supposed to work together,” Hack said.

*Editor’s Note: It is with great sadness that we report author Jack Meikrantz passed away Jan. 24, 2011. He was a Business Development Specialist at USAMRAA, Business Oversight Branch, Fort Detrick. Meikrantz held a B.A. in business administration and accounting from Lycoming College.*



# A Microclimate Cooling Technology for Dismounted Soldiers

Dr. Samuel N. Chevront and Dr. Scott J. Montain

**M**icroclimate cooling (MCC) technologies have been successful in alleviating heat strain in Soldiers confined to vehicles, but cooling limitations and restrictions on power and weight make them impractical when mobilized on foot.

The Skin Temperature Feedback Cooler microclimate cooling (MCC) method will make possible effective MCC for Soldiers mobilized on foot. (U.S. Army photo by PFC Michael Schuch.)



Traditional MCC approaches involve constant skin cooling with liquids at low temperatures and high flow rates. As a result, MCC power, size, and weight requirements are large. A longer-term solution was needed that increased the efficiency of heat transfer from the human body to the MCC system.

Scientists at the U.S. Army Research Institute of Environmental Medicine, with the help of engineers at the Natick Soldier Research, Development, and Engineering Center (NSRDEC), discovered that over-cooling the skin can actually slow heat loss, while under-cooling the skin results in greater strain on the heart.

Both problems were minimized by allowing skin temperature to fluctuate narrowly—in other words, using skin temperature itself to automate cooling.

### **Intermittent vs. Continuous Cooling**

The idea and the system for intermittently cooling the skin, rather than cooling it continuously, were conceived as a way to prevent the skin from constricting. The body constricts vessels in the skin to conserve heat when cold, and dilates vessels to expel heat when hot.

Although significant cooling can still occur when the skin is constricted (such as when we fall into ice water), it made sense that the MCC garment would become less efficient at removing body heat if the skin were over-cooled.

Experimentation determined that the choice of intermittent cooling paradigm did not seem to matter so long as skin

The technology is both evolutionary and revolutionary—evolutionary because it applies existing biomedical knowledge in a new way, and revolutionary because it heralds the development of new cooling vests that can sense temperature and deliver cooling to specific body areas.

temperature was kept within a narrow range (33-35 degrees centigrade). Lower skin temperatures offered only a small cooling advantage, while warmer skin temperatures drastically increased strain on the heart.

Using skin temperature feedback to control MCC made the most sense; the research team determined that a Skin Temperature Feedback Cooler (STFC) reduced MCC power requirements by more than 40 percent.

A patent was awarded Nov. 23, 2010, for body temperature regulation using skin temperature feedback, as an MCC methodology for maximizing heat flux, minimizing physiological strain, and conserving battery power. Sensors within an MCC garment signal the need to provide or withdraw cooling based on an optimal skin temperature range, as determined empirically from the laboratory experiments. Studies demonstrated that with this approach, heat extraction is optimized (similar to constant cooling), but power consumption is reduced by 40-50 percent.

### **Temperature and Power Requirements**

With STFC, application or withdrawal of cooling is determined automatically by skin temperature sensors.

Over-cooling the skin (to less than 33 degrees centigrade) results in body heat conservation and inefficient use of MCC power. Under-cooling the skin, allowing it to heat to more than 35 degrees centigrade, increases cardiovascular strain because of increased skin blood flow and skin blood volume. When STFC is used, cooling is automatically turned on or off when these thresholds have been reached. Compared with the traditional constant-cooling approach, STFC removes body heat and reduces cardiovascular strain.

STFC also requires 40 percent less power, which could reduce the size and weight of batteries carried by dismounted Soldiers. The net result is that STFC feedback may allow for expansion and integration of personal cooling systems for dismounted or mounted Soldiers. In addition, STFC improves comfort when compared with traditional systems. The initial research was funded as an Independent Laboratory In-House Research project in 1999 and then funded by a grant from the Defense Threat Reduction Agency. All of these findings have been published in peer-reviewed scientific journals.

### **Evolutionary and Revolutionary**

The application and integration of this MCC method will decrease the size and weight of future MCC systems and make possible effective MCC for Soldiers mobilized on foot.

The technology is both evolutionary and revolutionary—evolutionary

The idea and the system for intermittently cooling the skin, rather than cooling it continuously, were conceived as a way to prevent the skin from constricting.



Current MCC technologies, such as the Microclimate Cooling System, have been successful in alleviating heat strain in Soldiers confined to vehicles, but cooling limitations and power and weight restrictions make MCC impractical for Soldiers mobilized on foot. (U.S. Army photo courtesy of Program Executive Office Soldier.)

Compared with the traditional constant-cooling approach, STFC removes body heat and reduces cardiovascular strain.

because it applies existing biomedical knowledge in a new way, and revolutionary because it heralds the development of new cooling vests that can sense temperature and deliver cooling to specific body areas. It may also integrate emerging nanotechnology solutions to sense skin temperature and remove heat.

NSRDEC supports Program Executive Office Soldier's Air Soldier program with the development of vapor compression MCC technology called the Wearable Environmental Control System. Air Soldier is a phased program; as technologies mature and capabilities develop, they will be inserted into the Soldier's kit, culminating in the third phase, in which most legacy items will be replaced with a fully integrated ensemble.

The first phase of the Engineering and Manufacturing Development program will transition existing MCC technology in FYs 11-12 to address heat stress issues encountered by rear crewmembers in the UH-60 Black Hawk and CH-47 Chinook aircraft. These systems will use traditional MCC approaches and will not have STFC capability; further development is still needed, particularly with respect to garment and sensor development.

The next step for this system in the current theaters of operation is to find a funding source. This will enable coordinated sustained engineering, biomedical, nanotechnology, and material sciences research. A dedicated research effort is needed to develop improved MCC garments, which

probably will depend on emerging nanofiber and/or nanosensor technologies; the integration of sensors into clothing to control the STFC system; and the best Soldier applications of STFC.

#### **DR. SAMUEL N. CHEUVRONT**

is a Research Physiologist in the Thermal and Mountain Medicine Division at the U.S. Army Research Institute of Environmental Medicine (USARIEM). He holds a Ph.D. in exercise physiology from Florida State University.

#### **DR. SCOTT J. MONTAIN**

is a Research Physiologist in the Military Nutrition Division at USARIEM and Deputy Chief for the Division. He holds a B.S. in community health education from the University of Wisconsin-LaCrosse, an M.S. in biology (exercise physiology) from Ball State University, and a Ph.D. in kinesiology (exercise physiology) from the University of Texas-Austin.



# Bigger Not Always Better: The Power of Small Systems

Jaclyn Pitts

**T**oday's insurgent warfare requires Soldiers to exhibit agility, speed, and stealth to adapt to rapidly changing threats and environments. In response to these complex challenges, the Army is pursuing technology on a smaller scale, through mobile microsystems. While there is still much to be discovered, the capabilities such systems may provide are too great to ignore.



The Micro Autonomous Systems and Technology-Collaborative Technology Alliance of the U.S. Army Research Laboratory is working to deliver technology to enable the development of micro-autonomous systems. (Graphic courtesy of BAE Systems.)

The Micro Autonomous Systems and Technology-Collaborative Technology Alliance (MAST-CTA) of the U.S. Army Research Laboratory (ARL) is working to deliver technology to enable the development of such systems to team with Soldiers.

“We are trying to enhance tactical situational awareness in urban and complex terrain. That is our mission, and that is the environment we’re working in,” said Joseph Mait, Ph.D., Senior Technical Researcher for Electromagnetics at ARL. “Platforms need to be capable of stable, robust mobility and air-to-ground collaboration, and they need to be able to identify points of ingress.”

Mait, who chaired a panel on MAST Dec. 2 at the 27th Army Science Conference, emphasized how such small platforms could provide substantial capabilities for situational awareness, including path planning, threat identification and labeling, and map generation.

### Development Challenges

Ronald Fearing, Ph.D., Professor in the Department of Electrical Engineering and Computer Sciences at the University of California, Berkeley, and a member of the MAST-CTA, discussed several challenges facing micro-autonomous systems. Energy management was one challenge, echoed by panel members. “It’s not just the amount of energy we have available in a rechargeable battery or how much we can generate from a motor, but how we can use that energy,” Fearing said.

Flight, for example, takes a significant amount of power. According to Fearing, battery capacity is the limiting factor, providing a hover time of about 10 minutes or less on average. He explained that trade-offs must be made between climbing and flying capabilities, and between covering long distances or operating for long periods.

“What if we make a robot that can either fly when it needs to fly, or run or walk when it needs to run or walk?” Fearing said.

Additionally, power for computation and communication on such a small scale creates an energy struggle. Computation costs can be reduced, but communication energy costs generally reflect a fixed need for power, Fearing said. “As a robot gets smaller, the amount of power we have available for computation needs to scale,” he said.

Another challenge the experts addressed was lack of a Global Positioning System signal in operational areas. To address this problem, “[Robotic] ensembles must be adaptive ... responsive to human commands and responsive to adversarial settings,” said Vijay Kumar, Ph.D., UPS Foundation Professor and Deputy Dean for Education at the University of Pennsylvania’s School of Engineering and Applied Science, and Director of the MAST-CTA Center for Processing and Autonomous Operation. The MAST robots must navigate using cameras or laser range finders and collaborate as a cohesive unit to map locations. “Can one operator control a robot to go through a whole complex? We think big, but in this case, we want to deliver small and many,” Kumar said.

Actuation was another challenge the experts discussed. “As motors get smaller, performance goes down,” Fearing said. “There are always trade-offs between power density and efficiency and how fast these things operate.”

### Biological Inspiration

Robert J. Wood, Ph.D., Assistant Professor at the Harvard University School of Engineering and Applied Sciences, discussed robotic insects and flight. “We want to use biological trends to guide us,” he said. As an example, he cited the Harvard Microbotic Fly, which has demonstrated flapping wings capable of tethered

takeoff, but noted that this development also highlights several areas for future improvement in flight: fabrication, power, control, and aerodynamics.

Robert Full, Ph.D., Chancellor Professor and Director of the Poly-PEDAL (Performance, Energetics, Dynamics, Animal Locomotion) Laboratory at the University of California, Berkeley, reiterated the importance of biological inspiration. “We need to look at the organism and the robot environment as if they were one,” he said. “Nature has a huge number of sensors. Ultimately, we need multiple sensors. Robustness is critical. ... Nature can learn, and in the future, I think we will be able to move to something far more adaptable.”

“Lots of insects have hairs on them for a variety of reasons—sensing, navigation, protection,” said Kamal Sarabandi, Ph.D., Rufus S. Teesdale Professor of Engineering and Director of the Radiation Laboratory in the Department of Electrical Engineering and Computer Science at the University of Michigan, and Director of the MAST-CTA Center for Microelectronics. “We are developing hair sensors that can do the same things.”

### Advantages of Going Smaller

“We’re going smaller and gaining some advantages by having more robots that are cheaper, disposable, and more mobile than one large robot,” Fearing said. He posed a disaster situation involving collapsed rubble, in which a microbot would be useful. The tiny robot could easily navigate through small spaces to find trapped Soldiers or civilians, as opposed to a large robot that would be unable to fit through.

Reduced cost is another great advantage of microsystems. “They can be made very inexpensively, without much raw material in them,” Fearing said. “You’re not going to worry as much if you’ve got 100 or even 1,000 small robots at



Air and ground MAST systems work with a relatively larger Small Unmanned Ground Vehicle. (Illustration courtesy of ARL.)

\$10 each, and you lose 90 percent of them trying to crawl through rubble—as long as you’ve got enough robots that can get through into the space, leaving behind radio relay tags to relay information back out to a user.”

Networking capability is another advantage of microrobotics. Although each robot alone may not possess great processing capability, together they can form a strong computing network, Fearing noted.

Fearing also discussed communication relay capability. By breaking up large communication maps into several shorter paths, a microrobotic system will use less power than that needed for a single large map.

Probably one of the biggest advantages of microrobots is robustness. If a very small robot is dropped from a great height, “it will hit the ground just like an insect, in a way that will not affect its

operation,” Fearing said. “Making things really small is good for survivability.”

### Research Directions

Robots in the field today weigh several kilograms, but research is bringing that down to approximately 100 grams or less, Fearing said. Current research and development for small robots is aimed at an even smaller scale, with the capability of running at speeds greater than 1 meter per second.

In battery technology, research is underway to develop greater capacity in smaller packages, Fearing said. However, “we are facing really significant challenges to make significant improvements over what the cell phone industry is driving in batteries,” he said.

Looking ahead, Full said, “I think in five years, we’ll have specialized in hybrid platforms with added behaviors, such as burrowing, jumping, climbing, and other manipulation. In 10 years, I

think we’ll have multimodal platforms with specializations for certain tasks.”

Sarabandi said much work has been done on mission endurance and lightweight solar cells that can be used as part of a wing structure and provide power for charging a battery or enhancing the mission. Other future developments are likely to include hair sensors, advanced multifunctional wings, and improved flight dynamics.

Slide presentations from the Army Science Conference are available at <http://www.armyscienceconference.com/agenda4.htm>.

**JACLYN PITTS** provided contract support to the U.S. Army Acquisition Support Center through BRTRC Strategy and Communications Group. She holds a B.S. in journalism from West Virginia University and a B.S. in criminal justice from Kaplan University.



# When One Software Language Doesn't Fit All, Translator Technology Provides a Solution

Claire Heininger

**T**he mission of today's warfighter relies primarily on information, and it's flowing through faster, more diverse channels than ever. With troops conducting simultaneous offensive, defensive, and stability operations, the Army has developed sophisticated tools that help Soldiers observe, report, and act on a wide variety of information. But when it's time to transfer that information from one system to another? It might as well be gibberish.

SMART enables interoperability for tactical systems, including airspace management. The U.S. Army Communications-Electronics Research, Development, and Engineering Center's Command and Control Directorate is working with Assistant Product Manager Tactical Airspace Integration System to increase situational awareness in the cockpit. (U.S. Army photo by CW4 Daniel McClinton, courtesy of 1st Cavalry Division Public Affairs.)



“There are interoperability shortfalls across functional boundaries, services, and nations,” said Marvin Goldin, an engineer at the U.S. Army Communications-Electronics Research, Development, and Engineering Center (CERDEC).

CERDEC’s solution to this challenge? Get SMART: Semantic Mediation for Army Reasoning and Teamwork.

The technology has clear potential to benefit warfighters, said 1LT Andrew Campbell of the 159th Combat Aviation Brigade, which experimented with SMART during a recent exercise. “This program allows our analysts to quickly and efficiently translate incoming reports into a retrievable database,” Campbell said. “Soldiers then spend more time organizing and analyzing data and less time retyping every new report. More time spent analyzing will directly lead to better results on the battlefield.”

### The Interoperability Gap

Current software tools—a mix of government-off-the-shelf, commercial-off-the-shelf, and homegrown applications—use different means to store and transmit information.

Today, military analysts charged with disseminating certain field reports can face a laborious, time-intensive process. To transfer data manually from one system to another, they not only must copy and paste, which is subject to human error, but also extensively reformat the data to match the input requirements of the second system. By automating pieces of that translation process according to users’ specifications, SMART frees the analysts to focus on other tasks.

While ideally all systems could be brought onto a single, standard data structure, that approach is time- and cost-prohibitive, CERDEC officials said. They cited a 2006 research paper published by Carnegie Mellon’s Software Engineering Institute,

This program allows our analysts to quickly and efficiently translate incoming reports into a retrievable database. Soldiers then spend more time organizing and analyzing data and less time retyping every new report.

“Ultra-Large Scale Systems: The Software Challenge of the Future.” The report predicted that as DOD vigorously pursues information dominance, “systems will necessarily be decentralized in a variety of ways, developed and used by a wide variety of stakeholders with conflicting needs, evolving continuously, and constructed from heterogeneous parts.”

The report reinforced the notion that “one size does not fit all,” said Ron Szymanski, Chief Architect for Software and Technology for CERDEC’s Command and Control

Directorate (C2D). “Large systems are inherently heterogeneous, ever evolving, and decentralized,” he said. “We should embrace and move to standards, but will probably never get there.”

If software systems could not be forced to speak the same “language,” the C2D team decided they could instead create a translator. However, the problem of enabling interoperability between disparate software systems is significantly more complex than translation from one software language to another; the C2D team needed a solution enabling complex mediation of data while

**A Soldier monitors input from the tactical operations center during a test at White Sands Missile Range, NM. With the proliferation of systems that use different means to store and transfer information, interoperability has become a pressing concern. SMART allows systems to share more information faster to enhance collaboration, deconfliction, and integration. (U.S. Army photo.)**



preserving the meaning of those data. Data mediation involves mapping data between existing, incompatible data formats, allowing multiple software systems to share information.

The result is SMART, a solution that allows systems to share more information faster, enhancing collaboration, deconfliction, and integration.

