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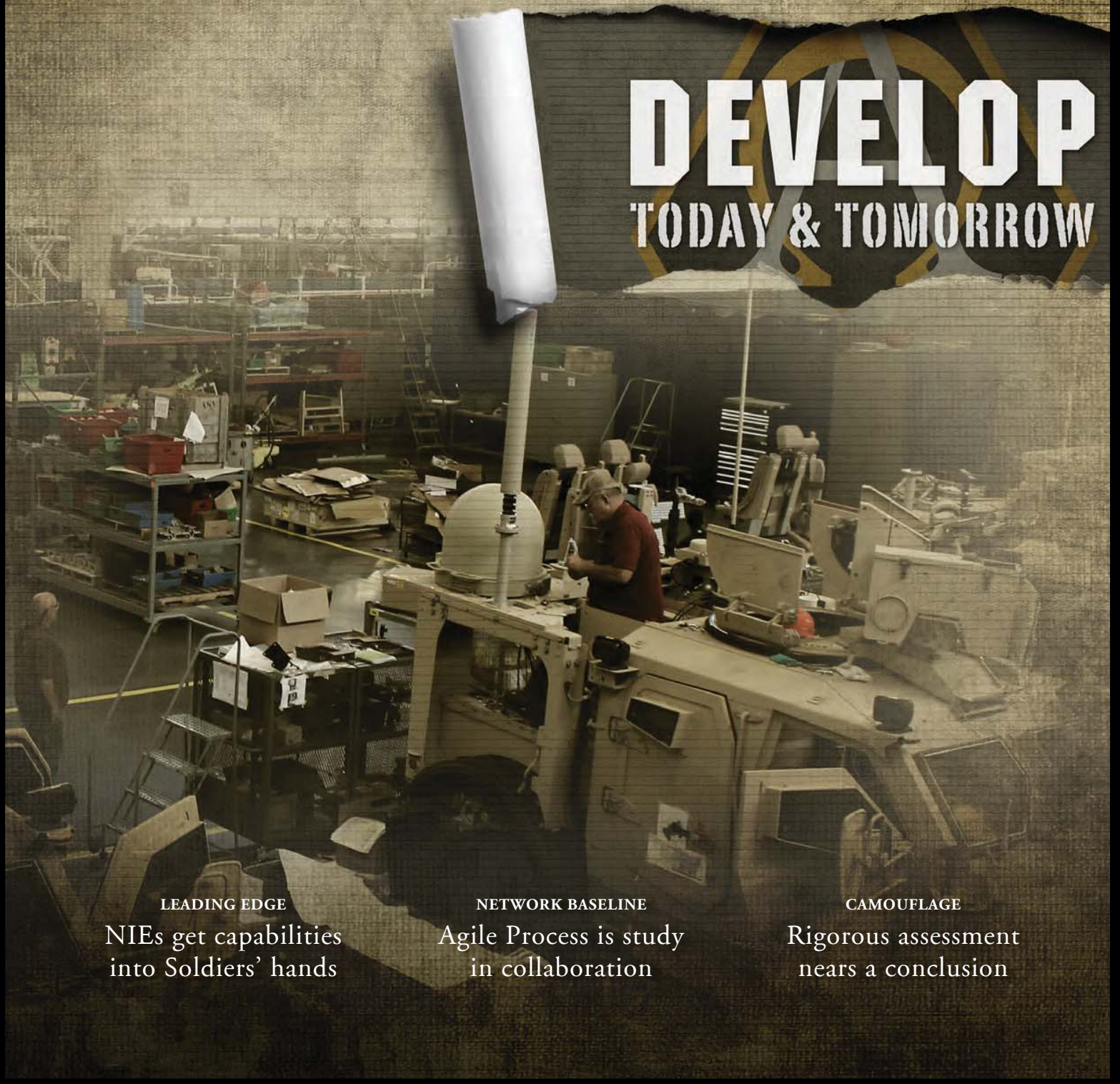

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From the lab to the battle space

ROTORCRAFT RESEARCH

Army, academia, industry join forces

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Advancing capability for the future force

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TALK BACK

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The right equipment makes all the difference. Ask any Soldier who's ever been on patrol in the dark of night, or ready to jump from that "perfectly good" airplane. Knowing you are equipped with the latest and greatest gear gives you an edge, both mentally and physically.

Where does all that great gear come from? The Office of the Assistant Secretary of the Army for Acquisition, Logistics, and Technology (OASA(ALT)). Comparatively few items in the Army's inventory are commercial-off-the-shelf, because few commercial items can stand up to the rigors of combat or meet the exact needs of the Soldier. With a cadre of approximately 42,000 Army Acquisition Workforce members specializing in everything from systems engineering to purchasing (and 12 other career fields), OASA(ALT) is literally "behind" everything in the Army.

This issue of *Army AL&T* is unique in that there are four different magazine covers designed to emphasize ASA(ALT)'s behind-the-scenes role to **Design**, **Develop**, and **Deploy** everything the Army uses, ensuring that our Soldiers **Dominate** the battlefield. This issue focuses on how the Army is leading technology, both in direction and development. Read about how experts at PEO Soldier are getting closer to selecting better camouflage for uniforms and equipment; see the many ways in which the Army science and technology community is improving the Soldier's advantage on the battlefield; join Army scientists as they explore new battery technology; and learn about how stratified sampling can help determine contract pricing.

Our guest columnist in this issue's "Critical Thinking" feature is Dr. Genevieve Bell, a cultural anthropologist and senior researcher with Intel Corp. Her field of study—how different cultures around the globe use technology—may have applications for how the Army Acquisition Workforce designs equipment and how Soldiers use it.

You can also read about how members of our workforce are making a difference every day. This issue's "Spotlight" features Ms. Rachelle L. Lapperre, the only Army Certified Lean Six Sigma (LSS) Master Black Belt in PEO Missiles and Space. Under her leadership of more than 50 LSS projects in the Joint Attack Munition Systems Project Office, Lapperre has been credited with $202.2 million in cost saving and avoidance—half of PEO MS' total savings achievement!

Finally, it's survey time again. Back in 2010, your comments led to a wholesale change in the focus, layout, and design of this magazine.

In an effort to better serve the acquisition community, we want your comments again. What do you like, dislike, or want to add? Your input will make a difference. Please go to the survey card and enter the URL, or use the QR code on your smartphone. Let us know what you think.

As always, I and the *Army AL&T* staff want to hear from you on what's new and interesting. If you have a suggestion about our coverage or want to submit a story for an upcoming issue, please contact me at **armyalt@gmail.com**.

Nelson McCouch III
Editor-in-Chief

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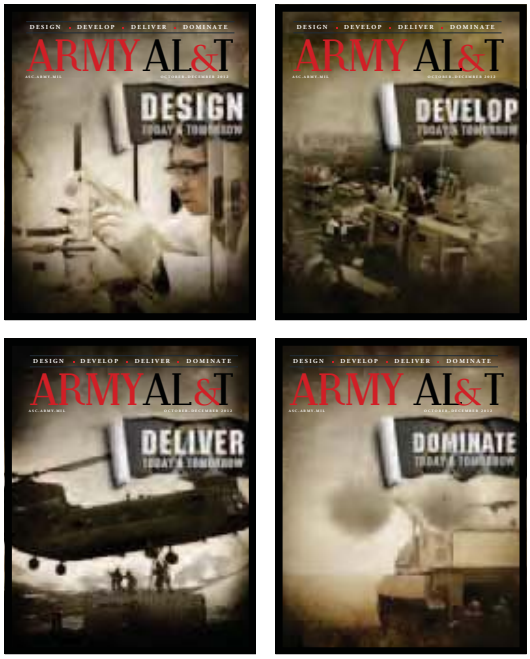

ON THE COVER

The theme of this edition of *Army AL&T* Magazine is in line with the Army Acquisition, Logistics, and Technology Workforce commitment to Design, Develop, Deliver, and Dominate. There are four distinct covers, each representing a different component of the mission.

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ARMY AL&T

OCTOBER–DECEMBER 2012

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By order of the Secretary of the Army

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United States Army
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JOYCE E. MORROW
Administrative Assistant to the Secretary of the Army
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SHIFTING FOCUS
The past decade of conflict has sharpened the Army's focus on accelerated delivery of commercial products to support Soldiers in Iraq and Afghanistan, while acquisition in the coming years will be shaped by the drawdown of U.S. troops from both theaters. Here, PFC Sean Serritelli, with 1st Battalion, 503rd Infantry Regiment, provides security during an operation outside Combat Outpost Charkh, Logar province, Afghanistan, Aug. 22. U.S. Army paratroopers provided support while Afghan National Army Soldiers searched houses for weapons caches. (U.S. Army photo by SPC Alexandra Campo)

FROM THE ARMY ACQUISITION EXECUTIVE
THE HONORABLE HEIDI SHYU

PLANNING *for the* FUTURE

Pace of technological change will influence next-generation capabilities

The United States Army is a proud institution, renowned for its remembrance and celebration of its solemn and honorable heritage. This has provided a source of resilience and constancy for the greatest fighting force in the world, now into its third century. However, I believe its greatest source of strength derives from the Army's enduring focus on the future and change. It has led to multiple transformations over time, reflected in the evolution of individual Soldier weapons from musket rifles to night vision goggles.

This issue rightly focuses on the Army's efforts to develop next-generation capabilities, so that future generations may be assured of maintaining the Army's unparalleled success against any threat. Our look ahead in this magazine calls attention to the turning point the Army is working diligently to meet. The drawdown of two major overseas combat operations, combined with an evolving and more complex threat, calls for agile, deployable, and technologically sophisticated capabilities. Coupled with strong budget pressures and renewed engagement in the Asia-Pacific region, these factors indicate that we are indeed in a new era.

As the Army's acquisition community, the question we must ask in response to the topics discussed within these pages is, "What are we doing to prepare for the future?" Foremost, I believe now is the time to reassess long-term planning for Army equipment capabilities. Long-term weapon system investment decisions—laid down under different assumptions regarding threats, technological possibilities, and available resources—should be fundamentally reexamined and either revised or reaffirmed. At a practical level, we need to define the future horizon for Army programs of record, balancing affordability, threat gaps, and obsolescence as we demarcate and plan for the transition of enabling technologies through science and technology research.

DELIBERATE CHOICES

The past decade of conflict has sharpened our focus on accelerated delivery of commercial products to support Soldiers in Iraq and Afghanistan. However, we cannot afford to leave future Soldier needs to the undefined markets of the future. Our planning must reflect more definite choices.

One reason is the escalating pace of technological change. This presents unique challenges in the development of defense capabilities, as noted by Lourdes M. Duvall in a June 6 research paper published by the Brookings Institution, "Be Quick, Be Useable, Be On Time: Lessons in Agile Delivery of Defense Analytic Tools." The "rate and unpredictability of advances in technology," to include exponential growth in computing power, Duvall writes, present significant problems for multiyear acquisition efforts, especially in information technology.

The advance of technology may also complicate our fielding of tactical capabilities

EVOLUTION OF THE SOLDIER
The Rifleman Radio and Nett Warrior system are two examples of how the Army's enduring focus on the future has transformed Soldier equipment. Here, Soldiers from 1st Battalion, 35th Armored Regiment, 2nd Brigade, 1st Armored Division practice movement-to-contact squad tactics Aug. 27 at Dona Ana Range, NM, using the Rifleman Radio and Nett Warrior. The unit deploys equipment under test and evaluation to the field and integrates it into training for operational use. (Photo by LTC Deanna Bague, Brigade Modernization Command)

in the future. The nonlinear trajectory of technological evolution at once makes certain capabilities less expensive and more accessible to adversaries.

It is quite possible that larger numbers of future nation-states and non-state actors will have vastly increased access to increasingly sophisticated capabilities, including longer-range, more capable sensors and ballistic missiles designed for "anti-access/area denial" capabilities; computer and networking technologies; communications; GPS capabilities; intelligence, reconnaissance, and surveillance assets such as unmanned aerial systems; and ground robots with progressively greater levels of autonomy. We cannot afford to let the curve of technological commercial change level the conditions of any potential future conflict. Our planning must reflect this.