### Adapting to Existing Systems

Rather than forcing different systems and users to abide by a single, one-size-fits-all “language,” SMART is flexible. It enables the solution to be introduced without additional requirements for training and day-to-day operations.

“SMART does the ‘hard work’ by bridging all those non-interoperable data schemas and services and does not force any changes on the existing systems or users,” Szymanski said. “Early interaction with warfighters improved the technology design, so there are few to no changes to the user experience when SMART is introduced.”

The SMART approach is to build upon successful past mediation solutions, including Data Mediation Service, Data Dissemination Service, Publish and Subscribe Service, and others, to tie them together into an overarching, enterprise-oriented interoperability framework, said Matthew Wilson, Director of Business Development for Future Skies Inc., who is supporting the project.

Unlike current data translation methods, SMART is extremely scalable to existing and future systems. It was specifically designed to allow for rapid introduction of new connectors to enable new systems to come online and share information with legacy systems.

### Putting SMART to the Test

The need for mediation solutions is not limited to Army systems, but also relates to managing data from joint,

SMART brings the potential to facilitate transparent coalition interoperability between native systems without requiring modifications to those systems.

interagency, and multinational systems. The ability of the SMART architecture to support multiple domains will be demonstrated through an upcoming exercise that aims to provide a clearer picture of the airspace to joint forces and coalition nations, said Goldin, the project’s technical lead.

The exercise will show how SMART can unite information from different systems, officials said.

“SMART brings the potential to facilitate transparent coalition interoperability between native systems without requiring modifications to those systems,” said Goldin. “By improving interoperability and automation among functional boundaries, services, and nations, better decisions in airspace management and utilization can be realized, hopefully reducing the burdens on the warfighter and improving the outcomes of missions.”

“What SMART does not do is remove the human from the process. There is, and should always be, a human in the loop to verify the final product,” Szymanski said. “The end result is a significant reduction in the amount of time required to obtain, process, analyze, and transmit information.”

SMART is one of the technologies and capabilities under development as part of the Collaborative Battlespace Reasoning and Awareness Army Technology Objective (COBRA ATO), which seeks to improve collaboration and interoperability within all levels of command, control, communications, computers, intelligence, surveillance, and reconnaissance. Also part of

the COBRA ATO are Command and Control Multitouch Enabled Technology, which uses touch- and gesture-based technology to improve warfighter collaboration, and customized battlefield applications for hand-held devices. The COBRA ATO also conducts research and development in support of Battle Command Web, a Web-based collaboration tool developed by Product Manager Strategic Battle Command within Program Executive Office Command, Control, and Communications-Tactical (PEO C3T). Battle Command Web is expected to reduce the hardware footprint to increase sustainability and efficiency.

This year, SMART is scheduled to be fielded with an operational unit, the 159th Combat Aviation Brigade, for the first time, and the technology is being transitioned to Product Director Common Software (PD CS). PD CS is assigned to Project Manager Battle Command, part of PEO C3T.

“SMART can be applied to the information needs of multiple communities, from airspace deconfliction to the military medical community,” said Michael Anthony, Chief of the Mission Command Division for CERDEC C2D. “SMART enables interoperability today.”

**CLAIRE HEININGER** is a staff writer for Symbolic Systems Inc. supporting the Army’s PEO C3T MilTech Solutions Office. She holds a B.A. in American studies and a minor in journalism, ethics, and democracy from the University of Notre Dame.





## CONFERENCE CALL

**I**n the current environment of change throughout DOD, acquisition plays a major role. The acquisition community is called on to continue providing unparalleled support to the Nation's warfighters as it embraces the challenges of budget constraints, greater collaboration among stakeholders, advancing science and technology, and continuously improving Soldier equipment. In this Conference Call section, *Army AL&T Magazine* focuses on these areas of evolution.

The section brings you coverage of the Association of the United States Army (AUSA) Institute of Land Warfare's Aviation Symposium and Exhibition Jan. 12-14 and the AUSA Institute of Land Warfare's Winter Symposium and Exposition Feb. 23-25. At these forums, senior Army, DOD, and private industry leaders discussed current initiatives and solutions. We hope you find this special segment of *Army AL&T Magazine* useful as you go about meeting the challenges of Army acquisition.

*Margaret C. (Peggy) Roth*  
Senior Editor

## CONFERENCE CALL



Chief of Staff of the Army GEN George W. Casey Jr. tells the audience at the February AUSA Land Warfare Institute's Winter Symposium and Exposition that Soldiers deploying after Oct. 1 could expect to have 24 months' dwell time upon return. (U.S. Army photo by J.D. Leipold.)

## Key Leaders Outline Priorities for Army in Transition

Margaret C. Roth

**W**ith encouraging signs of progress for the force and sobering signs of tighter budgets, top leaders in the Army, Army acquisition, and industry were cautiously optimistic about the years ahead, in remarks at the Association of the United States Army (AUSA) Institute of Land Warfare's Winter Symposium and Exposition from Feb. 23 to 25 in Fort Lauderdale, FL. The Army "is at a key transition point," said GEN George W. Casey Jr., Chief of Staff of the Army since April 2007. "We are coming out of a decade of war where we have fundamentally transformed the Army. And we are entering a period of continued war and, frankly, great uncertainty both at the strategic and the fiscal level."

Casey is retiring in April after nearly 41 years of service. GEN Martin E. Dempsey, Commanding General of the U.S. Army Training and Doctrine Command since December 2008, is Casey's successor as Chief of Staff of the Army.

The Army is stronger for having been rebalanced over the past five to six years, Casey noted. It is "a well-equipped and combat-seasoned Total

Force," though still stretched by continued war. The question at this time of congressional debate over the Nation's priorities is, "how do we sustain that balance and continue to build a balanced Army in a period of constrained resources?"

### Steps Toward Success

Casey cited a number of critical accomplishments that have enabled the Army both to sustain the all-volunteer force

and to restore strategic flexibility in the face of competing demands:

- Finishing the personnel growth that President George W. Bush directed and a temporary end strength increase of 22,000 Soldiers, which allowed the Army to field 120,000 Soldiers without having to use stop-loss.
- Increasing time at home station for Soldiers between deployments—Starting with deployments in FY12,

Soldiers can expect to have two years at home after a year deployed.

- Organizational change—“Between the modularization of the Army and the rebalancing of skills away from Cold War skills over the last seven years, we have fielded a fundamentally different Army ... much more suited to the challenges of the 21st century,” Casey said.
- The Army Force Generation (ARFORGEN) concept—While it was impossible to adhere to while the Army was deploying 150,000 to 160,000 Soldiers one year out and one year back, as of FY12 the Army will be able to execute ARFORGEN at a sustainable pace and tempo.
- Strategic flexibility—As a result of all the other achievements, Soldiers are now able to train for conflicts other than Iraq and Afghanistan.

## Challenges Ahead

The Army is poised to take on the current transition and sustain its new-found balance even without growth in its budget, Casey said. “We’re not in a bad place,” he said. However, he noted, “the war is not over.”

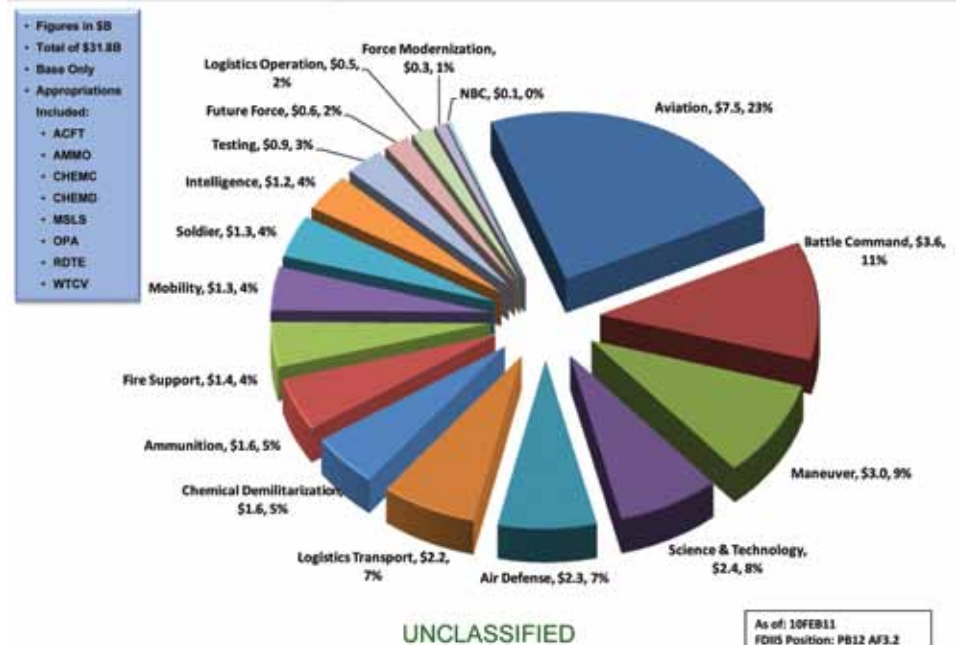
“We know the budget has to come down, we know we need to be more efficient in how we execute, but we have to be very, very careful that we don’t inadvertently hollow out the force as we’re trying to reduce the resources,” Casey said.

As Casey sees it, the challenges of the next decade, which he acknowledged may sometimes be conflicting priorities, include maintaining the combat edge of the current Army, reconstituting the force, and dealing with the impacts of a decade of war. “Think about it.

I want every soldier in the world to say, ‘Hell, no, I don’t want to fight the Americans. It’s a losing battle.’

AMERICA'S ARMY:  
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## FY12 Equipping Investments



We’ve lost over 4,000 Soldiers,” Casey said. “They’ve left over 20,000 family members. We’ve had over 25,000 Soldiers wounded, over 8,000 of them badly enough to require long-term care. We’ve had over 100,000 Soldiers since the beginning of the war diagnosed with traumatic brain injury; fortunately, over 90 percent of those are mild to moderate. We’ve had over 40,000 Soldiers since the beginning of the war diagnosed with post-traumatic stress. We’ve processed over 30,000 Soldiers through our Warrior Transition Units. We cannot take our eye off of the ball in terms of commitment to continue to support those who have been affected by this war.”

## Fiscal Realities

The Army has found the efficiencies and reductions that Secretary of Defense Robert M. Gates called for in

2010 without having to reduce force structure until 2015, Casey said. Gates set a goal of 2-3 percent net annual growth in warfighting capabilities without a commensurate budget increase.

Acquisition plays a major role in those efficiencies, Casey said. “We have to be hugely efficient to get the most value out of our acquisition dollars.” The recently completed Acquisition Study, for which an implementation plan is expected to be delivered late this summer, will help provide a road map for “how to make our requirements and processes more collaborative and more resource-informed ... how to better manage risk, and ... how to better grow our acquisition resources,” Casey said.

It is a paradox, Casey said, that while the Army’s acquisition core competencies suffered atrophy over the past 20 years, “we’ve got the best-equipped Army we’ve had in decades ... What we have to be careful of is that a series of incremental cuts doesn’t put us in the position, eight to 10 years from now, where we turn around and say, ‘What the heck happened?’”



## Acquisition Priorities

Dempsey emphasized the importance of adaptability. “We will build the Army that will be employed in 2020, and here’s what’s even more interesting to me: We’re building it with full knowledge that this Army will not be what we need in 2030. And that’s why adaptation must be an institutional imperative,” he said.

“It means that we have to revise our concepts every two years. It means we should expect significant organizational redesign every five years. It means incremental modernization with five- to seven-year procurement objectives synchronized to ARFORGEN. It means revision of doctrine, training methodologies, and leader development strategies every one to two years.”

GEN Peter W. Chiarelli, Vice Chief of Staff of the Army, noted that the ground combat vehicle, the first production model of which is expected to be delivered within seven years, embodies the Army’s desire for flexibility and versatility. It could benefit from lessons learned with the Army’s incremental modernization of the M1 Abrams tank, Chiarelli said. The present-day M1 is different than the original, because of improvements made with each incremental build, yet is “a platform that still shows great growth potential for the future.”

“If things go the way we hope they will go, [FY12] is not necessarily dire times,” said LTG Robert P. Lennox, the Army’s Deputy Chief of Staff (G-8). Lennox said the Army’s funding request to Congress places a high priority on initiatives that enhance Soldiers’ survivability, lethality, and situational awareness, and lighten their loads (See chart on Page 49). These FY12 investments include:

- \$1.37 billion to improve M4 Carbines
- \$1.2 billion to procure unmanned aircraft systems at the division, brigade, and battalion levels

- \$3.9 billion to develop a single, coherent network for Soldiers, platforms, and command posts
- \$884 million for Technology Development of the ground combat vehicle, with up to three contractor teams performing design and integration activities

## Small-Unit Focus

“The small unit, the squad and platoon, has become the decisive element in our formation,” Chiarelli said. “The Army’s success in the future requires us to empower the small unit leader.”

Dr. Malcolm Ross O’Neill, Assistant Secretary of the Army for Acquisition, Logistics, and Technology (ASAALT), also used the M1 as an example of strength, as he spoke of the need to make the dismounted Soldier a decisive weapon. Citing the M1’s overwhelming lethality, he said, “That’s what we call a decisive advantage: The enemy’s not going to fight you. They give up. I think the M1 tank has that kind of reputation worldwide, and I think the ground combat vehicle that we’re going to be fielding in seven years ... will have that kind of decisive advantage.”

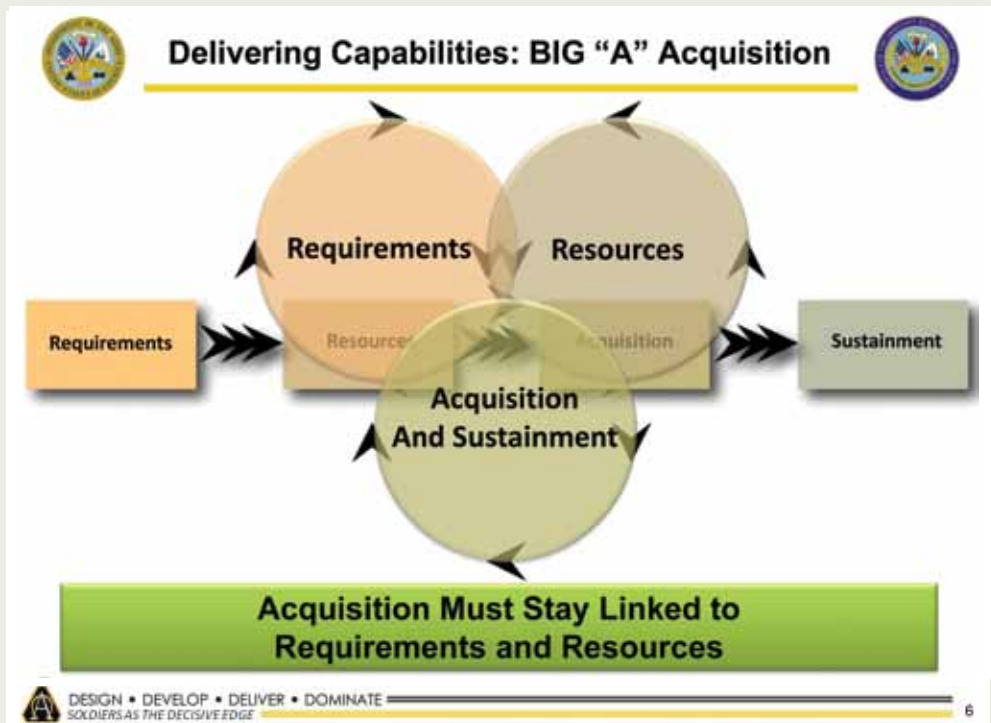
Dismounted Soldiers should have the same advantage, he said. “I want every soldier in the world to say, ‘Hell, no, I don’t want to fight the Americans. It’s a losing battle.’ The Soldier’s going to be my most important customer, whether he’s dismounted or mounted.”

## A Healthier Workforce

LTG William N. Phillips, Principal Military Deputy to the ASAALT and Director of Acquisition Career Management, emphasized the importance of collaboration throughout the design, development, delivery, and sustainment of systems.

“Requirements, resources, acquisition, and sustainment are inherently linked,” Phillips remarked. “They cannot be sequential. We have to be teamed together as we work through this.” With operational demands outpacing traditional business processes, he said, “We have got to reduce the bureaucracy that relates to Big-A acquisition” to prevail against an adaptive, responsive, and evolving enemy.

With regard to the professionals executing these acquisitions, Phillips



BAE SYSTEMS

## Internally Funded R&D, A Case Study Ultra-Lightweight Warrior (ULW)

Joe Coltman  
Vice President, Protection Systems



- Senior leadership commitment to infuse technology
- Two-year program of substantial IRAD investment
- Demonstrate:
  - Reduced weight
  - Mission scalability
  - System integration
- Engage user community
- Confirm opportunities for improvement

**Take-Away: Industry is willing to invest where there is a defined objective**

February 23, 2011 / AUSA Panel Discussion / unclassified 4

reiterated that “we have got to rebuild and rebalance the workforce.”