COST CONSIDERATIONS

Another reason is simple economics. The high cost of sustainment for hundreds of weapon systems and equipment, to include nonstandard equipment obtained during *Operations Iraqi Freedom* and *Enduring Freedom*, must be addressed.

A key element of our long-term planning must account for the sustainment costs that accrue long after equipment leaves production and initial fielding. This, too, must be addressed by deliberate choices that reflect assessments informed by our evolving budget environment and long-term priorities.

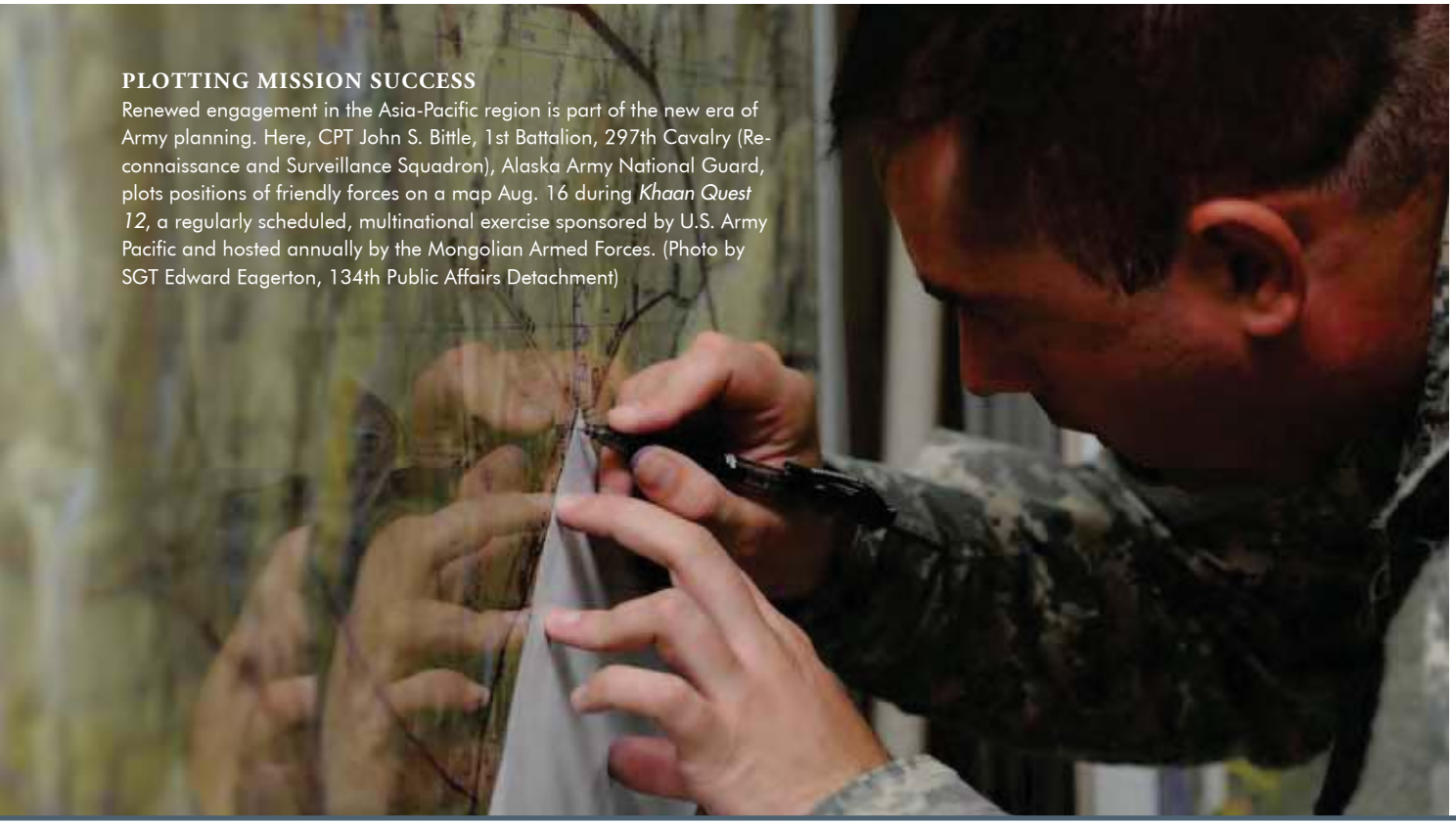
CONCLUSION

As we dedicate ourselves to meeting new challenges for a new generation, I am confident that our acquisition community will bring expertise, professionalism, sound business judgment, and an unwavering commitment to the Soldier to bear.

I am eager to work with each of you in this effort. As always, I am deeply grateful for your hard work and excellence.

GROWTH OF TECHNOLOGY
A robot under the control of Soldiers assigned to the 706th Explosive Ordinance Disposal Company searches for a reported buried improvised explosive device near Combat Outpost Sabari, Khost province, Afghanistan, July 31. The advance of technology, while benefiting U.S. acquisition efforts, is also likely to make certain capabilities, such as ground robots with progressively greater autonomy, less expensive and more accessible to adversaries. (Photo by SGT Kimberly Trumbull, Joint Combat Camera Afghanistan)

THE DRAWDOWN OF TWO MAJOR OVERSEAS COMBAT OPERATIONS, COMBINED WITH AN EVOLVING AND MORE COMPLEX THREAT, CALLS FOR AGILE, DEPLOYABLE, AND TECHNOLOGICALLY SOPHISTICATED CAPABILITIES.



PLOTTING MISSION SUCCESS
Renewed engagement in the Asia-Pacific region is part of the new era of Army planning. Here, CPT John S. Bittle, 1st Battalion, 297th Cavalry (Reconnaissance and Surveillance Squadron), Alaska Army National Guard, plots positions of friendly forces on a map Aug. 16 during *Khaan Quest 12*, a regularly scheduled, multinational exercise sponsored by U.S. Army Pacific and hosted annually by the Mongolian Armed Forces. (Photo by SGT Edward Eagerton, 134th Public Affairs Detachment)

The LEADING EDGE

Network Integration Evaluations enable synchronized fielding of one Capability Set while simultaneously building the next

by MG Genaro J. Dellarocco, BG Randal A. Dragon, and BG Daniel P. Hughes

After holding three Network Integration Evaluations (NIEs) over the past 16 months, the Army has now established the tactical communications baseline. Fielding efforts are underway to deliver Capability Set 13 to up to eight brigade combat teams (BCTs), beginning with two BCTs of the 10th Mountain Division in October. The new network modernization business model, termed the Agile Capabilities Life Cycle Process (or the Agile Process), has taken hold throughout the Army acquisition, requirements, test, and training communities, as well as within industry.

So what is the next target?

To stay on the leading edge of technology, the Army will use NIE 13.1 this fall to evaluate materiel solutions that could enhance the network baseline for the next Capability Set (CS). It will also start to design a solution to tackle integration of network equipment onto heavy platforms and will continue to examine potential solutions to non-network challenges, such as operational energy.

These parallel lines of effort—synchronized fielding of one CS while simultaneously building the next—will allow us to continuously fill capability gaps to meet Soldiers' needs.

ARRIVING AT CAPABILITY SET 13

Launched in June 2011, the NIEs are semiannual evaluations designed to quickly integrate and mature the Army's tactical communications network, the service's top modernization priority. To date, the NIEs have yielded more than $6 billion in cost savings and cost avoidance from the restructuring of Army programs and the consolidation of test practices.

The NIEs are part of the Agile Process, the Army's new quick-reaction acquisition methodology to address defined capability gaps and insert new technologies into the overall network at a lower cost. They support Capability Set Management, a structured approach that allows the Army to buy and field the right amount and type of gear for the brigades that need it first, then incrementally modernize it, instead of spending resources on technology that may be obsolete by the time it is needed.

NIE 13.1, the fourth event in the series, will take place in October and November at Fort Bliss, TX, and White Sands Missile Range, NM. It will build upon several key outcomes from NIE 12.2 in May and June, which served to validate and finalize the makeup of CS 13, the Army's first package of network components, associated equipment, and software that provides integrated connectivity from the

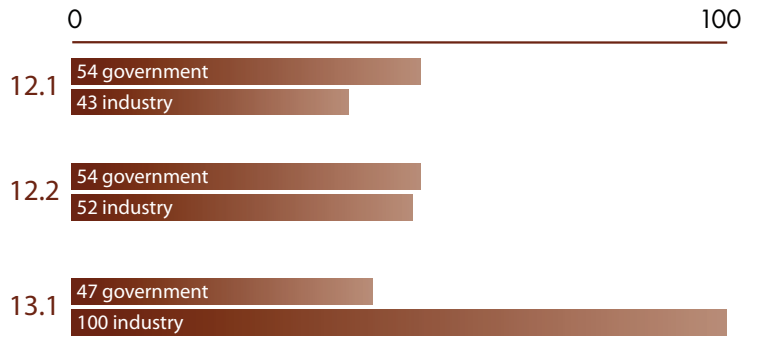
static tactical operations center (TOC) to the commander on-the-move to the dismounted Soldier.

The CS 13 network, on which 10th Mountain Division Soldiers will begin training this month, will give U.S. forces a significant advantage over adversaries by enhancing situational awareness, improving maneuverability, speeding decision cycles, and connecting Soldiers at the lowest level with one another and their higher headquarters. It is anchored by two major upgrades: mission command on the move—allowing commanders to take the network with them in their vehicles—and bringing dismounted Soldiers into the network, empowering ground troops with a new level of real-time information.

CS 13 addresses 11 validated Operational Needs Statements submitted by theater combatant commanders. It will be fielded to up to eight Infantry BCTs during the next year.

The CS was validated by the 2nd Heavy Brigade Combat Team, 1st Armored Division (2/1 AD), the unit that executes the NIEs. Stretched across more than 150 miles of punishing terrain, the 3,800-Soldier brigade fought a rigorous, intelligence-driven operational scenario against a battalion-size opposing force. Facing a hybrid threat composed of conventional forces, insurgents, criminals, and electronic warfare, 2/1 AD executed combined arms maneuver, counterinsurgency, and stability operations.

Number of responses received for the three NIEs that we have solicited for so far:



NIE 12.2 was the largest NIE to date and the first full brigade-level validation of CS 13 network architecture conducted in a hybrid threat environment. NIE 12.2 also accomplished three program tests for record and evaluated 35 government and industry Systems Under Evaluation (SUEs).

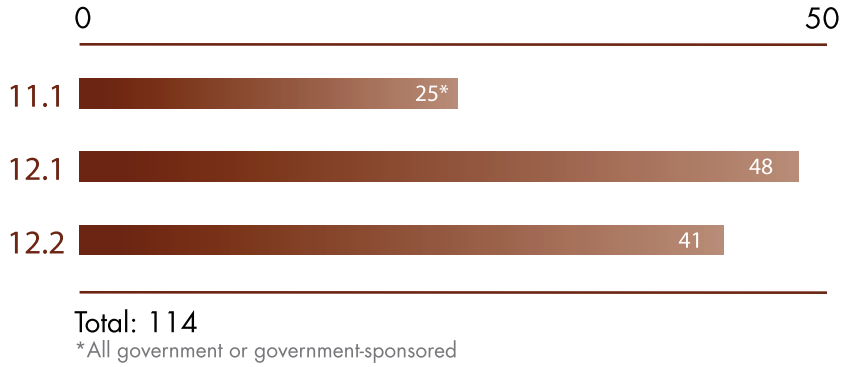
NIE 12.2 completed the Initial Operational Test and Evaluation (IOT&E) for Warfighter Information Network – Tactical (WIN-T) Increment 2, a major upgrade to the network backbone that enables mission command on the move and extends satellite communications to the company level. (See related article, Page 18.) It marked significant vehicle integration across the BCT, with more than 350 vehicles integrated with CS 13 baseline systems, including Infantry BCT, Stryker BCT, and Armored BCT platforms.