“Nowhere is that greater than in the contracting workforce,” he said. “We have a lot of work left to do. ... We’re probably about halfway there.” Overall, “We’re much better than we were three or four years ago.”

O’Neill noted that “We don’t have the ability to compete [with the private sector] on a salary basis,” but that DOD “is a great place to get the grounding.” In government, he said, you can “turn the iceberg.”

### Involving Industry

Asked how industry could contribute to giving Soldiers the decisive edge, O’Neill replied: “Think more about the Soldier.” He noted the huge investments industry made in America’s nuclear deterrence. “What we need is to have conventional deterrence. We should get some real big players, revenue-wise, into the area of the Soldier.”

Representatives from industry agreed with the need for greater investment in capabilities for the dismounted Soldier, but cited obstacles to innovation in the current acquisition processes.

“We’ve got to be significantly better in size [of Soldier equipment]. We’ve got to be significantly better in power. We’ve got to be significantly better in weight. We’ve got to be significantly cheaper,” said Robert P. Birmingham, Senior Vice President, Army Programs for L-3 Sensors and Simulation Group.

However, industry is reluctant to risk investing in new capabilities with no guarantee that the investment will lead to a Program of Record.

“There’s no incentive for us to provide any technological change beyond what was called for in the solicitation,” said Joseph W. Coltman, Vice President, Protection Systems at BAE Systems, a supplier of body armor, combat helmets, and other Soldier gear to the Army. For example,

Coltman said, there is no Program of Record for Soldier protective equipment.

Coltman showed the audience a hypothetical case study of internally funded research and development: the Ultra-Lightweight Warrior. One obstacle, he noted, is that no current product description fits this equipment, which would make it difficult to develop through existing acquisition programs. Furthermore, the project spans multiple Project Management Offices, raising questions about who would be responsible for developing, testing, and procuring.

Soldier protective equipment “has become a commodity market, and a commodity market supports at best incremental improvement. We need a vision of where that needs to go,” Coltman said.

“What we have to do is ... get things developed today and out in the field tomorrow,” O’Neill said. “I want to do this on time and within budget. Everything has to be affordable. ... The Army budget is not going to grow.”

*Casey’s remarks are online at <http://www.army.mil-speeches/2011/02/28/52575-feb-25-2011---remarks-at-the-ausa-winter-symposium/>; Dempsey’s remarks are at <http://www.army.mil-news/2011/02/25/52438-managing-transitions-profession-highlighted-in-csa-select-speech/>. Presentation slides are available at <http://crprogroupp.com/eventnotebook/>.*

**MARGARET C. ROTH** is Senior Editor of *Army AL&T* Magazine. She holds a B.A. in Russian language and linguistics from the University of Virginia. Roth has more than a decade of experience in writing about the Army and more than two decades’ experience in journalism and public relations.

## CONFERENCE CALL



To counter the growing threat of improvised explosive devices, DOD and the Army employed multiple contractors simultaneously to rapidly produce and deploy thousands of MRAP vehicles within a short, 2-year time span. (U.S. Army photo by SGT Mark B. Matthews.)

## Army Acquisition Evolves During Overseas Contingency Operations

Kris Osborn

**T**he U.S. Army acquisition community can best serve Soldiers at war by seeking at times to properly blend traditional acquisition practices with rapid and so-called hybrid approaches, said MG R. Mark Brown, Deputy for Acquisition and Systems Management in the Office of the Assistant Secretary of the Army for Acquisition, Logistics, and Technology (ASAALT).

“We have to remain flexible. We have to be responsive to the warfighter’s theater needs,” Brown said, speaking to an audience of military and industry Jan. 14, 2011, at the Association of the United States Army (AUSA) Institute of Land Warfare’s Aviation Symposium and Exhibition, National Harbor, MD.

Flexibility includes innovation to adjust to enemy techniques and tactics.

The current conflicts in Iraq and Afghanistan have required the Army to adapt its acquisition practices to be more efficient and more nimble in certain critical situations. The Army can accelerate, adjust, and, in some cases, bypass traditional acquisition processes in order to meet urgent operational needs. For example, DOD and the Army moved to rapidly produce and deploy thousands of Mine Resistant

Ambush Protected (MRAP) vehicles needed to counter the growing threat of improvised explosive devices.

This critical flexibility requires weighing traditional, DOD 5000 series acquisition procedures against more rapid approaches that promise speedier delivery of needed wartime gear and technologies. The Army has learned to perform this delicate balancing act and



The Army can accelerate, adjust, and, in some cases, bypass traditional acquisition processes in order to meet urgent operational needs.

respond quickly when enemy tactics have outpaced current technology, Brown said.

### Traditional Acquisition

Traditional approaches, which follow procurement practices delineated in DOD 5000 Defense Acquisition System guidelines, are much more deliberative, Brown said. They require extensive checks and balances including numerous certifications, specified plans, and documents at various stages in the acquisition process.

For example, a traditional, DOD 5000 Program of Record must have an approved requirement, Analysis of Alternatives Guidance, Initial Capabilities Documents, and a Capability Development Document. In addition, each of the milestones requires specific certifications such as verification of an approved technology development strategy, and a requirement to fully fund research and procurement plans for the life of the entire program.

“The hurdle gets increasingly high as you go through Milestone A and Milestone B. ... There is something called Section 2366 certification [DOD 5000]: Under Section 2366A, you must certify certain things for Milestone A. You must have an approved Technology Development Strategy, and RDT&E [Research, Development, Test, and Evaluation] must be fully funded for the entire program. You must have an improved Technology Readiness Assessment,” Brown said.

Milestone B requires an additional host of certifications, such as a fully funded

production program throughout the life of a given program before it can enter Milestone C, Brown said.

“So what we really need is some kind of hybrid process: shorter acquisitions, more mature acquisitions—buying less more often,” he said.

Nevertheless, these traditional processes are worthwhile and are indispensable to the success of many programs, such as those requiring a multiyear procurement strategy. Brown cited the UH-60 Black Hawk M helicopter as an example of the successful use of traditional acquisition approaches.

“There were some needs associated with this program [UH-60M] after it was fielded. Those needs were met through

the official way under the DOD 5000 traditional system; those needs were fly-by-wire, Common Aviation Architecture System, full authority digital engine control, and a composite tail cone,” he said.

“If you are going to have a big program that is going to have a long-term, far-reaching impact where we are going to spend billions and billions, like the Joint Strike Fighter, you might want to go the traditional route. But one size does not fit all,” Brown told the AUSA audience.

For instance, shorter processes can succeed for most Soldier equipment, Brown said. Improvements to Soldiers’ body armor fall in this category, Army officials indicated.

### Rapid Acquisition

“In the rapid acquisition system, you get an ONS [Operational Needs Statement] or JUONS [Joint Urgent Operational Needs Statement]. You go to the Army Requirements and Resources Board and get some OCO [overseas contingency operations]

The UH-60 Black Hawk M helicopter is an example of the successful use of traditional acquisition approaches. (Photo courtesy of the National Guard Bureau.)





The acquisition strategy of the Army's Gray Eagle Unmanned Aerial System blended traditional and rapid approaches. (U.S. Army photo by SPC Roland Hale, Enhanced Combat Aviation Brigade, 1st Infantry Division Public Affairs Office.)

dollars. You go out and buy something off-the-shelf and run it through a very rapid safety assessment and a Capabilities and Limitations Report. Then you send it into the fight. We have had a substantial amount of success with this," Brown said. As an example, Brown cited the UH-72A Lakota Light Utility Helicopter, which went from vision and concept to first unit equipped in four years. Trade-offs were made to accommodate the accelerated developmental time frame, Brown explained. Due to its speedy developmental cycle, the Lakota was not certified for combat; however, the arrival of the Lakota—now deployed in various key regions throughout the world—freed up Black Hawks, which were needed in Iraq and Afghanistan, he said.

### Hybrid Acquisition

Acquisition strategies that blend traditional and rapid approaches can be particularly useful when the Army seeks both to develop a needed future technology and to deliver capability rapidly to Soldiers at war, Brown explained.

An example is the Army's Gray Eagle Unmanned Aerial System program,

If you are going to have a big program that is going to have a long-term, far-reaching impact where we are going to spend billions and billions, like the Joint Strike Fighter, you might want to go the traditional route. But one size does not fit all.

Brown said. The Army has deployed two Quick Reaction Capabilities (QRCs) of the aircraft to Iraq and Afghanistan while pursuing a traditional Gray Eagle Program of Record.

From the time the Gray Eagle was designated as a QRC, a rapid acquisition, it took the Army 18 months to get it into the fight. "Somewhere in between QRC 1 and QRC 2, it was designated as a Program of Record," Brown said. "Because of its urgency to the fight, putting eyes on the enemy, the Defense Department and the Army leadership were willing to defer some of those high hurdles typically associated with traditional acquisition practices."

As with the Gray Eagle, hybrid approaches can afford the Army the opportunity to fast-track a needed technology and still preserve the checks, balances, and certifications

typically associated with traditional acquisition practices.

However, each method—traditional, rapid, or hybrid—meets the specific demands of a particular situation. This calls for a balanced approach whereby the Army selectively calls upon and employs a range of acquisition techniques.

The slides from Brown's AUSA presentation are available at <http://www.crprogroupp.com/2011%20AVIATION%20PRESENTATIONS/Thurs/PM/MG%20Mark%20Brown.pdf>.

**KRIS OSBORN** is a Highly Qualified Expert for the ASAALT Office of Strategic Communications. He holds a B.A. in English and political science from Kenyon College and an M.A. in comparative literature from Columbia University.

## CONFERENCE CALL



LTG William N. Phillips, Principal Military Deputy to the ASAALT, stressed the importance of relationships between the Army and industry in increasing productivity and cost savings. (U.S. Army photo by Ellen Hudson, U.S. Army Garrison Redstone, AL.)

## Army, Industry Seek Common Ground on Efficiencies

Kris Osborn

**A** rmy leaders and representatives from industry agreed that they can work together to increase productivity and help identify possible economic efficiencies and cost savings in an era of constrained resources, during a joint panel discussion Feb. 25 at the Association of the United States Army Institute of Land Warfare's Winter Symposium and Exposition in Fort Lauderdale, FL.

"We need a strong relationship with our industry partners so they can give us the feedback needed to make the best decisions possible," said LTG William N. Phillips, Principal Military Deputy to the Assistant Secretary of the Army for Acquisition, Logistics, and Technology (ASAALT).

The "efficiencies" discussion was grounded in guidance from Defense

Secretary Robert M. Gates and a Sept. 14, 2010, memo from Dr. Ashton B. Carter, Under Secretary of Defense for Acquisition, Technology and Logistics, titled *Better Buying Power: Guidance for Obtaining Greater Efficiency and Productivity in Defense Spending*.

Essentially, the guidance on efficiency asks the services to "do more without more," implicitly recognizing that the

overall defense budget is not expected to increase in coming years as it has in recent years.

A key element of the drive for efficiencies is the recognition that much of the cost savings will be reinvested in Army programs, Phillips said.

"The efficiencies that we have gained within our programs stay within



our programs. The PEOs [program executive offices] retain the savings so they can do better things for Soldiers within their programs,” Phillips said.

### Realistic Requirements

With these tenets in mind, Phillips emphasized that the Army needs to identify executable and affordable requirements. Along these lines, he cited the ground combat vehicle Request for Proposal (RFP) as an example of how the Army can properly align and prioritize its requirements.

The RFP called for a “tiering” of requirements and clear-cut cost goals so that industry would understand what was being asked and have the trade space necessary to fashion technologically mature solutions that can meet the requirements outlined in the proposal.

Getting this right calls for proper collaboration across a range of stakeholders, Phillips explained.

“We must be output-focused and resource-informed,” he said. “When we talked about the ground combat vehicle, this is what we are getting at. Today, for a major program, the acquisition folks, the sustainment folks, and the resourcing people must all be actively involved and engaged in the process before we begin to think about requirements generation.”

### Collaborative Possibilities

Another possible area of efficiency centers around looking for potential collaboration on weapons production throughout industry and across the services, Phillips said.

“As we work through the efficiencies with OSD [the Office of the Secretary of Defense], it’s important that we work with our industry partners. If you look at missiles built by the Army, Navy, and Air Force, are there opportunities for the industrial base or a company to leverage what we do



Testing is an area where potential economic efficiencies can be gained. Here, the Joint Light Tactical Vehicle undergoes a dirt track test at the Churchville Test Area near Aberdeen Proving Ground, MD, June 3, 2010. (U.S. Army photo by David McNally, U.S. Army Research, Development, and Engineering Command Public Affairs.)

and gain efficiencies by using the same production line?”

### Efficiencies in Testing

Testing is another area of potential efficiencies, Phillips said.

“Test is a critical part of every program. We should test to standard. We shouldn’t over-test, but we shouldn’t under-test either. There is a balance when it comes to making sure that you have a viable program that is going through the right testing procedures to validate that the systems you’re fielding are safe and suitable,” Phillips said.

The drive to achieve efficiencies is not intended to reduce industry profits but rather to create incentives and motivation for greater industry productivity, panelists said.

“I don’t see efficiency initiatives and profits being mutually exclusive,” said Steve Zink, Vice President, Oshkosh Defense Strategy and Planning.

“It’s achievable to think we can achieve a win-win,” said Mick Maurer, President of Sikorsky Military Systems.

### Army, Industry Council Gets Underway

In a related development, senior U.S. Army Contracting Command (ACC) leaders and a group of industry

representatives came together on Feb. 24 at ACC headquarters at Fort Belvoir, VA, for the first meeting of the ACC Industry Executive Council. The council is a forum to exchange information, identify common issues, build partnerships, and develop solutions that will improve Army contracting.

“We have been planning this for over a year, and now it aligns very nicely with DOD’s recent Better Buying Power Initiatives,” said Jeff Parsons, ACC’s Executive Director. “We’re here to gain a common understanding of how we can work together to face future challenges, including anticipated cutbacks in the Army budget.”

In addition to these DOD initiatives, the attendees discussed a recent Office of Management and Budget “Myth Busting” memorandum, which recommends that “each agency develop a high-level vendor communication plan.” The establishment of ACC’s Executive Industry Council is a step in that direction, according to a statement from ACC.

**KRIS OSBORN** is a Highly Qualified Expert for the ASAALT Office of Strategic Communications. He holds a B.A. in English and political science from Kenyon College and an M.A. in comparative literature from Columbia University.

## CONFERENCE CALL



By 2025, the CH-47 Chinook helicopter will be 70 years old. While the aircraft is currently effective, future threats and operations may require additional or different systems. (U.S. Army photo by MAJ Dan Hart, 1st Battalion, 5th Infantry, Fort Wainwright, AK.)

## Looking to the Future in Army Aviation Science and Technology

Robert E. Coultas and Kellyn D. Ritter

**B**y 2025, the CH-47 Chinook will be 70 years old; the UH-60 Black Hawk, AH-64 Apache, and OH-58 Kiowa nearly 50 years old. These aircraft will still be flying with no new vertical-lift aircraft to take their place.

MG Anthony G. Crutchfield, Chief of the Army Aviation Branch and Commanding General (CG) of the U.S. Army Aviation Center of Excellence (USAACE), Fort Rucker, AL, has set 2030 as the “aim point” to start producing new vertical aircraft.

While current aircraft are still effective, future threats and operations may require additional or different systems, said MG William T. Crosby, Program Executive Officer Aviation. This means the Army must make a commitment to funding science and technology (S&T) for new aviation programs.

In separate sessions at the Association of the United States Army (AUSA) Institute of Land Warfare’s Army Aviation Symposium and Exposition in January, Crutchfield and Crosby discussed a path forward for Army aviation.

Crutchfield told the AUSA audience at National Harbor, MD, that Army officials should not take the same approach to developing new aircraft as they did when the Army tried to develop the RAH-66 Comanche. Crutchfield compared the UH-1 program production timeline, started in 1952, with the Comanche program, started in 1982,

as an example of how moving the “aim point” affects aviation programs.

“It took eight years from requirements to production for the UH-1. About 16,000 UH-1s were produced, with about 7,000 serving in the Vietnam conflict. Overall, the UH-1 has been serving the Army for more than 45 years with some UH-1s still flying today,” Crutchfield said.

The Comanche, by contrast, was canceled in 2004. “I think we kept moving the aim point [of the Comanche]. We were looking to field the perfect



“How can you look to the future when you’ve got a \$7 billion [budget] with just over \$100 million in S&T?” asked Program Executive Officer Aviation MG William T. Crosby, then a brigadier general, Jan. 13 at the AUSA Institute of Land Warfare’s Army Aviation Symposium and Exposition. (U.S. Army photo by Todd Mozes.)

aircraft. There is nothing perfect. We lost sight of the goal,” Crutchfield said. “Even though technology will change and the environment will change, the aim point needs to remain the same.”