The integrated CS 13 package of radios, satellite systems, software applications, smartphone-like Nett Warrior devices, and other network components supported 2/1 AD as the unit spread across the desert and mountains to complete its mission. Soldiers fought to secure the fictional country of Attica, confronting an incursion by the army of a neighboring country and an insurgency. The network allowed the brigade to pass information rapidly within and across echelons.

Directing the fight from Fort Campbell, KY, was the 101st Airborne Division,

BOTTOM LINE: WE EXPECT NIE 13.1 TO ANSWER KEY QUESTIONS AND SERVE AS A PRELIMINARY OPERATIONAL TRYOUT FOR CS 14, YIELDING SOLDIER FEEDBACK AND TEST DATA THAT THE ARMY CAN ACT ON BEFORE FINAL CS 14 VALIDATION AT NIE 13.2 NEXT SPRING.

Number of systems evaluated, including Systems Under Test and Systems Under Evaluation:



acting as the higher headquarters for 2/1 AD and a virtual sister brigade. Just as it would in combat operations, the 101st commanded and coordinated across subordinate elements, which included 2/1 AD at White Sands, the 1st Sustainment Brigade at Fort Riley, KS, and a "simulation brigade" that was notionally fighting alongside 2/1 AD to provide added realism and network traffic.

NIE 12.2 marked the first time Army planners incorporated the role of higher headquarters into the evaluation. Another critical achievement with NIE 12.2 was the Army's ability to employ all early phases of the Agile Process before the NIE began, including using new laboratories at Aberdeen Proving Ground, MD, to their full capability to conduct assessments and mitigate risk in advance.

LOOKING AHEAD: CAPABILITY SET 14

Those laboratories also set the stage for NIE 13.1 by providing the first glimpse of CS 14. In the labs, engineers created a representative NIE architecture for the initial CS 14 baseline network. Through a combination of actual and simulated hardware and software, they recreated the end-to-end NIE network, which requires distinct configurations and different combinations of systems for each battalion within 2/1 AD. Through this Lab-Based Risk Reduction process, system functionality, interoperability, and all configuration settings and mission threads were validated before sending systems to NIE 13.1.

Just as we did for NIE 12.2, Army engineers also conducted significant upfront integration on the ground at Fort Bliss to decrease the burden on 2/1 AD once the unit begins conducting 13.1 operations at White Sands. For example, we again built "Golden Vehicle" designs to standardize the configuration of different combinations of network equipment on various platforms before configuring the entire fleet. This concept and other NIE lessons learned, such as system-of-systems training for Soldiers, are also being applied to the fielding of CS 13.

NIE 13.1 will conduct four program tests for record at White Sands, plus one more from a distributed site at Yuma Proving Ground, AZ, and will evaluate 23 SUEs. It will provide an early look at the CS 14 network baseline, building upon the CS 13 network architecture that was demonstrated at NIE 12.2.

Among the CS 14 upgrades to be evaluated at NIE 13.1 are the initial build of the Intelligence, Surveillance and Reconnaissance (ISR) Baseline and the progress of Ops-Intel Convergence, an Army initiative fusing real-time intelligence with combat operational data to deliver a comprehensive picture of the battlefield for the commander. (See related article, Page 12.) The event will also include an evaluation of mid-tier networking radios and waveforms to determine options for fielding with CS 14 and beyond.

More than a dozen companies with network and non-network systems are participating in NIE 13.1, reflecting the Army's aggressive effort to seek mature technologies from both large and small industry partners to fill hardware and software needs.

Bottom line: We expect NIE 13.1 to answer key questions and serve as a preliminary operational tryout for CS 14, yielding Soldier feedback and test data that the Army can act on before final CS 14 validation at NIE 13.2 next spring. CS 14 is expected to be fielded to up to six BCTs beginning in FY14.

CONCLUSION

The Network Integration Evaluation and Capability Set Management construct is an enduring Army process, and NIE 13.1 will build on its proven success.

The benefits we have reaped from it—informing requirements, aligning programs of record, allowing for integration of systems before deployment, and providing an avenue for industry to bring in mature capabilities for evaluation—will continue as we lead technology into the future.

For more information, go to ***http://www.bctmod.army.mil/.***

Capability Gaps by NIE:

12.1

- Fusing operations and intelligence information to the tactical edge.
- Executing command and control on-the-move.
- Sharing and displaying contextually relevant multisource data.
- Digitally integrating Joint, intragency, intergovernmental, multinational (JIIM) partners during planning and execution.
- Tailoring network resources (line of sight (LOS) and beyond line of sight (BLOS) to match commanders' priorities.
- Conducting cyber/electromagnetic activities.
- Network-related capabilities, which do not require the network for task performance but are enabled by the network.

12.2

- Having a robust network that provides fused information and responsive access to combat power, to the tactical edge.
- Executing mission command and control on-the-move.
- Sharing and displaying contextually relevant multisource data.
- Digitally integrating unified action (UA) partners during planning and execution.
- Tailoring network resources (LOS and BLOS) to match commanders' priorities.
- Conducting cyber/electromagnetic activities.
- Network-related capabilities, which do not require the network for task performance but are enabled by the network.

13.1

- Having a robust network, with interoperable applications, that provides fused information, and responsive access to combat power, to command posts and the tactical edge.
- Staff integration and collaboration, including UA partners (formerly JIIM partners) during planning and execution.
- Tailoring network resources (LOS and BLOS) to match commanders' priorities and enable use of the network as a weapon.
- Current education programs, training strategies, and home station infrastructure that do not provide sufficient opportunities for training, particularly in terms of mission command, the mission command warfighting function, and the network.
- The inability of current home station training and Combat Training Centers to train and familiarize Soldiers with theater-provided equipment before deployment.
- Current education programs, training strategies, and home station infrastructure that do not provide sufficient opportunities to train leaders at the company level and below on "how to train."

MG Genaro J. Dellarocco, BG Randal A. Dragon, and BG Daniel P. Hughes lead the Triad of Army organizations that execute the NIEs.

MG GENARO J. DELLAROCCO is the Commanding General (CG) of the U.S. Army Test and Evaluation Command. He holds a B.S. in business administration from Lake Superior State College, an M.S. in materiel acquisition management from the Florida Institute of Technology, a Master of Military Art and Science from the U.S. Army Command and General Staff College; and a Master of Strategic Studies from the U.S. Army War College. He is a member of the U.S. Army Acquisition Corps.

BG RANDAL A. DRAGON is the CG of the Brigade Modernization Command. He holds a B.S. in psychology from James Madison University; a master's degree in systems technology from the Naval Postgraduate School; a Master of Military Art and Science from the U.S. Army Command and General Staff College; and a Master of Strategic Studies from the U.S. Army War College. He has served in every leadership position from platoon through division level, including as a Deputy CG for the 1st Infantry Division at Fort Riley, KS, and Deputy CG, U.S. Division – South (Operation Iraqi Freedom/New Dawn).

BG DANIEL P. HUGHES is the Director of the Army's Systems of Systems Integration Directorate, which falls under the Assistant Secretary of the Army for Acquisition, Logistics, and Technology. He holds a B.A. in political science from the University of Texas at Arlington; an M.B.A. in business management from Oklahoma City University; and an M.S. in national resource strategy from the Industrial College of the Armed Forces. He is Level III certified in program management and in communications and computers.

BUILDING *the* NETWORK BASELINE

How BMC, ATEC, and SoSI Directorate collaborate to carry out the Agile Process through Network Integration Evaluations

by MAJ Jason (Jake) Wamsley and Scott West

The Network Integration Evaluation (NIE) facilitates agile acquisition by leveraging the power of industry alongside traditional acquisition programs, while using a unique management approach. This approach is carried out by a group known as the Triad, which manages the NIE process.

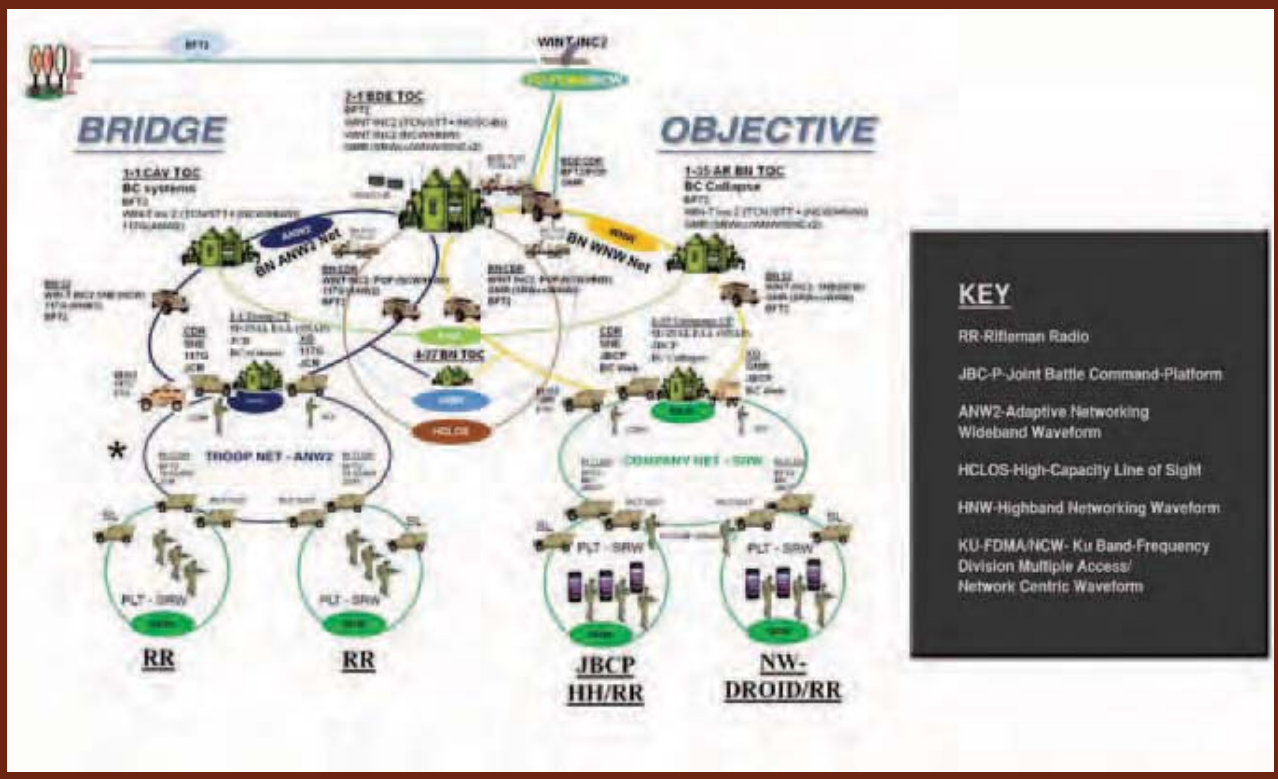
Triad membership comprises the Brigade Modernization Command (BMC), the U.S. Army Test and Evaluation Command (ATEC), and the System of Systems Integration (SoSI) Directorate. In order to ensure that Army requirements are adequately addressed and tested in accordance with the DOD 5000 series of directives that govern defense acquisition, these three individual commands work in conjunction to reach a common goal: ensuring that the materiel needs of the Army are met, the systems involved in the NIE are properly tested and evaluated, and the integration of systems into the Army's network is performed upfront to reduce or eliminate the integration burden on the Soldier.

This effort has led to a greater understanding of cross-system integration, as well as the challenges associated with integrating multiple vendors' hardware and software assets across the force.

Although each NIE lasts six to eight weeks, the preparation, planning, and pre-execution for each begin immediately after the previous evaluation is complete. Laying the foundation for what the network architecture will look like is a key step in preparing for an NIE. SoSI leads this effort by

NIE 12.1 Network Architecture

Figure 1



Capability Set 13-14 expands transport capacity and delivers enhanced network capabilities deeper into tactical formations. This diagram shows early deployment of the bridge architecture. (SOURCE: System of Systems Integration (SoSI) Directorate)

bringing together several Army program executive offices (PEOs) and program managers during the NIE/Agile Process, using the Capability Set Integrated Master Schedule for integration, production, and deployment.