Crutchfield noted that after 22 years in the Comanche timeline, only two aircraft were produced, versus the UH-1’s eight-year timeline, in which 16,000 were made.

### Aviation Portfolio

As the life-cycle manager of manned and unmanned aviation weapon systems, Program Executive Office (PEO) Aviation is tasked with supporting overseas contingency operations while also maintaining Army aviation for the Current Force and transforming for the Future Force. The PEO manages seven project offices and 2,250 personnel, with a Program Objective Memorandum (POM) of \$35 billion in FYs 10-15 and foreign military sales case value of \$7 billion.

But while PEO Aviation’s total FY10 budget was \$7 billion, its S&T budget was only \$107 million.

“How can you look to the future when you’ve got a \$7 billion [budget] with just over \$100 million in S&T?” Crosby asked. “How can you modernize? How can you sustain? How can you go to the next vertical-lift technology?”

The operational tempo of Army aviation is high, Crosby noted, with more than 4.3 million flight hours since February 2003. Crosby advised that flying aircraft at this rate greatly shortens their life cycle; a projected 20-year life cycle can be compressed to five years. Reset, while it can extend the life of the aircraft, doesn’t negate the wear and tear on that aircraft.

“Are we going to continue to sustain these aircraft for another 20, 30, 40 years?” Crosby asked the AUSA audience. “That’s the struggle we’re going to be looking to resolve.” The only new aircraft program in the PEO Aviation portfolio is unmanned aerial systems, he noted. Every other program is one of modernizing or upgrading existing platforms.

### Combat Multipliers

Crutchfield’s personal commitment to Army aviation, he said, is to remain the “combat multiplier of choice” for the Army’s ground maneuver commanders, provide resolute leadership in supporting continuous combat operations, and prepare for the future.

“Nothing is more important than how we train and sustain the flow of highly qualified aviation professionals to rapidly meet the demands of commanders worldwide and expertly employ the full-spectrum capabilities aviation brings to the Army and the Joint Force,” he said. “I want to know what’s good about Army aviation and what can be improved, so we can meet the demands of the commanders and Soldiers in the field.”

Crutchfield referred to a series of “aviation imperatives” that are necessary to meet his goals:

- Work as a team
- Be rapid and responsive
- Keep “cost culture” in mind
- Professionally develop the aviation force
- Maintain strong relationships with local, regional, and national communities
- Eliminate the aviation training backlog
- Significantly reduce aviation accidents

### Learning from the Past

Crutchfield stressed the importance of past experience in looking forward. “We’re here today because of young Soldiers,” he said. He reminisced that when he was training as a young second lieutenant, he learned how to fly on the UH-1 Hueys under the instruction of Vietnam veterans, whom he called “visionaries.” He eventually flew the AH-64 Apache helicopter in *Operations Desert Shield* and *Desert Storm*.

“They knew we would need new aircraft and equipment. I owe the same vision to today’s young Soldiers,” he said. “They will not fight the same war we are. Twenty-five years from now, I don’t want them, I don’t want my grandchildren, to fly the AH-64Z.” Currently, the Army uses the AH-64D Apache Longbow.

“Our [aviation] branch has to lay out what it needs, and it must be done now. It’s all about the future,” Crutchfield said. “We may not get all we want, but we’re going to get all we need. We must have a healthy aviation branch, postured for full-spectrum operations in defense of our Nation and our national interests. We may not get it all right, but we must not get it all wrong,” he said.

### Looking Ahead

Current vertical-lift platforms are critical enablers in today’s conflicts. Without planning for their future, Army aviation will be unprepared when these platforms need replacing, Crosby said. Almost 50 percent of future vertical-lift decision points (e.g., whether to begin acquisition of replacement aircraft) occur within the next 10 years, and 85 percent within the next 15 years.



Crosby cited several studies on Army aviation that indicate the path it should take and the resources to get there. The Aviation Capability Based Assessment, approved by the Army Capabilities Integration Center in April 2010, identified 22 areas in which Army aviation was lacking for the projected future. The Office of the Secretary of Defense Future Vertical Lift Initiative Report went to Congress Aug. 27, 2010.

The Future Vertical Lift Joint Multi-Role Study, a joint effort led by the Army, is ongoing. In S&T, the U.S. Army Aviation and Missile Research, Development, and Engineering Center is conducting a Joint Multi-Role Capability Technology Demonstration Program through 2019. These analyses indicate the need for a new generation of vertical-lift platforms, with fielding beginning in 2025.

Crosby advised that despite the evident need to look at future airframes, Army aviation should not expect any new aircraft Programs of Record (PORs) in the FY12 POM. Even if Army aviation

**MG Anthony G. Crutchfield, then a brigadier general, Chief of the Army Aviation Branch and CG USAACE, speaks at a Fort Rucker Garrison Workforce Briefing Jan. 18, 2011. (U.S. Army photo by Kyle Ford.)**



**Crosby likened deferral of S&T investments in Army aviation to continually upgrading an old system in the unrealistic hope that it will keep working indefinitely. (Photo courtesy of AUSA.)**

did get a POR, it faces a fiscal dilemma. “Where can you get the money to do [it]? What are you going to trade and give up from the other systems to fund that effort? Or do you continue to accept risk in that area?” Crosby asked.

“The bottom line that really concerns me is deciding where the major investments need to be and how do we fight for and sustain the resources,” he said.

The Army needs to decide if it’s going to continue to use old aviation designs or put money into new vertical-lift technology, Crosby said. “You can’t keep adding new upgrades to an old heating system forever, because eventually it will fail. We need to start saving for that new heating system before it quits, or it’s going to be a cold day in hell when it does,” he said. Currently, “we wait until it’s broken to fix it.”

There is no established solution to the budget challenges for Army aviation, but it’s clear that a major investment in S&T is critical for the future, Crosby said. “We’re going to need to make some hard decisions and risks in some areas to apply the proper resources in S&T.”

*The slides from Crosby’s presentation are available at <http://www.crprogroupp.com/2011%20AVIATION%20PRESENTATIONS/Thurs/PM/BG%20William%20Crosby.pdf>.*

*The slides from Crutchfield’s presentation are also available at <http://www.crprogroupp.com/2011%20AVIATION%20PRESENTATIONS/Friday/BG%20Anthony%20Crutchfield.pdf>.*

**ROBERT E. COULTAS** is the *Army AL&T* Magazine Departments Editor and an *Army AL&T* Online Editor. He is a retired Army broadcaster with more than 35 years of combined experience in public affairs, journalism, broadcasting, and advertising. Coultas has won numerous Army Keith L. Ware Public Affairs Awards and is a DOD Thomas Jefferson Award recipient.

**KELLYN D. RITTER** provides contract support to the U.S. Army Acquisition Support Center through BRTRC Strategy and Communications Group. She holds a B.A. in English from Dickinson College.

# Parallel Paths for Weapon Development and Training

MAJ Shawn R. Murray and MAJ Thomas H. Nguyen

**T**here was a time when new weapon systems were developed on a completely separate track from their simulator training components. The traditional path would follow a familiar pattern: requirement approval, candidate selection, testing, type classification, and fielding. Only then would the process of developing simulation capability begin.

Soldiers from Fort Bragg, NC, conduct escalation of force training in shoot/don't shoot mode using the Engagement Skills Trainer 2000. (PEO STRI photo by Doug Schaub.)





However, this workflow often delayed the Army's ability to use simulation to assist new gunners in the operation, sighting, and familiarity of a new weapon.

In light of two ongoing conflicts, such delays are hardly acceptable, which is why Program Executive Office (PEO) Soldier and PEO Simulation, Training, and Instrumentation (STRI) sought to change the old paradigm by putting weapons development and weapons simulation on a parallel path.

Two significant benefits resulted from this effort. The concurrent fielding of a live weapon system along with its simulator counterpart provided units the flexibility to simultaneously train on both their actual weapons and the simulators without the constraints of weather or range availability. Second, the working relationship served as a model for future small-arms fieldings that synchronize with a New Equipment Training (NET) schedule and are particularly focused on achieving best-value and enhanced training results.

### A New Model for Fielding and Training

The initiative began in early 2008 when the two PEOs set out to simultaneously field the new 40mm M320 Grenade Launcher (GL) and its Engagement Skills Trainer (EST) 2000 simulation counterpart through their respective Product Manager (PM) shops: PM Individual Weapons (IW) and PM Ground Combat Tactical Trainer (GCTT). The team wanted to develop an M320 simulator that would capitalize on the EST 2000's global footprint and not require the M320 program to invest in a costly stand-alone training system. In line with the Army Modernization Strategy, the team felt that this approach would allow Soldiers and NET teams to use virtual rounds in a simulated environment, instead of real ammunition on the range, to conduct familiarization with the weapon system.

"A simulator can allow you to rapidly present a variety of different tactical challenges to the trainee to create opportunities for learning that could take years to acquire in the real world," said Charles Amburn, Lead Instructional Systems Specialist, EST 2000. "The learning opportunities extend beyond the trainee. Weapon systems designers, unit leaders, authors of the training and tactics, and those responsible for the integration and study of technology in small-arms training also benefit."

Knowing that the development time to create a new M320 simulated weapon would be unacceptably long, PM IW needed to develop a creative solution to meet its fielding goal.

"Rather than destroy the test sample M320s we had built for the development phase, we decided to put them to good use," said Robert Phung, Product Director, PM IW. "Since the test weapons could not be fielded anyway, we provided them to PM GCTT so that they could quickly re-engineer the weapons into M320 simulators. The program office saved significant time and money, since they didn't need to fabricate simulators from scratch."

PM IW and PM GCTT next prioritized their fieldings based on the modular force concept for brigade combat teams (BCTs) deploying into theater, in compliance with the Army Force Generation (ARFORGEN) phases and force pools. During the reset/train phase, a BCT would receive its new M320 equipment and conduct training using the train-the-trainer model. The Total Package Fielding team trained gunners and leaders selected by their units over a three-day period using classroom time, EST 2000 exercises, and, finally, range time. This plan allowed units to be trained on the actual system while maximizing their training time in both real and virtual environments.

As a unit was fielded its M320 GLs, a NET team moved to the unit's location to assist in the initial operator and field maintenance training. Trainers made use of the Soldiers' M320s as well as the EST 2000 M320s to cover both operator/unit-level and field support maintenance. The EST 2000 provided the NET teams the opportunity to correct deficiencies with new gunners without having to spend valuable and expensive range time to complete the

### ENGAGEMENT SKILLS TRAINER 2000

The EST 2000 is the Army's tactical weapons training system that enables Soldiers to train across three different modes: individual marksmanship, small unit (collective gunnery and tactical training), and judgmental use of force (shoot/don't shoot), which includes escalation of force and graduated response scenarios. Each EST 2000 includes small arms (M1200, M9, M16, M4, M203, and attached and stand-alone M320); crew-served weapons (M240B and M249 Squad Automatic Weapon); the AT4 anti-tank weapon; and heavy machine guns (M2 and MK19). This mix of weapon systems provides Soldiers and commanders the capability to build and sustain individual marksmanship as well as team and squad fire distribution and control, using computer-generated imagery and video. (PEO STRI photo by Doug Schaub.)





## M320 GRENADE LAUNCHER

The M320 is the Army's newest 40mm low-velocity grenade launcher. It replaces the aging M203. The M320 features a launcher, an integrated day/night sight, and a hand-held laser rangefinder. The new weapon improves upon the M203 series of weapons by demonstrating greater lethality and accuracy, firing equally well in daylight or darkness. The M320 can also fire all U.S. standard 40mm, low-velocity ammunition and has an unrestricted breech design that allows the system to fire longer 40mm low-velocity projectiles. The M320 can also be converted into a stand-alone system, enabling increased modularity and helping units to better configure their weapons based on mission requirements. Finally, by adding a more



modern double-action trigger and firing system, the M320 series is safer and more reliable than its predecessor. (U.S. Army photo courtesy of PEO Soldier.)

familiarization and record fire. This capability also allowed the units to continue to conduct marksmanship training on the EST 2000 after the NET teams departed. To further facilitate sustainment training, NET teams left the units with CD-ROMs containing operator and maintenance training materials to be used for refresher and follow-on training as needed.

“The ability to conduct familiarization and preventive maintenance inspection on the M320, using the EST 2000, has saved valuable training time for the Army's mobilization stations,” said SFC George Floyd, Infantry Training Developer, Joint Training and Training Development Center, Fort Dix, NJ. “The Soldier throughput available with the EST 2000 has also shown a significant cost savings to the Army in ammunition consumption.”

By using this groundbreaking approach to fielding and training, the M320 Total Package Fielding teams increased the proficiency of M320 grenadiers as they transitioned from classroom to range to theater, and as they trained in compliance with the ARFORGEN structured progression model. The result of using the EST 2000 system

has been to improve gunner accuracy and lethality initially on the training range and later on the battlefield.

“Since marksmanship is a perishable skill, Soldiers can continue to perform sustainment training through the EST 2000 prior to deployment or even while in theater,” said SSG Darren Shavers, EST 2000 Training Noncommissioned-Officer-in-Charge, Maneuver Center of Excellence, Fort Benning, GA. “This frees up range time for other units in the ARFORGEN cycle while the deploying unit can continue to train in the EST 2000 with all the weapon systems in the infantry squad.”

### Syncing Solutions

Today's environment presents significant challenges to Army acquisition programs. To cope with declining budgets, program managers need to rethink how they conduct business to maintain Soldiers' readiness. The PEO Soldier and PEO STRI initiative provides a useful model for partnership and simulation training while maximizing the time a Soldier spends on the assigned weapon. Although applying simulation is not new, program offices should capitalize on this resource, which can be refreshed and upgraded as

new capabilities are developed. Finally, simulation can accelerate the marksmanship training process and decrease costs without taking shortcuts.

The M320 initiative marked one of the first fieldings in which new simulator weapons were fielded simultaneously with actual weapons for purposes of NET. Follow-on initiatives include the M26 12-Gauge Modular Accessory Shotgun System, the M141 Bunker Defeat Munition, and the XM806 Lightweight .50 Caliber Machine Gun. This synchronized approach could serve as a model for future weapon systems as well, allowing the combat developer to write the simulations requirement along with the weapons requirement so that both systems can be ready for fielding and training simultaneously.

In the end, Soldier effectiveness is enhanced by gear improvements only if the Soldier is trained properly. The faster superior training can be delivered to Soldiers, the sooner they will have a decisive advantage, with the capability they need to execute missions and prevail.

**MAJ SHAWN R. MURRAY** serves as the Army Liaison to the U.S. Navy PEO for Unmanned Aerial Vehicles and Strike Weapons, Patuxent River, MD. Before his current assignment, he was the Assistant Product Officer for IW, PEO Soldier. Murray holds a B.S.S. in educational military history from Ohio University, an M.B.A. from Columbia Southern University, and an M.A. in history from American Military University.

**MAJ THOMAS H. NGUYEN** serves as Department of the Army Systems Coordinator for special programs. Before his current assignment, he was the Assistant PM GCTT, PEO STRI. Nguyen holds a B.S. in management and systems engineering from the U.S. Military Academy and an M.A. in organizational leadership from Chapman University.

The LEMV will be a recoverable and reusable multi-mission platform. It can be forward located to support extended geostationary operations from austere locations and is capable of beyond-line-of-site command and control. (Graphic courtesy of Northrop Grumman Corp.)



## Acquisition of Long Endurance Multi-Intelligence Vehicle Prototypes as an 'Other Transaction'

Ronald J. Dillon and LTC Robert J. Hannah

**T**he Long Endurance Multi-Intelligence Vehicle (LEMV), a new Army project for a prototype hybrid airship platform to support intelligence, surveillance, and reconnaissance (ISR) missions within forward combat areas, provides an instructive look at an unusual acquisition approach, an Other Transaction.

The LEMV project was driven by an operational need to quickly develop a new air platform for ISR that would be able to stay in the air for extended periods, operate at medium altitude, carry a substantial ISR payload, and be economically supportable within theater.

The LEMV could be a major game changer for ISR, as there are no other systems with its persistence, payload capability, range, and operating altitude, combined with economical operation and support costs.

Because of the limited research and development (R&D) for hybrid airships within DOD and the potential need to use technologies developed outside the traditional DOD community, it was necessary to adopt an atypical acquisition approach conducted outside of the *Federal Acquisition Regulation (FAR)*. This approach, an Other Transaction (OT), proved highly successful, allowing access to new technology developed outside traditional DOD channels and increased competition during the source selection process.

OTs are a relatively unusual acquisition technique designed to access technology being developed outside DOD by companies that do not traditionally do business with the U.S. government and are not structured or willing to comply with DOD acquisition requirements. The governing statutes exempt OT agreements from the great majority of federal acquisition laws, regulations, and associated policies and procedures, including the *FAR*.

An OT provides tremendous flexibility and requires extensive review before approval. The most comprehensive information on OTs is contained in the "Other Transactions Guide for Prototype Projects" issued by the Under Secretary of Defense for Acquisition, Technology, and Logistics in December 2000 and available on the Defense Procurement and Acquisition Policy

## ADVANTAGES TO 'OTHER TRANSACTION' ACQUISITION

**Rapid design and prototyping**

**Increased competition with nontraditional acquisition strategy**

**Access to non-DOD technology**

website at [http://www.acq.osd.mil/dpap/cpic/cp/specific\\_policy\\_areas.html#other\\_transactions](http://www.acq.osd.mil/dpap/cpic/cp/specific_policy_areas.html#other_transactions).

### Requirement Origins

The requirement for the LEMV originated in a Joint Requirements Oversight Council Memorandum from the Vice Chairman of the Joint Chiefs of Staff in June 2008. The Office of the Secretary of Defense ISR Task Force initiated action to obtain funding and start the acquisition process within the Army. The U.S. Army Space and Missile Defense Command/Army Forces Strategic Command (USASMDC/ARSTRAT) was subsequently selected as the technology development and demonstration lead for the LEMV based on its expertise with lighter-than-air (LTA) vehicles.

LTA platforms have been in existence since the 19th century. They are familiar to the public in the form of hot air balloons offering sightseeing tours and commercial blimps such as the Goodyear blimp. DOD used blimps during World Wars I and II, and the U.S. Navy Naval Air Systems Command still operates a small airship that was used to support operations in the 2010 Gulf of Mexico oil leak. The LEMV airship harnesses decades of advances in aviation and materials knowledge compared with these existing commercial systems.

The U.S. government also makes extensive use of tethered, unmanned LTA platforms for ISR missions. It has invested in research for several

LTA systems such as the USASMDC/ARSTRAT High-Altitude Airship and HiSentinel efforts, and the Defense Advanced Research Projects Agency Walrus and Integrated Sensor Is Structure projects. However, none of these systems showed a high probability for meeting the LEMV performance requirements for persistence, payload, range, and altitude. The most promising solution meeting the LEMV requirements was hybrid airship technology, in which part of the lift for the airship is aerodynamic.

### An Aggressive Schedule

The LEMV project requires the design development, test, and acceptance of the complete integrated system (airship, ground stations, communications, and sensors) within 18 months of award.

Additionally, the LEMV project office was directed to obtain adequate intellectual property rights to pave the way for potential future competitive production of the LEMV.

The aggressive schedule must be accomplished despite the immaturity of the hybrid airship technology. No full-scale prototypes exist for the LEMV, which will be approximately 300 feet long and 1.4 million cubic feet in volume. The system must be mature enough after 18 months to be transported to an area of operations immediately after acceptance, for extensive Joint Military Utilization Assessment (JMUA) within forward combat areas.



This ambitious schedule requires development and fabrication of the airship concurrent with integration of the ground stations, communications, and sensors to enable use within the area of operations during a three-plus-year JMUA. Under the OT, the contractor must also establish logistic support in the area of operations for operation and maintenance of the LEMV during the JMUA.

### Nontraditional Contractors Needed

Before the LEMV, hybrid airship technology had only been explored outside DOD by companies at their own R&D expense. No full-scale hybrid airships existed, only small-scale models (60-foot and 125-foot experimental versions). The technology to achieve the required combination of persistence, payload, altitude, and range was unproven. Many of the companies possessing technology critical to achieving the LEMV performance requirements were not traditional DOD contractors and lacked the understanding, systems, and orientation to perform within the standard federal acquisition framework.

Because of this, the USASMDC acquisition team presented an acquisition strategy based on an OT agreement to the Office of the Assistant Secretary of the Army for Acquisition, Logistics, and Technology (OASAALT).

As expected for an acquisition approach that offers such a high level of flexibility, OTs are highly restricted and are subject to an extensive review and approval process.

Following in-depth market research and analysis, OASAALT concurred with the OT approach, which then was approved by the Under Secretary of Defense for Acquisition, Technology, and Logistics in December 2009. After congressional notification, the solicitation was issued in mid-February 2010. An award was made in mid-June

2010, following evaluation of two proposals and negotiation of all offers, to a team led by Northrop Grumman Corp. that included Hybrid Air Vehicles Ltd. of Cardington, England (a nontraditional company), at a cost-plus-fixed-fee amount of \$154 million for the initial prototype LEMV system and a total agreement value of \$517 million including options.

This team aligned well with the OT legal requirements and intent, bringing Hybrid Air Vehicles' extensive knowledge and hybrid airship technology into the agreement.

### Measures of Success

The OT-based acquisition of the LEMV was a success on a number of levels:

- A level of competition was obtained during the source selection that could not have been achieved under a *FAR*-based approach.
- The increased flexibility supported the approach to obtain intellectual property rights for future DOD acquisitions, which will set the stage for competition if the LEMV transitions into a major DOD program. The LEMV contract included obtaining a special license agreement that gives the U.S. government rights to technology developed commercially and at company expense prior to the LEMV project, unlike most technology developed outside DOD and subject to major data rights restrictions. The special license agreement grants the government rights irrespective of whether the technology was originally funded by the contractor, subcontractor, or the government.
- The ability to integrate existing R&D from nontraditional DOD sources resulted in lower development costs and significantly less development time. Use of existing technology outside traditional DOD sources will enable the LEMV to meet its aggressive 18-month delivery schedule. Independent development

of this technology through traditional DOD acquisition methods would have been impossible within the required timeline.

- While Hybrid Air Vehicles furnished its extensive knowledge of hybrid airship design and fabrication, it lacked the full system expertise and the managerial structure and experience to manage a large, complex, and highly aggressive project. Northrop Grumman had the managerial experience and expertise to run a difficult project as well as the comprehensive ability to integrate the airship as a complete system, but the company lacked expertise in hybrid airship technology.
- The LEMV entered Critical Design Review in November 2010 and is on track to complete system fabrication and test in mid-2011 before final acceptance and transportation to the area of operation in 2012.

If successful, the LEMV will be considered for transition to a major program and subsequent production under a *FAR*-based acquisition.

The potential market for hybrid airships is significant for both government and commercial markets. The LEMV approach has leveraged existing technology that was privately funded, to decrease government cost and schedule and to advance the technology to the level where it can become commercially viable.

**RONALD J. DILLON** is the Agreements Officer for the LEMV Technology Project. He holds a B.A. in history from Colorado College and an M.B.A. from Orlando College. Dillon is Level III certified in contracting and is a Senior Contracting Officer and U.S. Army Acquisition Corps member.

**LTC ROBERT J. HANNAH** is the Deputy Project Manager for LEMV. He holds a B.S. from the U.S. Military Academy and has 15 years' experience as an acquisition officer.



## From TRADOC System Managers to TRADOC Capability Managers: Creating an Organizational Focus

Carl Harris and John Robertson

*"...institutional change is not merely about pinching pennies or pushing pens. And efficiencies are not simply about improving the bottom line. They're about doing things better, doing them smarter, and taking full advantage of the progress, technology, knowledge, and experience that we have available to us."*

—The Honorable John McHugh, Secretary of the Army, Keynote Address,  
Association of the United States Army 2010 Annual Meeting and Exposition

**FIGURE 1. TRADOC SYSTEM MANAGER OFFICES**

To better integrate and synchronize the development and fielding of the Army's required capabilities, as well as to provide a more efficient and effective capability management process, the U.S. Army Training and Doctrine Command (TRADOC) recently changed its strategy for TRADOC Capability Manager (TCM) alignment to include TCMs that focus on organizations as well as other TCMs that will continue the traditional systems-based functional focus.

### From Systems to Programs

In the early 1970s, TRADOC was established and assumed the training functions of the Continental Army Command and the combat developments mission of the Combat Developments Command, as part of a major reorganization of the Army command structure. In assuming those responsibilities, TRADOC became the focal point for formulating the need and requirements for new weapon and materiel systems, monitoring the development of those systems, and identifying the need to adjust training, personnel, and organizations to facilitate the integration of these new systems into Army units.

To fulfill its role in providing training excellence, guidance on fighting the country's wars, and insights about the organization and materiel necessary to support the Soldier on the battlefield, TRADOC needed to take a total systems approach to development. This approach spawned the establishment of the first TRADOC System Manager (TSM) offices in 1977 (see Figure 1). Each TSM consisted of a colonel with a small staff pulled from the TRADOC centers and schools.

The TSMs represented all major weapon and materiel systems in development and functioned with power and authority comparable to those of the program and project managers within the U.S. Army Materiel Command

<p><b>FORT BENNING</b></p> <ul style="list-style-type: none"> <li>Black Hawk</li> <li>Fighting Vehicle System</li> <li>Improved Tow Vehicle</li> </ul>	<p><b>FORT HUACHUCA</b></p> <ul style="list-style-type: none"> <li>Corps Tactical Electronic Warfare/Intelligence System</li> <li>Division Tactical Electronic Warfare/Intelligence System</li> </ul>	<p><b>FORT RUCKER</b></p> <ul style="list-style-type: none"> <li>Attack Helicopter</li> <li>Advanced Scout Helicopter</li> <li>HELLFIRE</li> </ul>
<p><b>FORT BLISS</b></p> <ul style="list-style-type: none"> <li>Division Air Defense Gun</li> <li>Patriot</li> <li>Roland</li> <li>Stinger</li> </ul>	<p><b>FORT KNOX</b></p> <ul style="list-style-type: none"> <li>Tank System Development</li> </ul>	<p><b>FORT SILL</b></p> <ul style="list-style-type: none"> <li>Copperhead</li> <li>Firefinder</li> <li>General Support Rocket System</li> <li>M198 Towed Howitzer and associated systems</li> <li>Pershing II Missile</li> <li>Tactical Fire Direction System</li> <li>8" Howitzer Systems</li> </ul>
<p><b>FORT GORDON</b></p> <ul style="list-style-type: none"> <li>Automatic Telephone Central Office</li> <li>Advanced Tactical Support System</li> <li>Single Channel Ground and Airborne Radio System</li> <li>Tactical Satellite Communications</li> </ul>	<p><b>FORT LEAVENWORTH</b></p> <ul style="list-style-type: none"> <li>Positioning/Navigation</li> <li>Remotely Piloted Vehicle</li> <li>Smoke</li> <li>Stand-off Target Acquisition System</li> <li>Tactical Operating Systems</li> </ul>	

SOURCE: March 1977 brief to TRADOC CG

(AMC). They were given the job of integrating and synchronizing all the doctrine, training, leadership, organizations, and materiel activities associated with fielding weapon and materiel systems. The TSMs' charters were to facilitate the training, logistical support, and personnel functions needed to sustain the systems during fielding and beyond. They were designed to be the "energizers" of the larger TRADOC school staffs and not necessarily the "doers."

TSMs served as user advocates—the "voice" of the warfighter—and worked in complement with the system developers in AMC. They reported directly to their respective school commandants, and were chartered by and worked for the TRADOC Commanding General (CG) in defending the need for the systems.

The original intent was for each TSM office to be disestablished once the specific weapon or materiel system was fielded. However, the continuation of block improvements, the evolution of spiral developments, and the general requirement for continuous improvements to these systems required the TSMs to evolve beyond their original

purpose of addressing the life cycle of changing materiel programs and force design updates.

Recognizing the increasing linkages and interdependencies between systems and the growing number of different systems being developed and fielded, TRADOC identified the need for a similar type of office to facilitate integration across TRADOC centers and schools. Hence, TRADOC Program Integration Offices (TPIOs) were established with the mission to serve as the TRADOC integrating agency for their assigned systems. The first of these, TPIO Deep Battle, was established in April 1988. Unlike the TSMs, which managed specific systems, the TPIOs managed the commonality and interoperability aspects and provided management and development oversight for proponent system-specific components, modules, or weapon systems.

### Establishment and Evolution of TCMs

Eventually, rather than concentrating on a single system, TSMs gained responsibility for a family of materiel systems, or a group of closely related or interdependent materiel systems. TRADOC found



it advantageous to broaden the TSMs' focus to a functional or capability area versus retaining solely a system focus. In 2006, TRADOC decided to initiate the redesignation of TSMs as TRADOC Capability Managers (TCMs). Given their comparable integration roles and responsibilities, the TPIOs also were to be redesignated as TCMs (see Figure 2).

TCMs provide intensive, centralized, total capability management, and integration of all doctrine, organization, training, materiel, leadership and education, personnel, and facilities (DOTMLPF) considerations for a particular capability area or function. Capability areas normally include a class of capabilities, a family of materiel or system of systems, umbrella training capabilities consisting of systems or support programs, or, in some instances, a distinct organization.

TCMs traditionally have been focused and aligned based on weapon and

materiel systems responsibilities. However, the unit is the ultimate point where all elements of DOTMLPF must be integrated for a particular system to be successfully fielded, and where the various individual systems being fielded to the unit must ultimately work in consonance. Therefore, the Army Capabilities Integration Center (ARCIC) is leading a transition of several existing TCM offices from a systems focus to an organizational focus (see Figure 3).

This initiative follows a set of organization-based assessments and successful experiences implementing TCMs for the Stryker, Heavy, and Infantry Brigade Combat Teams (BCTs). TRADOC has learned by examining the impact of capability developments in an organizational context. TRADOC now leverages TCMs to better meet the Army's integration requirements by focusing across the organizations in the operational force.

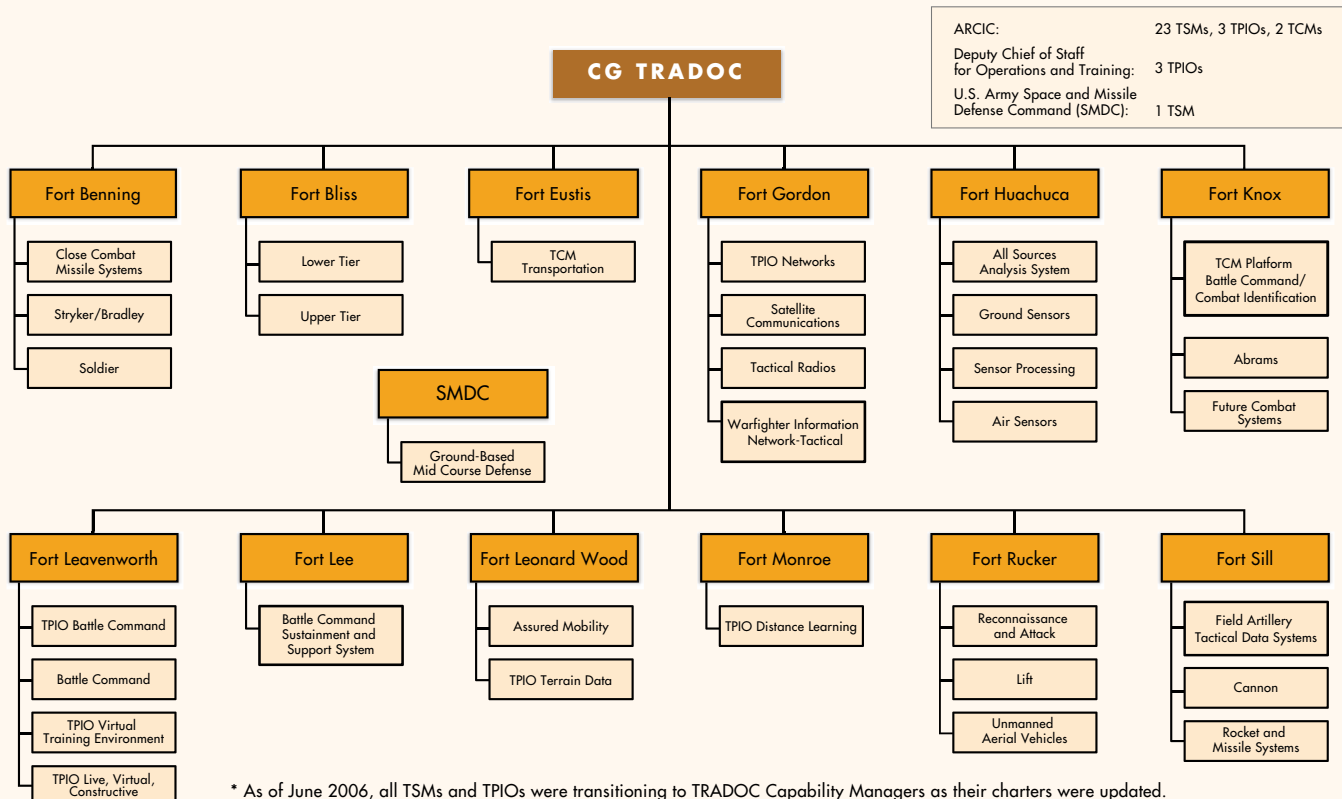
As part of the push for more TCMs with an organizational focus, TCM offices for the Air Defense Artillery Brigade, Army Air and Missile Defense Command, Battlefield Surveillance Brigade, and Maneuver Enhancement Brigade were formed in 2010. In early 2011, TCM offices for BCT Fires, Fires Brigade, and Fires Cell were established. TRADOC is realigning within existing resources as it continues to stand up these new TCM offices. A review is ongoing to decide whether to stand up one or more aviation organizational TCMs.