NIE ENTRANCE CRITERIA

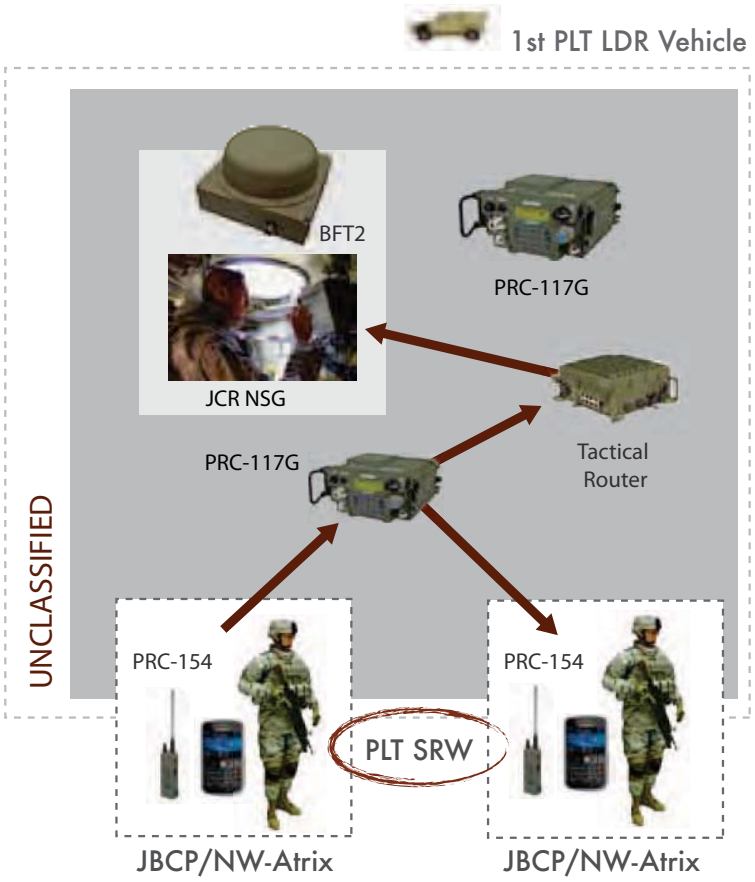
Participation of systems in the NIE is determined through the seven-phase Agile Process. Entrance criteria are led by the acquisition community and are based on identified capability gaps aligned to near-term requirements and opportunities. Once the gaps are prioritized, a Sources Sought Memorandum to industry and a Technical Call Memorandum to the U.S. Army Materiel Command (AMC) community are issued, soliciting mature capability solutions for potential participation in an NIE event.

After candidate capabilities are received through a white-paper process, they are assessed to determine the viability of candidate capability solutions and technologies to go forward for evaluation in the NIE.

Once accepted into the NIE process, industry equipment becomes what is known as a System Under Evaluation (SUE) and is placed on BMC's overarching equipment list, called the Horse Blanket (HB). In addition, government Programs of Record undergo formal testing during each NIE. These programs are referred to in the NIE framework as a System Under Test (SUT).

Network Key Nodes

Figure 2



The C4ISR [Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance] Systems Integration Laboratory at Aberdeen Proving Ground, MD, works to ensure that priority of effort is placed on building out "key nodes" in the evaluation brigade's architecture rather than the entire brigade structure. (SOURCE: SoSI Directorate/Communications-Electronics Research, Development, and Engineering Center (CERDEC))

The BMC HB uses the 2nd Heavy Brigade Combat Team, 1st Armored Division (2/1 AD) Modification Table of Organization and Equipment as a guide, listing each vehicle and dismount in the brigade, as well as any associated equipment, gear, and software.

INITIAL TRANSPORT DESIGN AND PEER REVIEW

Immediately after publishing the BMC HB in its initial form, SoSI's Project Director (PD) Futures at Aberdeen Proving Ground (APG), MD, begins the process of transferring the BMC HB information into unit-specific diagrams that show how the equipment and networks will be used for each brigade-, battalion-, and company-size element.

These diagrams, known as Transport Design diagrams (TDs), consist of a visual representation of each vehicle or dismount with communication equipment and the network that each will use for operations. Each TD undergoes multiple organizational peer reviews to ensure that the diagrams match exactly what is published in the BMC HB and that the proposed network architecture is accurate.

TDs generally take two to three weeks to create, a process conducted concurrently with the development of initial communication threads. Once complete, the TDs as a whole are referred to as the NIE Transport Architecture (TA). (See Figure 1 on page 13.)

THE AGILE PROCESS ENABLES THE ARMY TO ASSESS CAPABILITY GAPS, RAPIDLY FORM REQUIREMENTS, SOLICIT MATURE INDUSTRY SOLUTIONS, AND PERFORM LABORATORY AND FIELD EVALUATIONS, TAKING YEARS OFF THE TRADITIONAL ACQUISITION TIMELINE.

PARTICIPATION OF SYSTEMS IN THE NIE IS DETERMINED THROUGH THE SEVEN-PHASE AGILE PROCESS. ENTRANCE CRITERIA ARE LED BY THE ACQUISITION COMMUNITY AND ARE BASED ON IDENTIFIED CAPABILITY GAPS ALIGNED TO NEAR-TERM REQUIREMENTS AND OPPORTUNITIES.

ARCHITECTURE VALIDATION AND THREAD GENERATION

At the heart of each NIE is a set of system threads generated using the TD architecture. These threads are developed as part of a SoSI-led collaborative process that incorporates the NIE objectives published by the DA, specific capabilities required by the U.S. Army Training and Doctrine Command Capability Managers for each platform and weapon system, and the stated capabilities of each piece of equipment provided by industry.

Thread development for each NIE begins immediately after the previous evaluation. The thread development process is iterative, drawing input from experience gained in previous NIEs, generic approved mission threads, and the placement of SUEs and SUTs in the TA. In addition, test threads must accomplish DA objectives for the NIE. These objectives, modified for each NIE, serve as an overarching guide for the conduct of each evaluation.

SoSI's Futures Directorate manages early solution evaluations across all stakeholders, conducts competition, and oversees integration and configuration management across the PEO community.

LAB REDUCES NETWORK AND INTEGRATION RISK

The C4ISR [Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance] Systems Integration Laboratory (CSIL) at APG plays an integral role in network architecture validation and thread generation.

The lab uses actual hardware to test the interoperability of messages and provides support to reduce overall system risk, ensuring efficiencies in the NIE. CSIL's Lab Based Risk Reduction (LBRR) process ensures that priority of effort is placed on building out "key nodes" in the evaluation brigade's architecture rather than the entire brigade structure.

Key nodes are defined as key vehicles and dismounts that feature SUEs or SUTs, or vehicles and dismounts that serve as gateways from one waveform to another. For example, the platoon leader and platoon sergeant vehicles operating in a lower- and mid-tier construct serve as a gateway for platoon traffic from the unclassified Soldier Radio Waveform (SRW) network to the company and higher mid-tier classified network through the use of Cross-Domain Solution hardware. (See Figure 2.)

The PD Futures team further refines the TA by generating system views for each key node in the brigade. These system views display the equipment for each vehicle, connections between equipment, networks to be used in each vehicle, and the location of ATEC instrumentation.

The goal of each system view is to provide a simplified breakdown of each vehicle, enabling the CSIL to test the vehicle architecture and make changes if needed before executing the thread in a live environment. Ideally, the CSIL will note the locations of cable connections between devices once LBRR is underway, identify key data traffic flow capture points, and aid ATEC in instrumentation checkout.

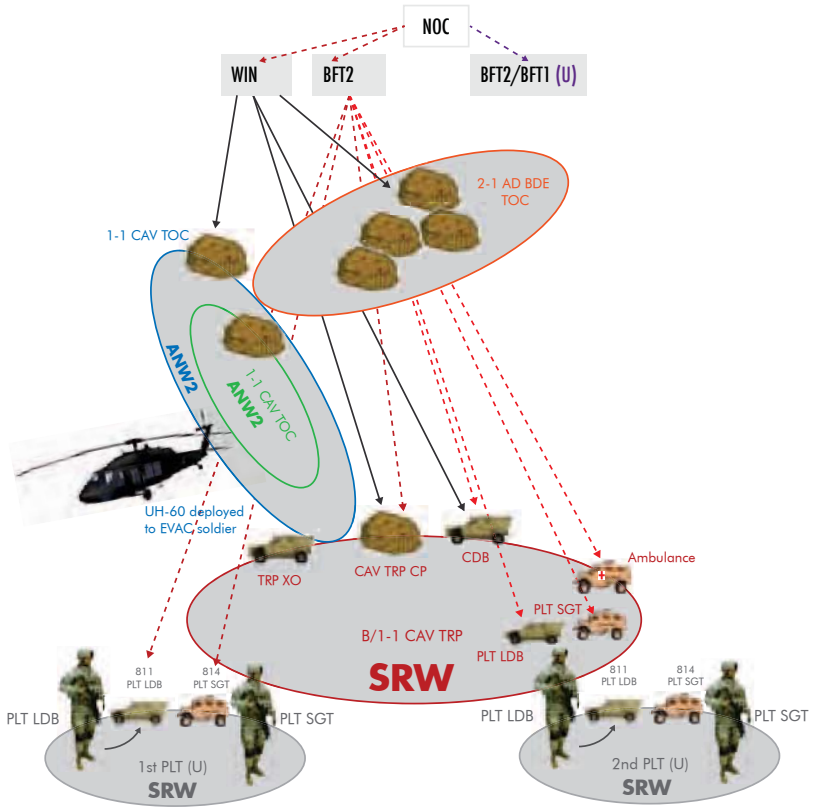
This will allow for more efficient troubleshooting and isolation of issues once the brigade begins equipment installation and integration at Fort Bliss, TX.

Once completed and validated in the CSIL, the vehicle system views are handed over for use during the NIE.

Upon receiving the required hardware and software, the CSIL replicates the key nodes in the TA and begins the risk reduction process. Each proposed thread is run

Following the Threads

Figure 3



At the heart of each Network Integration Evaluation (NIE) is a set of system threads generated using the Transport Design architecture. This is a sanitized example of a MEDEVAC mission thread as conducted during a recent NIE. These threads are developed as part of a SoSI-led collaborative process. (SOURCE: SoSI/CERDEC)

from the initiating node through receipt at its final location. (See Figure 3.)

The CSIL LBRR team will validate each thread to make sure it's executable and will recommend changes to threads if required. After each thread has been validated in the lab, the CSIL LBRR team continues to help with troubleshooting before and during the NIE's execution.

HANDOFF OF THREADS

When lab testing is complete, PD Futures supervises the installation of all applicable hardware in the 2/1 AD equipment set. Then the Soldiers of 2/1 AD conduct a live communications exercise (COMMEX). The COMMEX provides an opportunity to ensure that vehicle-specific integration issues are brought forward for further troubleshooting before the NIE begins.

Once the COMMEX phase is complete, all threads are executed by Soldiers in a realistic operational environment at White Sands Missile Range, NM, during the actual NIE event.

CONCLUSION

The Agile Process enables the Army to assess capability gaps, rapidly form requirements, solicit mature industry solutions, and perform laboratory and field evaluations, taking years off the traditional acquisition timeline. Through this process, the Army is able to keep pace with industry's rapid maturation of technology

THE LAB USES ACTUAL HARDWARE TO TEST THE INTEROPERABILITY OF MESSAGES AND PROVIDES SUPPORT TO REDUCE OVERALL SYSTEM RISK, ENSURING EFFICIENCIES IN THE NIE.

COMMUNICATIONS UPGRADE

In the months leading up to each NIE, Soldiers, engineers, combat developers, and test officials integrate hundreds of vehicles and systems at the Integration Motor Pool at Fort Bliss, TX. The NIEs integrate and mature the Army's tactical network and accelerate the way network technologies are delivered to Soldiers through integrated Capability Sets of communications gear. (Photo by Drew Hamilton, White Sands Missile Range, NM, Public Affairs)

and conduct integrated testing earlier and more often in the acquisition process. The output of the Agile Process is Synchronized Fielding. SoSI is synchronizing the implementation and fielding of Capability Set (CS) 13, composed of network components and associated equipment and software that for the first time will deliver an integrated voice and data capability throughout an entire brigade combat team (BCT) formation.