### Organizational Roles

Organizational TCMs perform the following functions:

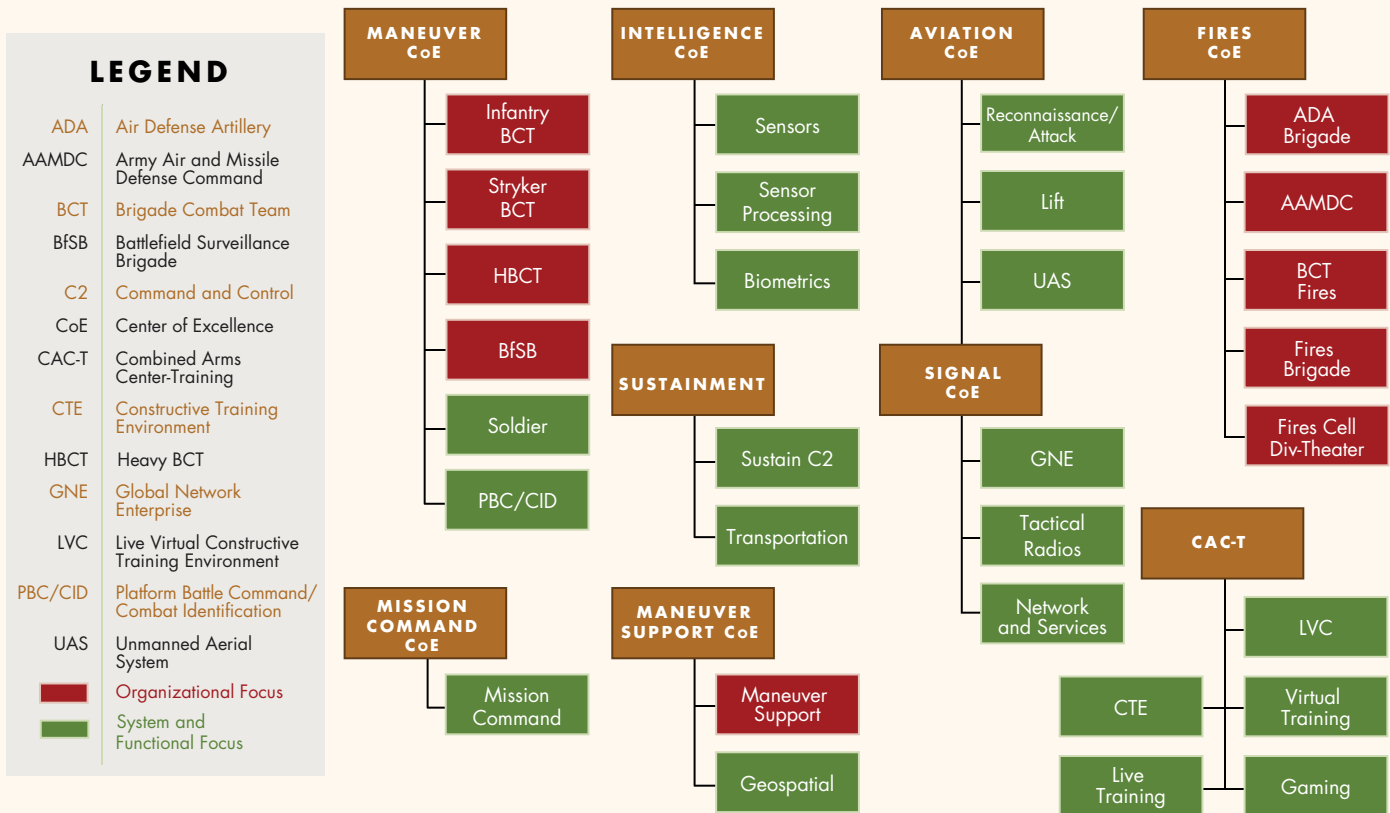
- Integrate requirements within their assigned organization across DOTMLPF
- Serve as the TRADOC point of contact for assessing DOTMLPF for their assigned organizations

**FIGURE 2. TSM/TPIO/TCM EVOLUTION\***



\* As of June 2006, all TSMs and TPIOs were transitioning to TRADOC Capability Managers as their charters were updated.

**FIGURE 3. TRADOC CAPABILITY MANAGERS**



- Provide organizational subject-matter expertise to various capabilities development forums
- Interact with operational units and warfighter forums on important issues to solicit their input
- Coordinate TRADOC products developed by the Centers of Excellence (CoEs) as they become available to enhance unit capabilities
- Influence TRADOC and Army Staff requirements, studies, actions, and other “good ideas” that affect assigned units
- Support Army Force Generation reset
  - ▶ Coordinate with brigade commanders, other TCMs, and program and project managers to facilitate the fielding or retrofit of new equipment or capabilities
  - ▶ Coordinate fielding of new doctrine, tactics, techniques, and procedures
  - ▶ Help unit commanders and program managers coordinate mobile training teams

- ▶ Represent the user, in many cases, in the materiel acquisition process for key organizational systems assigned to the respective TRADOC CoE, and work with other CoEs to coordinate capabilities for assigned organizations

Although much of the recent effort has been on creating TCM offices that focus on a specific organization, the need for some “functional” TCMs remains. Many capability solutions still transcend organizational boundaries. An example is the TCM for Tactical Radios; the scope of capabilities and responsibilities for this office includes all echelons of the force and is not specific to a unit type or organization.

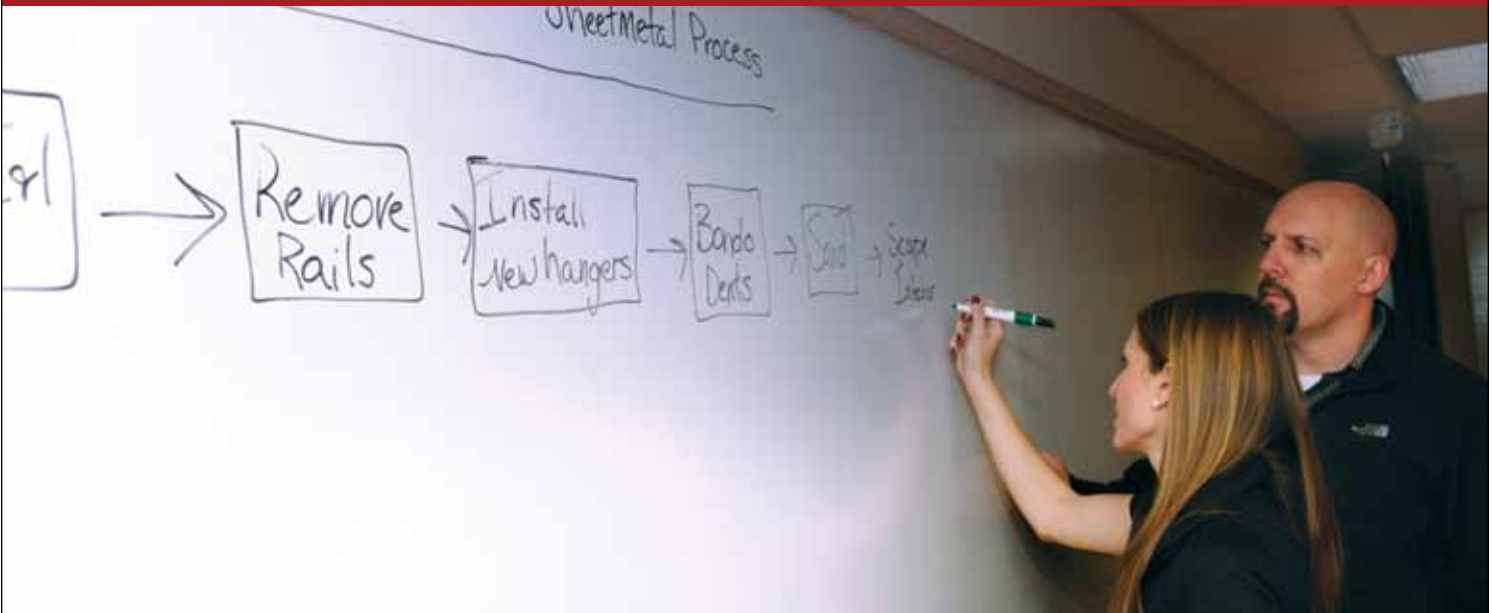
Functional and organizational TCMs will coexist as the Army moves forward in developing capabilities. This new alignment will ensure better integration and synchronization of the Army’s

requirements, as well as a more efficient capability management process. TCMs will continue to collaborate with systems program and project managers to ensure that development, fielding, and sustainment are integrated across all aspects of DOTMLPF.

**CARL HARRIS** is a Materiel Requirements Analyst in the G-3/5/7, ARCIC, TRADOC. He has served as the TRADOC staff officer for the TSM/TPIO/TCM program for the past 15 years. He holds a B.S. in accounting from North Carolina Agricultural and Technical State University.

**JOHN ROBERTSON** is the Deputy Director, ARCIC (Forward), TRADOC. He holds a B.S. in statistics and computer science from the University of Georgia and an M.S. in operations research from Stanford University.

## LEAN SIX SIGMA/BUSINESS TRANSFORMATION



The Program Executive Office Ammunition CPI/LSS pilot training program teaches students statistics, how to develop process maps, value-stream mapping, team development, and how to use a host of well-defined tool sets. Here, Process Improvement Specialists from Tobyhanna Army Depot, PA, outline a process improvement event. (U.S. Army photo by Tony Medici.)

## Assistant Secretary of the Army for Acquisition, Logistics, and Technology Directorate Launches Pilot Training Program

Kris Osborn

**T**he Assistant Secretary of the Army for Acquisition, Logistics, and Technology (ASAALT) and the Office of the Secretary of the Army (SecArmy) are co-sponsoring a new Continuous Performance Improvement (CPI)/Lean Six Sigma (LSS) pilot training program designed to make the training more relevant to the toughest problems faced by the Army acquisition workforce, while reducing costs and improving overall customer satisfaction, said Nancy Moulton, ASAALT's Director for Business Transformation and an LSS Master Black Belt.

"Achieving and sustaining performance improvements demand innovative ways of learning. To equip the acquisition workforce to meet today's complex set of demands on their time and produce the kind of results our Soldiers depend on, ASAALT is investing in innovative ways to apply CPI/LSS methods by making training and coaching resources

more available to ASAALT workforce members," Moulton said.

The pilot program, Continuous Process Improvement Workforce Transformation, co-sponsored by the SecArmy's Office of Business Transformation and the ASAALT's Directorate for Business Transformation, streamlines the existing

course structure to increase efficiency and improve results.

### A Cultural Change

CPI is a strategic approach used by ASAALT to focus on improving organizational performance. CPI improves management practices; structures and improves reliability of





Pilot CPI/LSS Green Belt and Black Belt courses are being tested in FY11 within the ASAALT and reporting organizations. (U.S. Army photo by Jon Connor, U.S. Army Sustainment Command.)

To equip the acquisition workforce to meet today's complex set of demands on their time and produce the kind of results our Soldiers depend on, ASAALT is investing in innovative ways to apply CPI/LSS methods by making training and coaching resources more available to ASAALT workforce members.

business processes; reduces process cycle times; and drives down costs through a variety of methods such as LSS, which is geared toward more efficient use of resources.

LSS is a method of improving efficiency and effectiveness that combines the Lean (identifying and eliminating activities lacking value) with Six Sigma (eliminating quality defects and waste caused by variation). This approach can

be applied to any process, whether it is manufacturing, acquisition, logistics, administration, or services. The objective of using LSS methodologies is to deliver high-quality products and services more efficiently and effectively.

LSS is designed to embody the tenets of CPI.

“What you are looking to do is get a level of proficiency systematically

deployed across an organization that can use the tools, speak a common language, and be able to use problem-solving techniques in a very structured, uniform way. That really drives the cultural change,” said Paul Chiodo, CPI/LSS Deployment Director for Program Executive Office Ammunition (PEO Ammo), one of the participants in the pilot program.

**Testing New Courses**

The new pilot Green Belt and Black Belt courses are being tested in FY11 within the ASAALT and reporting organizations. The courses have been designed based on feedback from PEOs and students who want them to be more focused on the student's need to solve the problem being addressed in a CPI/LSS project. The pilot courses

also incorporate feedback from the members of each class to further improve the content. The pilot training program aims to enable workforce members to become more effective problem solvers and better process managers, with a goal of 2-3 percent efficiency improvements each year in each organization, said Moulton.

Course creators selected CPI competencies from a host of industry and DOD organizations to include the American Society for Quality; DOD itself; the U.S. Army Armament Research, Development, and Engineering Center; and PEO Missiles and Space.

“We looked at a host of organizations and their training packages. We took the best of all of them and put them together, reducing the training cycle time by 50 percent. We are not only teaching the LSS methodologies, but we are teaching them CPI approaches,” said Wava Johnson, Army LSS Black Belt and ASAALT’s LSS Training and Certification Program Manager.

As a result, the Green Belt LSS, or apprentice-level course, was reduced from two weeks to one week; the Black Belt LSS, the more advanced or journeyman-level course, was reduced from four weeks to two weeks.

### Built-In Flexibility

Pilot courses also have built-in modularity and flexibility. Training can be specially tailored to meet the needs of executives and senior leaders who may not be able to attend classes because of busy schedules. Courses can be presented in a series of shorter sessions that

What you are looking to do is get a level of proficiency systemically deployed across an organization that can use the tools, speak a common language, and be able to use problem-solving techniques in a very structured, uniform way. That really drives the cultural change.

bring the information to executives and busy project managers, allowing them to complete LSS projects and make significant improvements using a variety of CPI methodologies, Johnson said.

Some of the core precepts of the training include instruction in an LSS approach known as Define, Measure, Analyze, Improve, Control (DMAIC)—a method of identifying and analyzing a particular problem before implementing a solution to improve the efficiency of a given business process.

“We’re building our fundamentals under the DMAIC process. When a person gets training, we mentor them through the entire process. They have to grow as a practitioner with every single project. Our mind-set is if we are going to deploy this, we want everybody to be of the same mind. We want to create a cultural change in our organization,” said Frank J. De Luca Jr., Assistant Program Executive Officer for Strategic Planning and Operations, PEO Missiles and Space (See related article on Page 73). Students are presented with business scenarios and problems to which they can apply the LSS approach.

“We teach them statistics, how to develop process maps, value-stream

mapping, how to do team development, and how to use a host of well-defined tool sets. We help to bring that into an enterprise or technical environment. We give specific examples of scenarios or past projects,” Chiodo said. “We continuously benchmark major corporations and other services for best practices in all these methods, techniques, and tools. We take a look at incorporating them to improve our practices.”

The course is for ASAALT employees selected by their leaders to attend. Individuals attending should be of the highest caliber, Johnson said. There is no cost to the organization for those attending the course.

Pilot courses have been conducted recently by PEO Missiles and Space, PEO Integration, PEO Command, Control, and Communications-Tactical, PEO Ammo, and Joint PEO Chemical and Biological Defense. Based on the positive feedback and enthusiasm generated by the initial courses, additional courses are being planned and will be listed in the Army’s Training Requirements and Resources System, <https://www.atrs.army.mil>, when they are available for enrollment.

The courses have been designed based on feedback from PEOs and students who want them to be more focused on the student’s need to solve the problem being addressed in a CPI/LSS project.

**KRIS OSBORN** is a Highly Qualified Expert for the ASAALT Office of Strategic Communications. He holds a B.A. in English and political science from Kenyon College and an M.A. in comparative literature from Columbia University.

## LEAN SIX SIGMA/BUSINESS TRANSFORMATION



The improvement of CPI/LSS in PEO MS will improve operational business success and enable the PEO to manage programs.

## The Leaning of Lean Six Sigma: A Systems Approach to Cultural Change

Frank J. De Luca Jr.

**P**rogram Executive Office Missiles and Space (PEO MS) at Redstone Arsenal, AL, set out to realign deployment of the Army's Continuous Performance Improvement (CPI)/Lean Six Sigma (LSS) program tool sets to achieve fundamental cultural change and, ultimately, improve operational business success.

These initiatives were inspired by the PEO's willingness to listen to the voice of the customer (VOC), which is fundamental to the success of every business. When employee-customers express a need for fundamental organizational process change in LSS deployment, the deployment process must be adjusted accordingly.

From January 2007 to April 2010, PEO MS employees voiced their need for change in the deployment of LSS throughout the PEO, providing a detailed laundry list of their VOC needs.

Here's what they said:

- The LSS Program of Instruction (POI) is too broadly focused, primarily in the area of manufacturing versus transactional business environments.
- Army and PEO business environments are more "Lean" than "Six Sigma"; PEO MS needs a POI that would more accurately reflect our transactional environment. An example of such an environment is that PEO MS directly produces paper and e-mail products, versus manufacturing products, that support its business processes and Soldiers.
- Transactional environments have very limited process data, so we need to better understand data types and how to mine data in our transactional world. Process data refers to the flow of paper information—such as product contract requirements from the Project Management Offices to the Contracting Center, engineering data between the government and industry partners, and acquisition milestone decision documents among the PEO, the Assistant Secretary of the Army for Acquisition, Logistics, and Technology (ASAALT), and the



Department of the Army (DA)—and the time that it takes from start to finish, to include flow days, delays, and redos.