The Army's CS fielding plan supports a synchronized vehicle and network fielding strategy, prioritizes capabilities for deployed forces, and improves alignment of limited resources.

Beginning in October, the Army is fielding CS 13 to as many as eight BCTs, with priority going to deployed forces (three BCTs), units scheduled to deploy next (three BCT training sets), a forward stationed brigade in Korea, and 2/1 AD.

For more information, contact MAJ Jason Wamsley at ***jason.b.wamsley.mil@mail.mil****; or go to* ***http://www.bctmod.army.mil****.*

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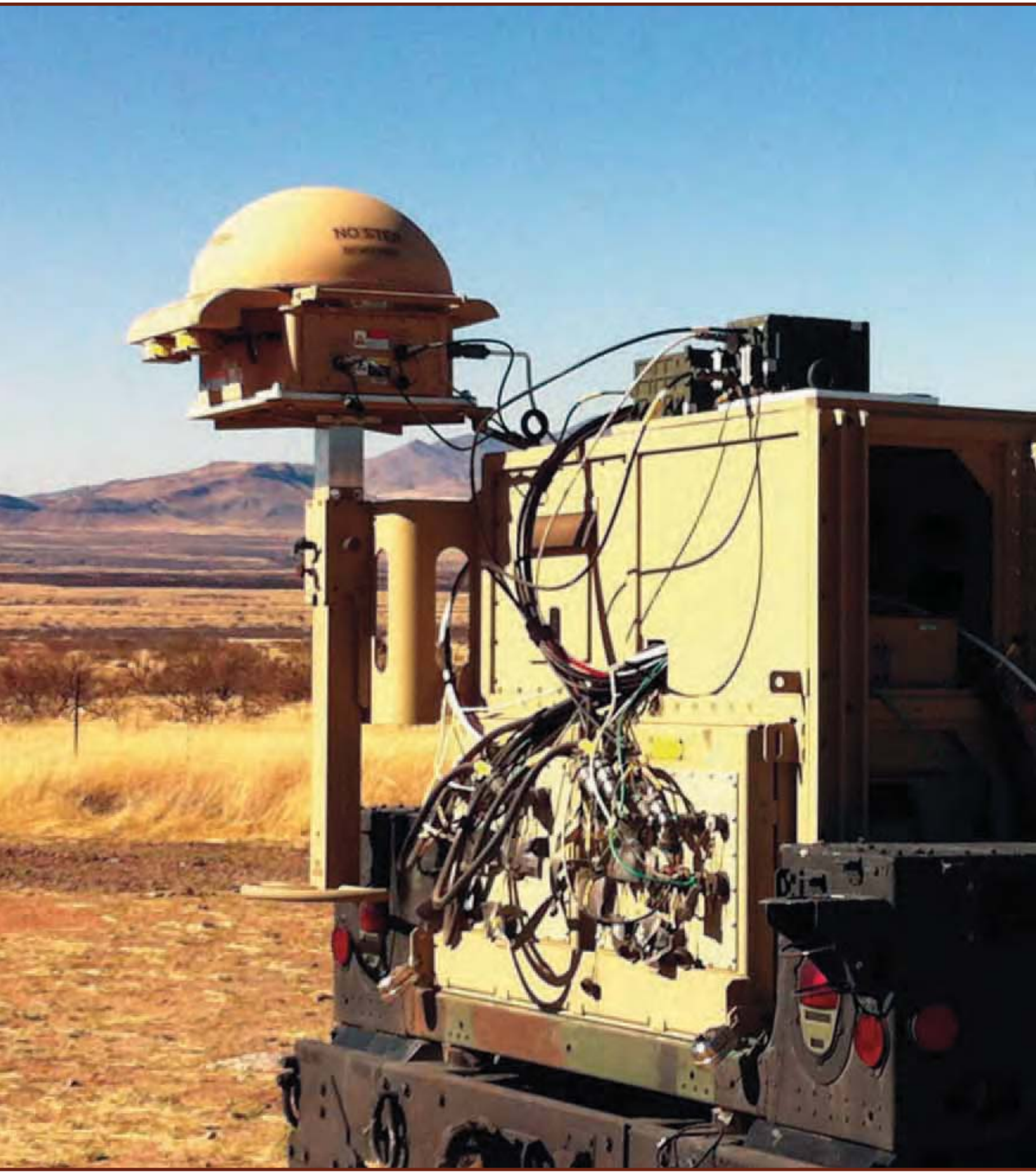

TOP-TIER SOLUTION

Army's network aerial layer promises to increase network performance and reduce satellite reliance

by COL Ed Swanson, LTC Robert Collins, and LTC J. Ward Roberts

As the Army continues its quest to improve network performance and reduce reliance on overburdened commercial and military satellites, it must come up with ways to offset the increasing demand for satellite bandwidth, which is not only expensive but also comes with higher latency than line-of-sight alternatives.

One such remedy is already in the pipeline. Warfighter Information Network – Tactical (WIN-T) Increment 3, the third generation of the Army's tactical communications network backbone, will add an air tier to the existing WIN-T network architecture to increase capacity and offload communications from satellite transponders.

AIR TIER ADVANTAGES

Project Manager (PM) WIN-T continues to develop and test this airborne layer, referred to as the WIN-T Communication Payload (WCP). In essence, a communication package, or kit, will be installed on an aerial platform, such as an unmanned aerial vehicle like the Gray Eagle, which will offload network communications from satellite transponders to the aerial tier. With the addition of the air tier, the Soldier will possess a three-tiered WIN-T communication network (terrestrial, aerial, and celestial).

The WIN-T Increment 3 aerial layer capability will thicken and improve the reliability of the tactical communications network. The connectivity will be transparent to the user, but now there will be three paths where previously there were just two, which helps considerably in making sure the network is adaptive, responsive, and resilient. This three-tiered architecture will increase the capacity, availability, and overall reliability of the network.

The high demand for limited commercial and military satellites requires the Army to prioritize Satellite Communications (SATCOM). The WIN-T Increment 3 air tier will make sure SATCOM resources are available to

WIN-T POINT OF PRESENCE

A Warfighter Information Network – Tactical (WIN-T) Point of Presence mounted on a vehicle was used during the WIN-T Increment 3 Communication Payload testing at Fort Huachuca, AZ, in June. (U.S. Army photos by Lawrence Lipke)

TACTICAL COMMUNICATIONS NODE
The raised mast of a Tactical Communications Node features a Highband Radio Frequency Unit-Multiband Terrestrial line-of-sight antenna.

support mission-critical requirements. The air tier also provides significantly increased throughput and cost savings by avoiding having to pay for expensive satellite bandwidth.

Not only will the air tier reduce reliance on satellites, but it will also extend connectivity range across the battlefield and improve network availability. The airborne layer is expected to provide continuous robust connectivity to the nodes on the ground, and, like SATCOM, it allows for on-the-move communication in locations previously unreachable. It will provide maximum operational flexibility and connectivity to support full-spectrum military operations.

The air tier also offsets the high latency involved with satellite communications. Compared with the distant satellite transponder orbiting in space, the aerial tier nodes fly approximately 15,000 feet above the ground, providing an increase in performance because of the shorter distance the communications signal has to travel. Messages and information arrive more quickly, and users reap the rewards of increased bandwidth.

THE WIN-T NETWORK

In 2004, the Army began fielding WIN-T Increment 1, then known as the Joint Network Node – Network, in Iraq and Afghanistan to meet network communication requirements to support highly mobile and dispersed forces in a digital environment. Similar to a home Internet connection, Increment 1 provides Soldiers with high-speed, high-capacity voice, data, and video communications, down to battalion-level units at-the-quick-halt.

WIN-T Increment 2 introduces self-forming, self-healing networking radios; enhances network operations (NetOps) for network planning and monitoring; pushes capability to the company level, and supports operations while on-the-move. It is a vital piece of Capability Set 13, the first integrated group of network technologies being fielded to Army brigade combat teams starting in October.

However, WIN-T Increment 2 is the Army's initial on-the-move tactical network. WIN-T Increment 3 will both add new capabilities and mature previously fielded Increment 2 capabilities to realize a full on-the-move tactical network for the Army.

WIN-T Increment 3 continues developmental testing on the Joint Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (JC4ISR) radio.

The radio makes great strides in improving throughput capacity and extending communication ranges. With a dual-channel capability that facilitates additional operational flexibility for both ground and air operations, it is a major component of WIN-T Increment 3 and will be integrated into the WCP as part of the aerial tier.

NETWORK OPERATIONS

One of the biggest challenges for the Army S6 (communications officer) is managing the Army's increasingly complex networks. NetOps is the S6's tool to command and control the network, and to make the S6's job easier. It has been greatly improved in WIN- T Increment 2 and will be further enhanced in Increment 3.

The WIN-T NetOps tools are designed to facilitate and simplify the planning, administration, management, response, initialization, and spectrum and frequency allocation for the network. Planning before operations, as well as configurations and maintenance while in the field, rely on the WIN-T NetOps. It ensures that the network systems are fully operational and can identify issues for immediate correction, sometimes before the unit even knows they exist.

TECHNOLOGY INSERTIONS

As networks and operational challenges become more complex on the battlefields of today and tomorrow, equipping the

Soldier with the most advanced technologies possible will contribute to safety and mission success. In an effort to provide these needed technologies sooner rather than later in its final complete package, elements of WIN-T Increment 3 will be inserted early into WIN-T Increment 2.

This plan allows for proven technologies to be brought to the field as early as possible to support Soldiers and their missions. As elements of Increment 3 mature and complete testing and evaluation, these capabilities will be inserted into Increment 2, which is PM WIN-T's current strategy for the JC4ISR radio and WIN-T Increment 3 NetOps.

HARNESSING UAVS
A Gray Eagle Unmanned Aerial Vehicle is expected to carry the WIN-T Communication Payload airborne relay for WIN-T Increment 3, which is still in development.

WIN-T Increment 3 technologies will also be included in upcoming Network Integration Evaluations to gain early insights directly from Soldiers of the 2nd Brigade, 1st Armored Division (2/1 AD) on integration and how well the technologies perform. In fact, Product Manager WIN-T Increment 3 conducted a demonstration of Increment 3 NetOps software with 2/1 AD Soldiers in July to highlight new functionalities and garner user feedback on how the development was proceeding. The complete WIN-T Increment 3 package is on schedule for fielding in FY18.

CHALLENGES AHEAD

Of course, there will be challenges for WIN-T Increment 3, including the shared integration of high-capacity communication kits onto various ground and aerial vehicle platforms. There are always size, weight, and power constraints to be addressed when integrating new communications equipment onto vehicles without adversely affecting either the communication or platform capabilities.

The aerial layer also adds complexity because of the environment in which it operates, including altitudes and temperatures. Communication frequencies can interfere with avionics and other platform electronics. When the aerial platforms bank in certain ways, they have to maintain the link with the ground and ensure that reception is not blocked or lost.

CONCLUSION

Currently on schedule for an FY15 Milestone C decision, WIN-T Increment 3's limited user testing is scheduled for fourth quarter FY14, with operational test and fielding projected for 2018. The advanced technologies of WIN-T Increment 3 will not only reduce reliance on overburdened satellites, but will provide Soldiers with an uninterrupted flow of timely, relevant, and actionable information to successfully complete future missions.

For more information, go to ***http://peoc3t.army.mil/wint/*** *and* ***http://peoc3t.army.mil/wint/inc3.php****.*

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LTC ROBERT COLLINS has been the Product Manager for WIN-T Increments 2 and 3 for the past two years, recently relinquishing the WIN-T Increment 3 charter as Increment 2 heads into fielding scheduled for October. He holds a B.A. in management from Shippensburg University, and master's degrees from Webster University and Oklahoma University. He is a member of the AAC with a Level III certification in program management.

LTC J. WARD ROBERTS is the Product Manager for WIN-T Increment 3. He holds a B.A. in political science from the University of South Florida and an M.B.A. from Columbia Southern University. He is a member of the AAC with Level III certification in program management and Level II certification in contracting.

URBAN TERRAIN TRAINING

Military Operations on Urban Terrain (MOUT) are one example of the many types of training systems in the Army's Live Training Transformation (LT2) Product Line. The development of a Mobile Product Line Architectural Framework will involve synchronization with the emerging second generation of LT2 products and the Common Training Instrumentation Architecture. Here, Soldiers with 3rd Brigade Support Battalion, 1st Heavy Brigade Combat Team, Third Infantry Division (1HBCT, 3ID) enter a shoot house during MOUT training at Fort Stewart, GA, June 21. (Photo by SSG Christopher Blakeslee, 1HBCT, 3ID)

LIVE TRAINING *Goes* MOBILE

PEO STRI advances Army vision for handheld applications with common architecture, data, standards, processes, and components

by Andrea Morhack, James Todd, and Dr. Jeremy T. Lanman

In May 2010, the U.S. Army Deputy Chief of Staff, G-3/5/7 stated that the vision for the Common Operating Environment (COE) is to establish "an approved set of standards that enable secure and interoperable applications to be rapidly developed and executed across a variety of computing environments."

This vision includes the mission to "provide Soldiers with a position of advantage using mobile or handheld devices to access relevant, trusted information required to make timely decisions." To make this a reality, the Army has established a set of goals to be achieved over five years. The first goal, critical to the success of this mission, is the development of a Mobile Product Line Architectural Framework (MPLAF).

The Army is just beginning to pursue the use of mobile devices and applications in its live training domain. The migration to and reliance on these devices is likely to grow significantly over the next few years. As the Army looks into the application of mobile devices for many of its systems, there is an opportunity to apply product-line architectural techniques and lessons learned. The adoption of standards, frameworks, and style guides will ensure 1) early realization of cost avoidances; and 2) early return on investment from systematic reuse.

Currently, live training mobile applications range from maintenance roles, through command and control systems, to after-action reviews. These applications will be operated in stand-alone or connected configurations, or as service providers or consumers deployed into a cloud-based COE environment, allowing Soldiers on-demand training capability. However, just as there are many potential benefits, there also are many challenges, including security and information assurance, technical performance, and the current acquisition business model. To ensure success, an underlying mobile architectural framework that promotes product-line guidance and standardization must be established and maintained.

HANDHELD TARGET CONTROL
The TRACR Ültra Lite handheld target control system is a mobile application supporting the Targetry Range Automated Control and Recording control system. It is ready for transition to operational use. (Image courtesy of Dignitas Technologies LLC)

This article will explain the benefits of applying an MPLAF, a set of standards, and a style guide to live training, and will describe lessons learned and implementation considerations for developing mobile applications. Furthermore, it will discuss synchronization of the live training MPLAF with the emerging second generation of the Army's Live Training Transformation (LT2) Product Line and the Common Training Instrumentation Architecture (CTIA), and the Program Executive Office Simulation, Training, and Instrumentation's (PEO STRI's) overall enterprise mobile architecture approach.

MOBILE PRODUCT LINE CONCEPT

LT2 has long been a true software product line. The LT2 Family of Training Systems is based on the Army's CTIA. The CTIA is the technical framework that provides commonality across training instrumentation systems, and is the live training instrumentation interface to the Live – Virtual – Constructive Integrated Training Environment, a common instrumentation platform for training systems. The CTIA consists of standards, protocols, infrastructure services, and common software components to be used by system developers. It is the core software infrastructure of training instrumentation systems.

LT2 core assets include open architectures, common software components, standards, processes, policies, governance, documentation, and more, all leading to a common approach and framework for developing live training systems. Examples of the many types of training systems in the LT2 family include Military Operations on Urban Terrain, Maneuver Combat Training Center, instrumented live-fire range training, and various Joint training systems.

Similar to the LT2 Product-Line Architectural Framework, the MPLAF vision is to create a family of mobile applications using a common architecture with common data, standards, processes, and components. This commonality facilitates the rapid development of new applications, and ensures that applications across the LT2 product line can communicate and interoperate with one another. This is important because large training exercises need to employ different training systems working together.

The LT2 product line makes use of plug-and-play components and applications that are common between products and applications, allowing for changes, upgrades, and fixes developed for one application to be applied

to others. This concept provides the inherent logistical support benefits that derive from commonality, standardization, and interoperability, reducing total life-cycle costs.

Specifically, as defined by the Army's COE, the MPLAF should include a common software development infrastructure (CSDI) comprising operating and run-time systems, native and common applications and services, software development kits, and standards and technologies for handheld and wearable devices, with an initial focus on implementation of live training capabilities. Additionally, the MPLAF will provide guidance for hardware specifications to support integration of compliant capability solutions on the Soldier.

As a proof of concept, the Target Modernization program within PEO STRI's Project Manager Training Devices (PM TRADE), in conjunction with the U.S. Army Simulation and Training Technology Center, developed a mobile device application to support the Targetry Range Automated Control and Recording (TRACR) control system. The TRACR Ültra Lite (TÜL) handheld target control system, implemented quickly and efficiently by leveraging and defining mobile application standards, is ready for transition to operational use. TÜL is the next-generation handheld target controller for use on the Army's live-fire training ranges. TÜL provides a suite of graphical user interface-based controls for the individual or scenario control of targets in either operational or maintenance mode. TÜL communicates with the tower TRACR computer via a rest state interface to ensure timeliness of performance and safety of control.

Based on level of maturity, PM TRADE's TÜL currently focuses on adequately defining the description of functional characteristics and identification of common standards and practices for the MPLAF. Design considerations for the CSDI and associated hardware specification and network interfaces are preliminary. However, synchronization with the current LT2 Product Line construct and next-generation CTIA Service-Oriented Architecture (SOA), and systematic reuse has begun, with similar mobile initiatives in PM TRADE using MPLAF.

CHALLENGES AND LESSONS LEARNED

The emergence of mobile technology in the training environment introduces a number of challenges, including information assurance, ruggedization, reusability, integration into existing training systems, and life-cycle support.

One of the greatest challenges with the emergence of mobile architecture is ensuring the continued protection of data and adhering to evolving security regulations. Information assurance requirements need to keep up with the pace of mobile innovation. In addition to threats presented by a standard "non-mobile" system, mobile devices present their own unique security challenges.

Because of these constantly evolving threats, it is imperative that mobile systems go through the DOD Information Assurance Certification and Accreditation Process to successfully achieve an Authorization to Operate. The security risk for mobile architectures needs to be reduced to an acceptable level, while allowing innovation in this area to continue.

Second, mobile devices need to be ruggedized for use by Soldiers in a variety of environmental and physical conditions to ensure survivability in the field. These conditions include temperature extremes, wind gusts, humidity, sand, dust, and wear and tear by the operator. Also, Soldiers may need to wear gloves while using the mobile devices; therefore, the cases for the device's screen must be considered.

In keeping with PEO STRI's goal of reusability, mobile applications need to follow suit. A challenge to be overcome is

JUST AS THERE ARE MANY POTENTIAL BENEFITS, THERE ALSO ARE MANY CHALLENGES, INCLUDING SECURITY AND INFORMATION ASSURANCE, TECHNICAL PERFORMANCE, AND THE CURRENT ACQUISITION BUSINESS MODEL.

to ensure that mobile applications are not stovepiped. The question of how to reuse part of an application needs to be studied. Mobile applications need to have reusable components built into them.

For example, TÜL has a component that allows the user to draw around targets with a finger in order to control multiple targets simultaneously. That same component, with very little modification, has the potential to be reused in another mobile application's capability to select and control multiple improvised explosive device simulators simultaneously. As a result, Army programs would save money and field much-needed capability to Soldiers more quickly and efficiently.

Considerations when developing mobile applications include connectivity and integration into an existing system. Factors to take into account include updating the system's information assurance accreditation boundary, user and maintenance documentation, training, and existing software. Also, in keeping with the Army's COE and mobile handheld initiatives, the MPLAF will allow for adoption of future policies, procedures, and design decisions required for Army-wide enterprise integration.

In addition to meeting the previous challenges and considerations, the MPLAF will consider elements such as the selection of operating systems, platforms, software development kits, etc., that are consistent with the Army's COE and enterprise mobile architecture approach.

Lastly, for life-cycle support, sustainment needs must be considered.

An early lesson learned from this emerging technology is the need to protect the application from the user. Users should not have the ability to access functionality or applications that are not needed for their intended training task. To avoid this situation, a kiosk mode may be used. Kiosk software locks down the application and prevents the user from intentionally or accidentally accessing all functionality except what is predefined for the training task.

GAME ON

The Army's migration to and reliance on mobile devices is likely to grow significantly in the near term. Here, Soldiers participate in a Mobile Device User Exercise conducted by the ROTC at the University of Central Florida. (Photo by Shelly Brown)

RETURN ON INVESTMENT

The development of a MPLAF allows for multiple avenues of return on investment (ROI). The MPLAF cannot be expected to yield the same reuse ROI as a typical software product line, given the compact nature of mobile applications and the technology evolution of mobile hardware. However, there still should be significant ROI from systematic reuse.

It is anticipated that the MPLAF will allow up to 45 percent reuse of software components within the product line. Couple this with the reliance of feature profile concepts of the second-generation product line ideology, and the reuse rate could climb above 60 percent. This reuse could equate to a cost avoidance of as much as $4 million to $5 million per year in development and sustainment.

MOBILE MAPPER

SPC Limburg Neal of the 7th U.S. Army Joint Multinational Training Command uses the Army Range Mapper Mobile on his iPhone to reference driving routes on Grafenwoehr Training Area, Germany, April 18. As the Army expands the use of mobile devices and applications in live training, it is taking steps to apply product-line architectural techniques and lessons learned. (Photo by Michael Beaton, U.S. Army Europe)

Development of the MPLAF will also allow the live training domain to synchronize the road map between the current LT2 product line and the mobile devices. The MPLAF will provide the architectural framework and standards for SOA (Training as a Service) and cloud computing solutions.

The ability to implement SOA and cloud-based services will extend the functional reach of the LT2 Family of Training Systems, as well as provide mechanisms to lower life-cycle operational and sustainment costs. By centralizing the services and abstracting the processing, less manpower will be required to operate and sustain each system, as common functions could be run from a remote facility for all training applications.

CONCLUSION

The key to ensuring a positive ROI with respect to the MPLAF lies in the early implementation of the construct, as well as early implementation of lessons learned. Therefore, it is incumbent not only to develop the MPLAF based on best practices, but also to temper these with concrete lessons learned.

It is very tempting to move forward with mobile applications as if they were disposable. However, given tighter budgets, it is imperative that we implement a sound product-line approach for mobile applications and devices, and focus resources on product-line development and advancement that promote the systematic reuse of common assets and capabilities.

For more information, go to ***www.lt2portal.org****.*

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A REALISTIC PICTURE

In one assessment tool the Army is using to evaluate possible camouflage patterns, individuals dressed in the various patterns conceal themselves at preselected locations downrange while the vision of Soldier-observers is obscured. Then the Soldier-observers try to locate the camouflaged individuals. Aiming devices such as this one are linked to a computer, allowing the test team to determine whether the Soldier-observer has, in fact, accurately located an individual in camouflage. (Photo by Doug Cuddihy)

CONCEALMENT CAPABILITY

Army prepares to complete the final phase of comprehensive camouflage assessment for uniforms, equipment

by LTC Eugene F. Wallace

The New Mexico sun is blazing overhead as a team carrying weapons dashes toward its objective before suddenly dropping into a prone firing position. At the objective, another team of Soldiers tries to detect the position as the aggressors go to ground. This is not combat, but the outcome will have a direct impact on Soldiers in conflicts around the globe. Four families of camouflage patterns developed by private industry, as well as several camouflage patterns already in use by the services and by Special Operations forces, are being assessed in one of several Army Phase IV camouflage field evaluations.

"Effective camouflage hands the initiative to the Soldier," said COL Robert Mortlock, Project Manager Soldier Protection and Individual Equipment (PM SPIE), which is responsible for uniforms, body armor, helmets, and other individual Soldier equipment. "If the enemy can't see you, he can't shoot you. And if he doesn't see you coming, you maintain the advantage of surprise.