- Current Green Belt and Black Belt training is too long (two weeks and four weeks, respectively); it competes with mission needs. Can we reduce training time and focus the POI to better align the content between the two training levels?
- The expectations for the time it will take to complete belt projects are unrealistic, as we are an Army at war. Can we adjust LSS to our business and operational realities?
- The amount and levels of mandatory belt certification practices, policies, and procedures contradict CPI and LSS tenets. Can we adjust LSS to a more user-friendly, intuitive tool set, realizing that doing a first project does not make one an expert, but a novice practitioner whose expertise evolves with each project? Otherwise, LSS project completion and certification represent an LSS finish line, versus a starting line for LSS cultural development.

### Understanding Excellence

Americans expect and believe that our military, specifically our Army, is the world's best. But excellence in business and performance do not happen by osmosis; we must make them happen through hard work, performance planning, and proper use of CPI tools and organizational metrics. Dr. Malcolm Ross O'Neill, ASAALT, said at the ASAALT Materiel Acquisition, Logistics, and Technology Review Nov. 1, 2010, that "LSS is a mind-set change." If we wait for the best-intentioned individuals or groups to collectively disrupt their comfort zones and embark on change management, very little, if anything, will happen spontaneously.

The benefits of success and the costs of failure are equally great in every business endeavor. To foster success, there are

organizations that use national criteria and established processes to systematically advance their corporate vision for improved business performance. For example, the annual Malcolm Baldrige National Quality Award, named after the former U.S. Secretary of Commerce from 1981 to 1987, recognizes U.S. organizations in the business, health care, education, and nonprofit sectors for performance excellence. The Baldrige Award is the only formal recognition of performance excellence in both public and private U.S. organizations.

To receive a Baldrige Award, an organization must develop an organizational management system that ensures continuous improvement in the delivery of products and services, and further demonstrates efficient and effective operations in the following categories: leadership; strategic planning; customer and market focus; measurement, analysis, and knowledge management; human resource focus; process management; and results.

In the past year, our PEO had five Project Management Offices and one Assistant PEO Office submit Malcolm Baldrige-type Level 1 and Level 2 applications. Our applications were part of our five-year quality plan. As a first step in building our culture, we submitted applications to the State of Alabama Quality Award Program.

Although all the PEO applicants believed they were fully engaged in the seven Malcolm Baldrige Award categories, they quickly realized that they could not demonstrate or prove their level of involvement in most, if not all, of the categories to the extent required. From the perspective of business and operational efficiency and effectiveness, they were getting the job done. However, there was still work to be done to further refine their business operations and practices to the level of excellence required for recognition. By doing the hard work of building their

applications, they realized that "good enough" was just not good enough for their business operations.

### Not Just a Certification

The issue here is to understand that there must be an organizational commitment to cultural change, versus simply counting completed projects, as an indication of involvement in CPI/LSS. In the article "Mad Belt Disease: Over-Emphasis on Certification," Gary A. Gack wrote: "An emerging trend—which can justifiably be labeled as a case of 'Mad Belt Disease'—may be threatening the long-term credibility and success of Six Sigma. It is time for practitioners of Six Sigma to help stem the spread of what is beginning to look like an epidemic. This disturbing trend is the increasingly frantic emphasis on Green Belt or Black Belt certification."

Gack further stated, "Six Sigma certification must be based on results, not knowledge alone. The success of Six Sigma realized by leaders such as GE, Motorola, Raytheon and others always has been based on a carefully orchestrated deployment process that begins at the top and is fully supported by appropriate infrastructure. This infrastructure includes coaching, mentoring and fact-based monitoring of results. Training and testing are among the less important elements of a successful deployment—necessary, but far from sufficient alone. Certification based only on knowledge is form without substance."

That said, an organization that enables its practitioners to voice their issues, is willing to listen, and demonstrates its willingness to advance those issues to the ASAALT and the DA may be on the right path to creating an environment for cultural change.

Our PEO and employees had earned their CPI/LSS stripes and saw a need to "lean" LSS. They wanted to become more efficient and effective in the workplace, hopefully using an

improved LSS tool set. Intuitively they knew that if we collectively remained on our current path, we would make LSS certification a destination versus the start of a cultural journey.

In that regard, it was their intent that employees achieve learning on their first few projects and work to achieve practitioner status with each project undertaking.

### Taking It to the Top

In early April 2010, we elevated our customer VOC needs to the DA, Office of Business Transformation (OBT), via the ASAALT. LTG Robert E. Durbin, OBT Director, understood the message, reacted positively, and immediately directed that we conduct a pilot program to address the CPI/LSS process concerns. He agreed to co-sponsor, with his office and ASAALT, a two-site program to increase the overall efficiency and effectiveness of the Army's CPI/LSS deployment.

Durbin included PEO Ammunition at Picatinny Arsenal, NJ, the Army's 2009 Public Sector Malcolm Baldrige Award winner and CPI/LSS leader. He acknowledged the need for positive cultural change, created a pathway, established a timeline, and enabled an environment for CPI/LSS process improvement throughout the Army. Immediately, the Deputy Assistant Secretary of the Army for Strategic

One of the PEO MS VOC needs was to reduce Green Belt and Black Belt training time and focus the POI to better align the content between the two training levels. (U.S. Army photo.)



Communications and Business Transformation within ASAALT, using its already established Training Integrated Process Team (IPT), began to address all aspects of the VOC process concerns.

By mid-September 2010, the IPT team, with input from DA and ASAALT co-sponsors, had developed VOC solutions with approved process changes that would make CPI/LSS significantly easier to deploy and use in the Army's organizational and business environments. We collectively assessed, developed, and improved the deployment techniques, methodologies, and POIs, ultimately developing the process into LEAN Lean Six Sigma.

A key challenge was to address VOC issues and maintain standards without compromising the POI's body of knowledge, which is based on the American Society for Quality (ASQ) education base line. The team measured and developed a Lego-style or stackable, aligned, and consistent ASQ standard of knowledge for Green and Black Belt training. ASAALT, working with the training IPT, approved the team's recommendations, which institutionalized solutions that provide practical guidance on 16 major CPI/LSS process issues.

### Seven Solutions

The seven approved VOC solutions represent changes in the way the Army will deploy its CPI/LSS practitioners to become more efficient and effective:

- Approved pilot site POIs that reduce all LSS belt training times by 50 percent.
  - Yellow Belt: 6 hours of training
  - Green Belt: 1 week of training
  - Black Belt: 2 weeks of training
- Authorize local Master Black Belts to teach Yellow Belt, Green Belt, and Black Belt POIs.
- Authorize local Black Belts to teach Yellow Belt and Green Belt POIs.
- Authorize local Master Black Belts and local panels to DA-certify Green Belts and Black Belts.

- Authorize DA certification for methodologies other than Define, Measure, Analyze, Improve, Control for DA Green Belt and Black Belt certifications.
- Authorize scheduling and administration of local DA-approved training and certification to meet the needs of the deployment, customer, and culture.
- Develop reasonable and acceptable project certification-level documentation.

Each VOC solution addresses a particular need for change that was apparent to everyone we talked to or briefed and was not specific to PEOs Ammunition and MS. The VOC solutions go a long way in addressing systemic change management and clearly demonstrate DA's and ASAALT leaders' commitment to LSS—that they, too, recognize that change, regardless of how useful or beneficial, is difficult for people to accept.

Many original CPI/LSS change agents and practitioners no doubt will see the revised LSS pilot deployment strategy as unnecessary, possibly as a threat to what they have fought to build or achieve. Ultimately, they will realize that the only constant is change. They will realize that the leaning of Lean Six Sigma is an organizational and systems approach to business process and organization cultural change, which is what we should be doing daily to support the Soldier.

**FRANK J. DE LUCA JR.** is the Assistant Program Executive Officer for Strategic Planning and Operations, PEO MS, Redstone Arsenal, AL, and a retired U.S. Air Force colonel with 31 years of service. In November 2006, he was recruited from industry to be an Army civilian. He holds a B.S. in aviation business management from Embry-Riddle Aeronautical University and an M.A. in contracting from Webster University. De Luca is certified Level III in program management and life-cycle logistics and holds an LSS Black Belt certification.



## From the Acquisition Support Center Director

After more than a year in the making, the Army Acquisition Center of Excellence (AACoE) became reality on Jan. 25, 2011, on the campus of the University of Alabama in Huntsville (UAHuntsville). This endeavor was a partnership among the U.S. Army Acquisition Support Center, U.S. Army Training and Doctrine Command (TRADOC) Combined Arms Support Command, and UAHuntsville. The AACoE offers the Army Acquisition, Logistics, and Technology Workforce education and training in how to provide Soldiers with the latest capabilities to survive and win on the battlefield. The center also saves taxpayers' money by merging two previous training sites, the Bevill Center at UAHuntsville and the Institute for Advanced Technology at the University of Texas at Austin.



My vision for the AACoE is to work with our TRADOC partners and review requirements across the spectrum of professional development for the AL&T Workforce, as well as acquisition education and training for groups in other communities. At the AACoE, we will assess and develop those new to the acquisition community including military officers, NCOs, and civilian interns. There's a great synergy when you have diverse populations doing things together. The

intermingling of students from various backgrounds, in a real college campus setting such as UAHuntsville, will bring together different perspectives, enabling them to share lessons learned as well as cultural and professional experiences. This new center will forge a homogeneous capability at a campus that brings in diverse and disparate groups, including those from outside the acquisition community, to provide our warfighters with the capabilities they need, when they need them.

AACoE courses include Acquisition Basic, Intermediate Program Management, Intermediate Contracting, Contracting Laboratory, Acquisition Noncommissioned Officer Leaders, Contracting Officer's Representative, and Functional Area 51 Intermediate Qualification. The center is a one-stop shop for forecasting our future workforce needs and providing world-class acquisition training and development for its students.

I am genuinely proud of the learning environment we have created at the AACoE. The new location allows us unprecedented access to acquisition leadership representatives from the government, industry, and academia. As a result, we have not only efficient and centralized acquisition training, but extremely relevant training as well.



For more information, visit the AACoE page on the USAASC website at <http://asc.army.mil/aacoe/AACoE.cfm>. You can also access the website using the QR symbol at left with your smartphone.

**Craig A. Spisak**

Director, U.S. Army Acquisition Support Center

## Contracting Community Highlights



### Converting Time and Materials Contracts for Better Buying Power

*Kathie Potter*

On Sept. 14, 2010, DOD leadership issued guidance to restore affordability and productivity in defense spending. According to the memorandum *Better Buying Power: Guidance for Obtaining Efficiency and Productivity in Defense Spending* by Under Secretary of Defense for Acquisition, Technology, and Logistics Dr. Ashton B. Carter, "We have a continuing

responsibility to procure the critical goods and services our forces need in the years ahead, but we will not have ever-increasing budgets to pay for them. We must therefore strive to achieve what economists call productivity growth: in simple terms, to do more without more."

Carter's subsequent *Implementation Directive for Better Buying Power—Obtaining Greater Efficiency and Productivity in Defense Spending* of Nov. 3, 2010, requires that immediate consideration be given to fixed-price-incentive contracts. For those of us who have relied heavily on time and materials (T&M) contracts, how do we convert to cost-plus-incentive-fee or firm-fixed-priced contracts? To address this question, consider the importance of these key areas: business reformation or cultural tendencies, contract cost impact, market research, and Performance Work Statements (PWSs).

#### **Business Reformation**

If we are to effectively change the way we do business, we need to better define mission requirements and reduce overhead costs on our contracts.



## Converting T&M Contracts Requires:

Contract cost assessment  
 Market research  
 Solid performance requirements  
 A collaborative strategy

A primary initiative in Carter's memo focuses on phasing out T&M contracts for services, a contract type widely recognized as having led to cost growth over time. In a T&M arrangement, the contractor has no incentive to contain costs because all of them are passed on to the government and, ultimately, the taxpayer. A shift in focus is called for, from the spending program to the correct contract formation.

The question is, what are some of the key considerations for converting T&M contracts to either firm-fixed-priced or cost-plus-incentive-fee?

### Contract Cost Assessment

Independent cost estimates and adequate market research are important tools in contract formation. They are equally important in converting from a T&M contract during resolicitation or before exercising an option. We should assess the cost of a program, line item by line item, and determine if the service or goods are really necessary.

Early acquisition decisions should identify the major mission drivers and how they can be made less expensive while still meeting mission needs. In gathering as much information as possible about a previous acquisition, what was effective or ineffective in managing contract performance? When asking for proposals, it is important to understand how industry typically builds pricing for its commercial business. With enough market research and good cost estimates, we can determine the best marketing strategy for our acquisitions.

### Market Research

Start by identifying the goals of the research, and then take the time to fully understand how private industry prices the same or similar goods and services. This isn't just about advertising the acquisition on the FedBizOpps website (<https://www.fbo.gov>); it's an opportunity to use trade journals, marketing magazines, government reports, and Chamber of Commerce market profiles, as well as to travel to site plants, to determine the demographics of the specific market. Collect information from existing customers by using questionnaires and conducting

personal interviews and focus groups for feedback on the specific products and services. Observe contractors in various locations to see how they are actually performing.

Organize the collected research data, determine or reevaluate the marketing strategy based on the results, and develop a truly independent government cost estimate. Start looking at the cost drivers of an acquisition and the trade-off between capability and costs, and then decide where to obtain the most capacity without paying the highest cost. Develop a fixed-price or cost-plus-incentive contracting arrangement that is in line with the cost drivers, so that cost risk is minimized or mitigated. Requirements should be developed correctly from the beginning, so that changes are not needed later in the acquisition process.

### Performance Requirements

Focus adequate time and energy on developing performance requirements. The PWS is the most critical piece of the acquisition process; it is the foundation for the Request for Proposals and the resultant contract. It explains concisely what is to be accomplished in terms of results, so that the government can effectively monitor and evaluate the progress and final result of the project. The PWS should state requirements in general terms of what is to be done, rather than how it is to be done.

The goal of the PWS is to give the contractor maximum flexibility to devise the most efficient and effective method to accomplish the mission. It must be written to ensure that all offerors compete equally, and any requirements that could restrict a potential offeror should be removed. At the same time, the PWS must be descriptive and specific enough to protect the interests of the government and promote competition. The clarity and explicitness of the requirements in the PWS will invariably enhance the quality of the proposals submitted. A well-written, definitive PWS is more likely to produce definitive proposals, thus reducing the time required for evaluation. At a minimum, every PWS should:

- Give a precise statement of objectives or outcomes.
- Identify the tasks, but not specify how they should be performed or approached.
- Use measurable performance standards in terms of quality, timeliness, quantity, etc.
- Develop a quality assurance surveillance plan (QASP) for each PWS requirement.

A good PWS and QASP should always promote productivity and innovation by eliminating unnecessary process requirements and focusing on the outputs and outcomes. Most of all, they must maximize contractor accountability by making the contractor, instead of the government, responsible for the PWS and QASP.

## A Collaborative Strategy

The acquisition professional has myriad resources to reduce the use of T&M contracts. Acquisition professionals, contracting personnel, and program managers should work closely to reach an understanding of the true mission requirement and change the contract type from T&M when appropriate.

Share your experiences with your program personnel and customers. Educate them on the market research, PWS development processes, and reviews of existing and previous contracts and experiences. Use this knowledge and experience to create lessons learned for future best practices.

*Kathie Potter is the former Chief of Policy for the U.S. Army Contracting Command-Aberdeen Proving Ground, MD (Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance) and is currently deployed to Iraq. She holds a B.L.A. in landscape architecture and environmental planning from Utah State University and an M.P.A. from the University of La Verne. Potter is Level III certified in contracting and is a U.S. Army Acquisition Corps member.*

## Two-Phase Design/Build Selection Process Speeds Contract Review

*Virginia E. Mitchell*

In 2004, the U.S. Army Corps of Engineers (USACE) received one of its greatest contracting challenges. As the Army's agent for military construction (MILCON), USACE needed to execute an unprecedented surge in construction requirements to meet the imminent demands of Army Transformation, the Global Posture Initiative, and Base Realignment and Closure.

Clearly, USACE could not achieve this mission using a business-as-usual approach to awarding contracts. The days of applying design, bid, build procedures to single facilities at installations had ended. The Army needed to transform its methods for executing MILCON, and it did so by transitioning to centrally managed designs under the Centers of Standardization (CoS) and by taking a new look at the way it solicited construction requirements. USACE also reached out to industry for input on how to best accomplish its goals on a local and regional basis and under a national acquisition strategy.