"This is why the Army is conducting such a scientific evaluation of camouflage patterns that can be used in terrains and environments found all over the world," Mortlock added. "This program was a bottom-up initiative launched because of feedback from Soldiers serving on the front lines."

A FOUR-PHASE UNDERTAKING

A study in June 2009 concluded that the Army needed a more effective camouflage pattern than the current Universal Camouflage Pattern (UCP). That August,

ROUND-THE-CLOCK EFFECTIVENESS

Henry LeGras, an engineer working for U.S. Army Test and Evaluation Command, operates the multi-spectral sensor suite. The system records images day and night using digital color cameras and night vision sensors to provide full-spectrum data on camouflage effectiveness. (Photo by Doug Cuddihy)

Congress directed the Army to provide more effective camouflage for Soldiers participating in *Operation Enduring Freedom (OEF)*.

The following month, then-Secretary of the Army (SecArmy) Pete Geren directed Project Executive Office (PEO) Soldier, PM SPIE's parent organization; the U.S. Army Training and Doctrine Command; and the U.S. Army Natick Soldier Research, Development, and Engineering Center (NSRDEC) to execute a four-phase camouflage improvement effort for the Army. (See "*Operation Enduring Freedom* Camouflage Pattern: A Rapid Response to a Complex Need," *Army AL&T* Magazine, October-December 2010, online at **http://asc.army.mil/docs/pubs/alt/archives/2010/Oct-Dec_2010.pdf.**)

Phase I provided alternate camouflage pattern uniforms and equipment to two battalions serving in Afghanistan for assessment. This was completed in November 2009.

Phase II evaluated environment-specific camouflage. PM SPIE and NSRDEC used calibrated photos of camouflage uniforms taken in Afghanistan and photo simulation tests to determine a suitable alternative camouflage for troops serving in Afghanistan as part of *OEF*. This was conducted between November 2009 and January 2010.

Phase III used data developed during Phase II to select and field a new camouflage pattern for Soldiers operating in *OEF*. Fielding of uniforms and individual equipment using the selected pattern, known as the *OEF* Camouflage Pattern, began in July 2010.

Phase IV, the final step in the process, is to determine a long-term multi-environment camouflage strategy for the entire Army. This phase uses a process consisting of a series of field tests at both day and night, as well as tests that use calibrated image assessment.

Soldiers are involved in almost every part of this process, as both test subjects and observers.

PEO Soldier, NSRDEC, the U.S. Army Test and Evaluation Command (ATEC), the U.S. Army Maneuver Center of Excellence, the U.S. Army Materiel Systems Analysis Activity, U.S. Army Corps of Engineers, U.S. Marine Corps, the U.S. Naval Research Laboratory, Naval Surface Warfare Center, U.S. Air Force, and the U.S. Special Operations Command (SOCOM) are all collaborating in this effort.

The goal is to assess and determine the best-performing family of patterns that can be used in a wide variety of regions and terrain sets around the globe. Each family of patterns being evaluated has a pattern for arid or desert conditions; a pattern for heavily forested or jungle conditions; and a transitional pattern for the in-between microenvironments with varying degrees of vegetation.

INDUSTRY INVOLVEMENT

The Army issued a Request for Proposals to industry on April 15, 2011. A primary requirement was for industry to provide a family of camouflage patterns of similar geometry for arid, woodland, and transitional environments as described above. In additional, each contractor was required to propose a single pattern that blends with these three different patterns. It will

be used for the Soldiers' packs, ammo pouches, and other equipment known as Organizational Clothing and Individual Equipment (OCIE).

More than 20 families of patterns were evaluated in the first stage of the Phase IV camouflage program, which began in June 2011.

On Oct. 31, 2011, SecArmy John McHugh and Chief of Staff of the Army GEN Raymond T. Odierno approved the second stage of the Phase IV program, to continue field trials and more extensive computer analysis.

On Jan. 10, PEO Soldier awarded contracts to four commercial vendors to provide fabric in their family of camouflage patterns for uniforms and OCIE, in preparation for the second stage of Phase IV. These firms are: Crye Precision LLC of Brooklyn, NY; Kryptek Outdoor Group of Fairbanks, AK; ADS Inc. of Virginia Beach, VA; and Brookwood Companies Inc. of New York, NY.

A CAMO PATTERN FOR AFGHANISTAN

Using data developed during Phase II of its four-phase camouflage improvement effort, the Army selected and fielded a new camouflage pattern for Soldiers operating in *Operation Enduring Freedom (OEF)*. Fielding of uniforms and individual equipment using the *OEF* Camouflage Pattern (OCP) began in July 2010. Here, SPC John Yifith, an Assistant Gunner attached to 2nd Battalion (Airborne), 377th Parachute Field Artillery Regiment, wears the OCP uniform and associated equipment as he conducts a security patrol outside of Forward Operating Base Salerno, Khost province, Afghanistan, July 7. (Photo by SSG Jason Epperson, 4th Brigade Combat Team, 25th Infantry Division Public Affairs)

COMPREHENSIVE APPROACH

These patterns are being assessed alongside several currently used DOD camouflage patterns. "It is extremely important to have those government patterns in the test as a benchmark for performance," said Glenn Rogers, Senior Test Officer for the Phase IV program.

"This is the most comprehensive test process we have ever assembled for camouflage assessment," added Rogers, who works for ATEC's Aberdeen Test Center and has been involved in camouflage testing for more than 20 years.

"We are doing detection testing using camouflage at various ranges, so we can find out how far away it is initially detected," he said. "We are also having the Maneuver Battle Lab conducting tactical assessments. Additionally, we are collecting calibrated images in various locations around the world to provide a comprehensive assessment of camouflage in the various global land covers and terrains."

FINAL ASSESSMENTS

Field trials, completed in August, took place day and night at Fort Carson, CO, and Fort Bliss, TX. The trials included assessment of both static detection range and tactical exercises. The Aberdeen Test Center conducted the static detection range assessment using a passive scoring system that accommodates 24 Soldiers simultaneously. The scoring system recorded the time it took to acquire the camouflage, along with azimuth and elevation for scoring. Concurrently the Maneuver Battle Lab oversaw team-size maneuver assessments.

In September and October, several hundred Soldiers will have participated in photo simulation exercises to further assess each camouflage pattern's daytime and nighttime performance by measuring both detection range and blending. Calibrated image collection for this

SEEKING A NEW SOLUTION

A study in June 2009 concluded that the Army needed a more effective camouflage pattern than the current Universal Camouflage Pattern (UCP), shown in this photo. In August 2009, Congress directed the Army to provide more effective camouflage for Soldiers participating in *Operation Enduring Freedom*. Here, Paratroopers assigned to 1st Battalion, 325th Airborne Infantry Regiment, 2nd Brigade Combat Team, 82nd Airborne Division (2/82) conduct a platoon-size raid Aug. 3 at a Fort Bragg, NC, training site. (Photo by SGT Kissta DiGregorio, 2/82 Public Affairs)

exercise is occurring at various locations in the United States and around the world. After conducting a massive study of land cover types of the combatant commands, the Corps of Engineers identified these locations as having terrain and vegetation that represent as many different environments as possible.

Images of the camouflage in these varied natural terrains will be shown to Soldiers in the photo simulation exercise. The Soldiers will assess the effectiveness of various patterns in these backgrounds, determining how well the patterns blend with land cover in various terrains and at various ranges.

"It is important to note that we will also be collecting imagery at nighttime with scientific systems to look at how the camouflage performs when viewed through night vision devices," Rogers said.

"In these various environments, we will have individuals wearing the camouflage along with the OCIE and helmets, so that we will have them fully configured.

"We worked hard to make this assessment fair and scientific," Rogers said.

There is participation in this program across the services: The Army, Navy, Air Force, Marine Corps, and SOCOM are involved.

The way the assessment has been structured is that everyone has had a seat at the table during the planning stage and has been invited to participate in the various aspects of the program, so we are getting some of the best minds from all the services involved in the planning, testing, and analysis.

"Including what we are collecting from the tactical exercises, the static detection tests, and the photo simulation exercise, we expect to gather nearly 100,000 observations from hundreds of Soldiers who will be involved in this assessment," Rogers said.

"This will be one of the most valuable data sets collected in my career that will inform the Army's long-term camouflage strategy, provide critical information to other programs within DOD, and likely be studied for the next decade."

CONCLUSION

The Phase IV process will allow senior Army leaders to make informed, scientifically grounded decisions based on rigorous testing and analysis coupled with Soldier involvement and continuous feedback. Leadership will receive a full report on the test results in late November or early December to review as they formulate a future Army camouflage strategy for combat uniforms and equipment. The new strategy will maximize Soldier performance, based on the science of camouflage, while minimizing implementation timelines and optimizing precious resources in a period of fiscally constrained budgets.

For more information, contact Doug Graham at ***douglas.f.graham.ctr@us.army.mil*** *or go to* ***peosoldier.army.mil****.*

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IN-THEATER ASSESSMENT

The Army sent a camouflage assessment team to Afghanistan to evaluate six different camouflage patterns in a variety of terrains. From left, the patterns were: AOR-2, UCP, MultiCam, Desert Brush, UCP-Delta, and Mirage. The photo was taken in Khost province, Afghanistan, close to the Pakistan border, in late October 2009. (Photo by PEO Soldier)

SAFEGUARDING THE NETWORK

A simple key loader is tested for use with a wideband tactical radio by Project Director Communications Security (PD COMSEC) staff. PD COMSEC supports the encryption of data on the Army's tactical network, ensuring that it is protected with cryptographic solutions and key management capabilities supporting daily garrison network operations, global contingency operations, and humanitarian efforts. (Photo by Travis McNiel)

NETWORK SECURITY, SMARTER and FASTER

PD COMSEC identifies better ways to field improved capability to Soldiers

by Chris P. Manning

As the U.S. Army's network capability continues to grow, so does the need to protect it—and, simultaneously, to find efficiencies in doing so.

Recognizing that the job of updating and procuring communications security equipment for the tactical network is gaining in importance, the Army chartered Project Director Communications Security (PD COMSEC) to the Program Executive Office Command, Control, and Communications – Tactical (PEO C3T) in September 2010. PD COMSEC has established itself as the central manager of Programs of Record for the cryptographic standardization, key management, and overall life-cycle management of Army communications security.

PD COMSEC resources safeguard and encrypt data on the Army's tactical network, ensuring that it is protected with cryptographic solutions and key management capabilities supporting daily garrison network operations, global contingency operations, and humanitarian efforts. PD COMSEC is the central hub for Army system integrators seeking COMSEC expertise as they assimilate and streamline network and software capabilities. We're in charge of the Army's cryptographic systems from cradle to grave, providing the Soldier with a single place to go with questions about the life-cycle management of their equipment.

Delivery of this mission is focused on three primary lines of effort: fielding improved capability to Soldiers, ensuring smart system integration of COMSEC solutions, and embracing efficiency.

With more than 380 cryptographic and ancillary models in the field, establishing a central point for addressing COMSEC upgrades, challenges, and acquisitions is crucial, particularly in light of budget constraints.

In the past two years, a streamlining of the COMSEC process has swiftly taken hold. Our organization is leading Army efforts to procure, field, and sustain COMSEC equipment more quickly and efficiently, with fewer burdens on the Soldier.

FIELDING IMPROVED CAPABILITY FASTER

As the Army's representative at the National Security Agency regarding development, procurement, deployment, and sustainment of COMSEC materiel, the organization has established a streamlined process to field equipment, fulfilling a mission requirement to accelerate fielding to the Soldier.

First, we looked at the Army depots to inventory what stock was available for reissue. Second, a pilot program was established in May 2012, which focused on replacing specific outdated

PD COMSEC WOULD LIKE TO BE INVOLVED AS EARLY AS POSSIBLE AS NEW SYSTEMS ARE BEING DEVELOPED. WE CAN HELP INFLUENCE AND GUIDE THE DEVELOPMENT OF NEW KEY MANAGEMENT PLANS AND CROSS-DOMAIN SOLUTIONS.

cryptographic individual devices with accelerated fielding-compliant equipment. Using this two-phased approach, PD COMSEC avoided $3.4 million in costs. This accelerated fielding is known as the Army-wide Cryptographic Network Standardization (ACNS) program.