## Industry Collaboration

In 2005, USACE conducted one nationwide and four regional industry and technical forums at key locations across the country, as well as one specialized forum with the permanent

prefabricated/pre-engineered/modular construction industry. Input from these forums, combined with Web-based market research, helped USACE gain a productive working understanding of industry's capabilities, experience, and interest. It also provided information on current construction techniques to help build 41 different facility types as varied as chapels, child care facilities, and command and barracks complexes, while ensuring better, faster, and cheaper execution. The U.S. Army Engineering and Support Center, Huntsville, AL, maintains the standards for these facility types.

## Phases and Award

In Phase 1 of the best-value source selection process, USACE experts perform a capability analysis and assessment of performance risk. To accomplish this, offerors are evaluated in three areas: corporate relevant experience, past performance and organization, and technical narrative.

Preparing a proposal for this phase is fairly simple and straightforward. Once an offeror becomes familiar with the process, it can tailor the response to each new requirement.

The government often receives many Phase 1 proposals. Proposals in numbers of 20 or more are received for stand-alone "C" type contracts, while as many as 40-60 proposals are typically submitted for single-award task order contracts (SATOCs) and multiple-award task order contracts (MATOCs). This streamlined initial evaluation allows for a much quicker decision as to which proposals will make the cut for the Phase 2 evaluation.

The two-phase selection process also can save industry money and time upfront. If eliminated in Phase 1, offerors can save an estimated \$50,000-\$100,000 and an average of 60 working days by not preparing the Phase 2 proposal. Offerors not

**Construction workers erect wall panels for a new physical fitness center at Fort Stewart, GA, Nov. 29, 2010. USACE is building a new campus for the 4th Infantry Brigade Combat Team at the installation. (Photo courtesy of USACE.)**





Roofing work progresses on the new child development center at Fort Bliss, TX, Dec. 9, 2010. USACE has expanded construction at the installation for the past five years as units of the 1st Armored Division relocate there from Germany. (Photo courtesy of USACE.)

selected to proceed to the next phase in the competitive process can request a debriefing to learn where their proposals could have used improvement, then quickly turn their attention to another business opportunity.

Generally, for a stand-alone Request for Proposal (RFP), the best three to four proposals will make the cut for Phase 2 evaluation. For a MATOC, eight to 10 proposals will make the cut for Phase 2, from which three to seven contract awards will be made.

In Phase 2 of the selection process, experts evaluate the design technical capability, remaining performance capability, and price. This evaluation takes a deeper look at what's offered against the expressed needs of the government and the price. The Phase 2 evaluation determines the best-value offeror(s), depending on whether the acquisition involves a stand-alone contract or MATOC.

### Pioneers in Savannah

While the two-phase selection process is not new under *Federal Acquisition Regulation* Part 36, the Savannah District, GA, pioneered this approach for USACE, releasing a design-build construction solicitation employing its first two-phase selection in FY00, for a \$70 million aviation brigade barracks complex at Fort Stewart, GA.

In the first two-phase solicitation, the contract for which took approximately 10 months to award with three offerors, Phase 2 contained 11 primary factors and 14 subfactors, compared with the current process involving up to five factors and no subfactors.

“Increasing transparency has been our primary goal, and a key lesson we have learned is that giving more information to industry about how we will evaluate offers is a good thing,” said Rita Miles, Chief of the Execution Branch (Contracting) at Savannah District. RFPs issued at Savannah District now include very specific information regarding the government's source selection plan, such as the adjectival rating descriptors, their definitions, and relative importance. More detail is also

given about the evaluation process relative to the steps and how final ratings are determined by the source selection board.

### Proven Benefits

Savannah District receives relatively few protests under the two-phase selection process. Offerors sometimes protest to obtain information; however, as a result of the openness of this process, generally they already have useful information on the results of their evaluation. They receive feedback about how they can improve future submissions and walk away confident that they are being treated fairly.

Current processes will be continually refined and streamlined to meet the challenge, as existing stand-alone “C” contracts, SATOCs, and MATOCs expire and are replaced, and a greater number of proposals from industry are received for evaluation.

The two-phase best-value selection process has proven itself a vital tool in fulfilling the historically unparalleled USACE construction mission. It takes an average of eight months from release of solicitation to award base contracts and an average of 75 days from release of RFP letter to award task orders. Time frames will always be affected by the complexity of the projects.

Having standardized facility types is essential to meeting the construction demand. Child development centers (CDCs) are a top priority for the Army, USACE, and the U.S. Army Engineering and Support Center, Huntsville. Recently, the first CDC completed under the CoS, a large facility for children 6-10 years old, opened at Fort Lewis, WA. The centers provide much-needed, affordable day care for Soldiers' children. In all, more than 20 CDCs are in various stages of construction at such installations as Fort Bliss, TX; Fort Hood, TX; Fort Lewis; and Fort Stewart. The majority of projects were awarded under the southern region 8(a) MATOC.

Funding of the CoS program has been unique. In addition to the yearly MILCON appropriation from Congress, a number of CoS projects have also been funded with *American Recovery and Reinvestment Act* funds, the most recent being a small CDC at Fort Polk, LA, for which a contract was awarded in September 2010.

*Virginia E. Mitchell was formerly the Principal Adviser for Policy and Compliance, Business Operations Division at the U.S. Army Engineering and Support Center, Huntsville. She currently is a Procurement Analyst in the Contracting Operations Division, U.S. Army Contracting Command Headquarters, Redstone Arsenal, AL. She holds a B.S. in social science from Bowling Green State University and is pursuing an M.A. in acquisition and contract management from the Florida Institute of Technology. Mitchell is Level III certified in contracting and is a member of the U.S. Army Acquisition Corps, Defense Acquisition University Alumni Association, and National Contract Management Association.*



## U.S. Army Contracting Command Renames Centers

The U.S. Army Contracting Command (ACC) has renamed its major Contracting Centers (CCs) to reflect their geographical locations. These centers provide comprehensive acquisition, contracting, business advisory, production support, and depot-level maintenance services in acquiring, fielding, and sustaining Army weapon systems, services, and Soldier support.

ACC Soldiers and civilians work with industry to acquire equipment, supplies, and services for America's Army. If a Soldier shoots it, drives it, flies it, communicates with it, wears it, or eats it, ACC contracts for it.

"Over the past two years, we've come to realize the importance of establishing a consistent and practical identity across the organization," said Jeff Parsons, ACC Executive Director. "After much study and consideration, the one area where we believe we can achieve some major returns on investment is branding and standardizing the naming convention of the ACC Contracting Centers. We decided to incorporate the geographical locations of the centers in their new names."

Following are the former and new names of the ACC Contracting Centers:

Former Name	New Name	Location
National Capital Region CC	ACC-National Capital Region	Alexandria, VA
U.S. Army Tank-automotive and Armaments Command CC	ACC-Warren	Warren, MI
U.S. Army Communications-Electronics Command CC	ACC-Aberdeen Proving Ground (Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance)	Aberdeen Proving Ground, MD
U.S. Army Research, Development, and Engineering Command CC	ACC-Aberdeen Proving Ground (Soldier, Chemical, Research, and Test)	Aberdeen Proving Ground, MD
Joint Munitions & Lethality CC	ACC-Picatinny	Picatinny Arsenal, NJ
U.S. Army Aviation and Missile Command CC	ACC-Redstone	Redstone Arsenal, AL
Rock Island CC	ACC-Rock Island	Rock Island Arsenal, IL

—Article courtesy of the ACC.

## Logistics Civil Augmentation Program Improves Support Capabilities

*Tommy L. Marks and Robert Gottfreid*

The Logistics Civil Augmentation Program (LOGCAP) is an Army initiative to contract for a broad range of logistics and support services to U.S. and allied forces during wartime, contingency, peacekeeping, humanitarian, and training operations. The LOGCAP mission continues to evolve, providing premier support to the Soldier with flexibility, agility, and timely execution.

Lessons learned during this evolution have improved contract oversight in a variety of ways, in a variety of areas of operation. LOGCAP has grown from a contingency plans management program to the Army's premier contract vehicle of choice, capable of providing service support anywhere in the world.

### LOGCAP III and IV

The LOGCAP III contract was awarded to Kellogg, Brown & Root Inc. (later renamed KBR Inc.) in 2001, furnishing support operations in Afghanistan, Iraq, Kuwait, Djibouti, Jordan, Kenya, Uzbekistan, and Georgia.

Before *Operation Iraqi Freedom (OIF)*, LOGCAP III was valued at about \$5 million per year. With the growth of U.S. military participation in combat in Southwest Asia, LOGCAP also grew to nearly \$5 billion a year. However, the processes and personnel needed to manage the program could not keep up with its expanding mission.

Awarded in April 2008, LOGCAP IV involved a single support contractor, SERTO, and three multiyear, best-value performance contractors, DynCorp International, KBR Inc., and Fluor Corp. Performance contracts were awarded as Indefinite Delivery/Indefinite Quantity with one base year and nine option years, with a lifetime maximum value of \$150 billion.

LOGCAP IV's use of multiple performance contractors fosters competition to reduce overall costs and award fee incentives appropriate for the risk associated with specific tasks that enhance the quality of services. The use of multiple contractors reduces the risk to the Army associated with a single contractor and broadens the selection of mission resources. The intent during the transition to LOGCAP IV has been to ensure uninterrupted delivery of services to field units.

While LOGCAP III remains in effect in Iraq, LOGCAP IV is now active in Afghanistan, Kuwait, Bahrain, and Qatar.

## Lessons Learned

The transition from LOGCAP III to LOGCAP IV incorporated lessons learned that strengthened contract oversight. One of the most significant lessons learned was to consolidate multiple unique task orders into standardized task orders with baseline pricing. By applying this concept, LOGCAP's entire contracting process changed from requirements generation to contract completion.

Another lesson learned was to increase staff levels at the headquarters to better manage contract administration, planning, operations, training, and exercises. This enables the LOGCAP Program Management Office (PMO) to better support deployed LOGCAP teams with improved requirements generation and program execution.

The tailoring of LOGCAP training for unit-level contracting officer's representatives provides better contract oversight and execution in forward locations. With improved training and staffing, forward-deployed Department of the Army civilians, contracting officer's representatives, and LOGCAP planners can fully use LOGCAP PMO reachback support.

## Spotlight: Afghanistan

In Afghanistan, the concept of LOGCAP Camp (LOGCAMP) is reducing the time it takes to get materials into theater for new Forward Operating Bases (FOBs) or to expand capacity at existing FOBs. As an innovation to Force Provider, organic prepackaged tents and camp equipment for rapid deployments, LOGCAMP is referred to as a "FOB in a box." By standardizing the LOGCAMP requirements, units are able to select the right-size options for their needs and capabilities.

The greatest advantage of LOGCAMP is having an experienced contractor workforce to quickly and efficiently construct FOBs and furnish basic life-support operations, allowing warfighters to focus on executing their assigned mission. LOGCAP IV has negotiated pricing for FOB construction, operations, and maintenance services in five supported population ranges, from 300 to 20,000 personnel.

LOGCAP support officers (LSOs), located at various camps in Iraq, Kuwait, and Afghanistan, serve as the program interface to the supported units. The LSOs assist customers in developing Statements of Work and Performance Work Statements for required services, as well as overseeing the life cycle of the requirements from development through delivery.

## Spotlight: Iraq

LOGCAP also supports other government agencies, the largest being the Department of State in Iraq. LOGCAP services for the State Department include base life support, equipment maintenance, theater transportation, and postal operations.



A Soldier takes a break at a recreation center in Iraq. LOGCAP provides base support, such as Morale, Welfare, and Recreation services for Soldiers in theater. (U.S. Army photo by Galen Putnam, U.S. Army Sustainment Command Public Affairs.)

Many of these services were provided by the Army and shared with the State Department during *OIF*.

LOGCAP is committed to providing the best support to our commanders as they execute President Obama's directive to draw down forces from Iraq by the end of 2011. The end state for the LOGCAP team in Iraq during drawdown is the successful withdrawal of forces, return of bases to the government of Iraq, and complete and accurate property disposition.

To facilitate drawdown, LOGCAP staffs at unit locations synchronize plans with the Base Closure and Assistance Teams, which consist of contracted multifunctional logisticians assigned to guide units through the process, adhere to established procedures, and determine best practices for transferring bases to Iraqi authority. Property at the base is inventoried and designated, as appropriate, for use in Iraq, Afghanistan, or other government agencies. A portion of a base might be returned to the government of Iraq, while U.S. forces retain a presence. The gradual turnover of the facilities allows for a smaller U.S. footprint and a smaller logistics support effort by LOGCAP.

## Spotlight: Haiti

In January 2010, when a large earthquake in Haiti caused widespread devastation, LOGCAP responded by awarding a task order to Fluor with the mission to assess a possible support requirement for the U.S. military's humanitarian effort. Since the U.S. military presence was expected to be temporary, Army leaders determined that short-term, expeditionary support was appropriate, rather than a long-term, LOGCAP-style, contractor support structure.





LOGCAP provides Soldiers in the field with a variety of support services, including laundry. (U.S. Army photo by Galen Putnam, U.S. Army Sustainment Command Public Affairs.)

In responding to this challenge, with a contract award made in just four days and contractors arriving in Haiti in five days, LOGCAP proved it had the capability of providing support services for three global contingencies simultaneously and in a short period of time.

### Moving Forward

By sharpening and applying lessons learned, requirements generation, contingency planning, and program oversight, the LOGCAP partnership of military and corporate assets will continue to improve in its mission of fulfilling customer needs worldwide.

*Tommy L. Marks is the LOGCAP Executive Director for the U.S. Army Sustainment Command, Rock Island, IL. He holds a B.S. in health and education from McNeese State University, an M.S. in materiel acquisition management from the Florida Institute of Technology, and an M.A. in national security from the U.S. Naval War College. Marks is certified Level III in life-cycle logistics and Level I in program management, and is a U.S. Army Acquisition Corps member.*

*Robert Gottfreid is a logistics management specialist for the U.S. Army Sustainment Command LOGCAP Plans Office. He holds a B.S. in aircraft maintenance management from Parks College of St. Louis University and is Level I certified in life-cycle logistics.*



## DAU Alumni Association

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# U.S. Army Acquisition Corps (AAC) Annual Awards 2011 Call for Nominations

It is time for the U.S. Army Call for Nominations for the following awards. The winners of these awards (excluding the Packard Award and Workforce Achievement Award) will be presented at the 2011 AAC Annual Awards Ceremony on October 9, 2011.

- The **Army Acquisition Excellence Awards** recognize an Army acquisition workforce member and/or team whose performance and contributions set them apart from their peers. The awards directly reflect the outstanding achievements in support of the Army's Soldiers and the Army's transformation initiatives. The Call for Nominations for these awards is **March 1 to April 26**.
- The **Secretary of the Army Project and Product Manager (PM) and Acquisition Director (AcqDir) Awards** applaud the PM and AcqDir whose outstanding contributions and achievements merit special recognition and provide a forum to showcase exceptional leadership within the AAC. The Call for Nominations for these awards is **March 15 to May 10**.
- The **David Packard Excellence in Acquisition Award** recognizes Department of Defense (DOD) civilian and/or military organizations, groups, or teams, who have made highly significant contributions that demonstrated exemplary innovation and best acquisition practices, reflecting achievements that exemplify goals and objectives established for furthering life-cycle cost reduction and/or acquisition excellence in DOD. The U.S. Army Call for Nominations for this award is **March 29 to May 24**.
- The **Under Secretary of Defense for Acquisition, Technology, and Logistics Workforce Achievement Award** has been established to encourage and recognize excellent performance by members of the defense acquisition workforce in the acquisition of products and services for DOD. This program recognizes individuals (military or civilian) who represent the best in the various acquisition workforce disciplines. The U.S. Army Call for Nominations for this award is **March 29 to May 24**.
- The **Assistant Secretary of the Army for Acquisition, Logistics, and Technology (ASA(ALT)) Contracting Noncommissioned Officer (NCO) Award for Contracting Excellence** applauds the ASA(ALT) Contracting NCO whose outstanding contributions and achievements merit special recognition and provides a forum to showcase exceptional leadership within the AAC. The Call for Nominations for this award is **April 12 to June 7**.
- The **Director, Acquisition Career Management Award** is reserved for the Army Acquisition, Logistics, and Technology Workforce member who has shown outstanding performance and made conspicuous, significant, and long-lasting contributions to the AAC over the course of his/her career. The nominee's career should span a minimum of 20 years of federal government and/or military service. The Call for Nominations for this award is **April 26 to June 21**.

For more information on the awards and upcoming Call for Nomination dates, please visit our website at <http://asc.army.mil>.

*Searching for Our Brightest Acquisition Stars!*

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FT BELVOIR, VA 22060-5567

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" We will build the Army that will be employed in 2020, and ... we're building it with full knowledge that this Army will not be what we need in 2030. And that's why adaptation must be an institutional imperative. "

GEN Martin E. Dempsey  
*Chief of Staff of the Army*