Five pilot sites were selected as a starting point for the program—Fort Eustis, VA, Fort Gordon, GA, Fort Jackson, SC, Fort Knox, KY, and the Detroit Arsenal, MI. COMSEC teams now use the sites to perfect the process of replacing antiquated equipment before offering ACNS to more installations, which include 63 additional sites in CONUS as well as 14 sites abroad.

The process includes identifying the equipment to be replaced, filling the order, training and integration, and disposal of legacy equipment. The end result will be significant cost avoidance for the Army.

In July, PD COMSEC began an aggressive push for its cryptographic network planning solution, Automated Communications Engineering System (ACES), which enables the Soldier to perform cryptographic network planning, management, generation, and distribution of mission planning and keying material. Within a two-month period, PD COMSEC set out to refresh computers for every authorized Army, National Guard, and Reserve unit. The existing computers had passed the five-year refresh mark and were in need of upgrades. Units in Hawaii and Kuwait were the first to receive the refreshed equipment.

ACES, required as part of cryptographic network management and distribution, is also being leveraged as the Army's platform to consolidate radio and planning software. This Armywide strategy uses the ACES platform for all cryptonet and key management planning and distribution.

Starting in January 2013, PD COMSEC will field the Joint – Tactical Networking Environment NetOps Toolkit, which places three software solutions on one laptop.

These steps to consolidate software make it easier for the Soldier, who will not have to maintain or log in and out of three laptops. Consolidation is also more efficient for the Army, with a reduction in laptop purchases.

SMART INTEGRATION

Over the past 12 months, COMSEC's efforts reached 10 project managers (PMs) and four other Army organizations throughout the Assistant Secretary of the Army for Acquisition, Logistics, and Technology community, assisting them in making informed program decisions regarding COMSEC integration into their systems.

In cryptography, a "key" is a parameter that determines the functional output of a cryptographic algorithm or cipher. The algorithm would be useless without a key. In encryption, the key is the process of changing plaintext into ciphertext, or vice versa during decryption.

PD COMSEC recently provided PM Force XXI Battle Command Brigade and Below (FBCB2) encrypted key support for vehicle-based FBCB2 systems, successfully integrating cryptoperiod (effective and key expiration) data to key tagging information. This enables network planners to effectively manage FBCB2 cryptonets without error.

Working with PEO C3T, we also completed support for an Advanced Extremely High Frequency (AEHF) Secure Anti-Jam Reliable Tactical Terminal Upgrade. The process included modifying the existing software to allow COMSEC account managers (CAMs) to electronically and rapidly receive KGV-310B endorsement messages from the Central AEHF Key Management Station (CAKMS).

These endorsement messages eliminate the requirement for a CAM to initiate a follow-up email or phone call to the CAKMS for endorsement status. The process also reduced the uncertainty of an end crypto unit's status, which would require the CAM to ship a KGV-310B back to the depot unnecessarily for rekeying and initialization.

PD COMSEC also worked with PEO Intelligence, Electronic Warfare, and Sensors to provide platform crypto integration support for its Product M Radars. By effectively integrating the KG-175D TACLANE-Micro Encryptor devices on both the AN/TPQ-53 Counterfire Target Acquisition Radar and the Lightweight Counter Mortar Radar, we

enabled Out-of-Band-Transfer of COMSEC key between the Fire Direction Center and the radar sets, eliminating the need for a Soldier to travel across terrain to manually load the key into a COMSEC device.

PD COMSEC helps the platform PMs understand the complicated world of COMSEC. We have worked with the Chief Information Officer/G-6 to help streamline development of the Key Management Plan and Army Staff approval, providing the PMs with an identified customer advocate for help with this sometimes extremely difficult document.

To reach out to a broader community of interest, the PD continues to host semi-annual COMSEC Integrated Process Team (IPT) forums where system integrators and industry partners discuss COMSEC integration-related challenges, solutions, and lessons learned.

Forums stress cost-effective approaches to Army platform integrators and determine the most effective way to build COMSEC features into future capabilities. The IPT forums have proven more efficient than individual approaches to COMSEC solutions in reaching overall objectives.

PD COMSEC would like to be involved as early as possible as new systems are being developed. We can help influence and guide the development of new key management plans and cross-domain solutions. Embedding crypto as early as possible in the development cycle ensures compatibility with existing and emerging COMSEC capabilities.

The next COMSEC Integration IPT is scheduled for Oct. 23-24 at the Bob Jones Auditorium, Redstone Arsenal, Huntsville, AL.

EMBRACING EFFICIENCY

Efficiencies in the procurement and sustainment of reliable cryptographic and key management equipment involve promoting materiel solutions that are sustainable throughout the life cycle, resulting in the best value for the government while reducing the operational burden on the Soldier.

The Armywide initiative to streamline the procurement and distribution of cryptographic equipment has a projected cost avoidance of $47 million over the next six years.

The number of units procuring COMSEC equipment using their own operational funds during FY13-15 will be reduced by 132 as units take advantage of the free issue provided through ACNS. The COMSEC standardization of the Army is scheduled to be complete by the end of FY15, when legacy systems are no longer supportable.

PD COMSEC also took on examining the current concept of operations for equipment in the Army Key Management System and Cryptographic Systems program lines. We are supporting the successful fielding of Capability Set 13/14 by participating in the Network Integration Evaluations, using the Agile Process for acquisition, and using the existing Army equipment stock at Tobyhanna Army Depot. In the process, we identified 19 Value Engineering efforts. These efforts, to be completed within the next two years, could result in significant cost savings and/or avoidance for the Army.

Meanwhile, through a separate process, PD COMSEC identified another Value Engineering effort validating a cost savings and/or avoidance of $47 million, and a Better Buying Power submission identifying a cost avoidance of $3.4 million realized by accelerating fielding of COMSEC equipment to the force.

In addition, PD COMSEC has completed a Lean Six Sigma project achieving a cost avoidance of $42 million, which is incorporated into the ACNS project. Partnering with its sustainment team at Tobyhanna, we assisted in improving the depot's equipment receiving process by reducing the time needed to induct equipment from 57 days to 28. This project contributed to the larger efforts of the depot's COMSEC division, which earned them the prestigious Shingo Silver Medallion this year.

CONCLUSION

Since our inception two years ago, PD COMSEC has worked diligently to establish acquisition discipline through life-cycle management, standard logistics, strategic planning, type classification, and Standard Line Item Numbers. Our objective is to ensure that the Soldiers have the most modern, sustainable equipment possible for a technological advantage on the battlefield. We will continue fielding and integration efforts to ensure that Army COMSEC improves to meet increasing network defense needs.

For more information, visit ***http://peoc3t.army.mil/comsec/****.*

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BIRTH *of an* ENTERPRISE

Army Geospatial Enterprise delivers standardized and shareable geospatial solutions

by Daniel L. Visone and Jamal B. Beck

The U.S. Army uses geospatial information for various warfighting and peacetime operations. Geospatial information identifies the geographic location and characteristics of natural or constructed features and boundaries on the Earth, including statistical data and information derived from multiple sources, among them remote sensing, mapping, and surveying technologies as well as charting, geodetic data, and related products.

Soldiers use this information to support logistics, training ranges, installation management, modeling and simulation, civil works, remediation, and environmental activities. In fact, high-resolution, feature-rich geospatial information is so prevalent in planning, executing, and evaluating missions conducted by ground warfighters across all the services that it has become a Mission Command Essential Capability.

However, the intricacies inherent in the numerous, complex data formats and standards used to collect, process, and disseminate geospatial information have rendered the Army's management of its geospatial operations environment a formidable task. Many activities only partially reflected geospatial policies, procedures, requirements, and standards. In effect, there was no real enterprise from which to coordinate and synchronize Army Geospatial Information and Services activities.

The absence of an enterprise has resulted in barriers to rapid data transfer and sharing, disconnected unit transfers, and a lack of unified ground force synchronization. Unfortunately, these mismatches in turn can translate into operational disarray, lost agility for information operations, and slowed threat responses, all of which detract from mission success.

ARMY GEOSPATIAL ENTERPRISE

The Army Geospatial Enterprise (AGE) is an integrated system of technologies, standards, data, and processes that delivers a standard and shareable geospatial foundation (SSGF), which facilitates a common operating picture for the ground warfighter

EYE IN THE SKY

This high-resolution BuckEye Unmanned Aerial System imagery shows a town in Nagal, Afghanistan. BuckEye's imagery and LiDAR (Light Detection and Ranging) elevation data, used to conduct intelligence, surveillance, and reconnaissance missions in operational environments, exemplify the quality of data necessary to populate the Army Geospatial Enterprise (AGE). (Image courtesy of U.S. Army Geospatial Center (AGC) BuckEye Team)

at all echelons. (See Figure 1.) The SSGF is a Mission Command Essential Capability that:

- Provides for a consistent, coordinated, and synchronized common operating picture.
- Enables all elements of the force to operate on the same map.
- Provides sharable warfighting functional layers and supports real-time coordination and collaboration.
- Leverages national, commercial, and Joint, interagency, intergovernmental, and Multinational (JIIM) geospatial data sources.
- Creates an updatable, common map foundation and provides an accurate display for maneuver, situational awareness, and precision joint targeting.
- Enables accurate, updatable geospatial data stores with geospatial shareable layers.
- Provides a geo-referenced display to support critical information, intelligence, and warfighting functions data tailored to a unit's mission, task, and purpose.
- Enables visualization and dissemination of tactical plans via mission orders and synchronization of graphic overlays.
- Enhances Soldier situational awareness and leads to information superiority.

The AGE is not a new program or system; it's a set of Army policies, directions, standards, and specifications that apply to all producers and consumers of geospatially referenced information, with an emphasis on current and future mission command systems.

The AGE aligns with G-3/5/7 LandWarNet and U.S. Army Chief Information Officer (CIO)/G-6 Army data strategies as well as the Assistant Secretary of the Army for Acquisition, Logistics, and Technology (ASA(ALT)) Common Operating Environment (COE) Implementation Plan, while providing a key Mission Command Essential Capability.

Successful implementation of the SSGF/AGE improves mission planning, rehearsal, execution, modeling, simulation, and training. Additionally, the AGE's interoperability with the JIIM community enables full-spectrum dominance as envisioned in the Army's Functional Concept for Mission Command.

GOVERNANCE PROCESS

The Army established a three-star-level Geospatial-Enterprise Governance Board (GGB) to administer and facilitate development of the AGE.

The GGB ensures that the AGE is implemented across the Army and synchronized within the National System for Geospatial Intelligence guidance and architecture. The GGB is co-chaired by the Chief of the U.S. Army Corps of Engineers (USACE) and the U.S. Army Deputy Chief of Staff (DCS), G-2. Other principal members are the CIO/G-6, the DCS G-3/5/7, DCS G-8, Principal Military Deputy to the ASA(ALT), and the Director of the U.S. Army Training and Doctrine Command's Army Capabilities Integration Center.

As chartered, the GGB is a decision-making body that addresses AGE issues impacting the current and future force.

Mapping the Operational Environment

Figure 1

The AGE is an integrated system of technologies, standards, data, people, and processes that delivers a shareable geospatial foundation, facilitating a Common Operating Picture for the ground warfighter at all echelons. (SOURCE: AGC)

"WITH AN ENTERPRISE SOLUTION DEPLOYED ACROSS THE FORCE, WE CAN HELP ELIMINATE THESE INTEROPERABILITY DEFICIENCIES, WHICH WILL ULTIMATELY REDUCE REDUNDANCY, IMPROVE THE PROBABILITY OF MISSION SUCCESS, AND SAVE LIVES."

To manage the operational, administrative, and daily responsibilities of the AGE, the GGB chartered a Senior Executive Service civilian to serve as the Army Geospatial Information Officer (GIO).

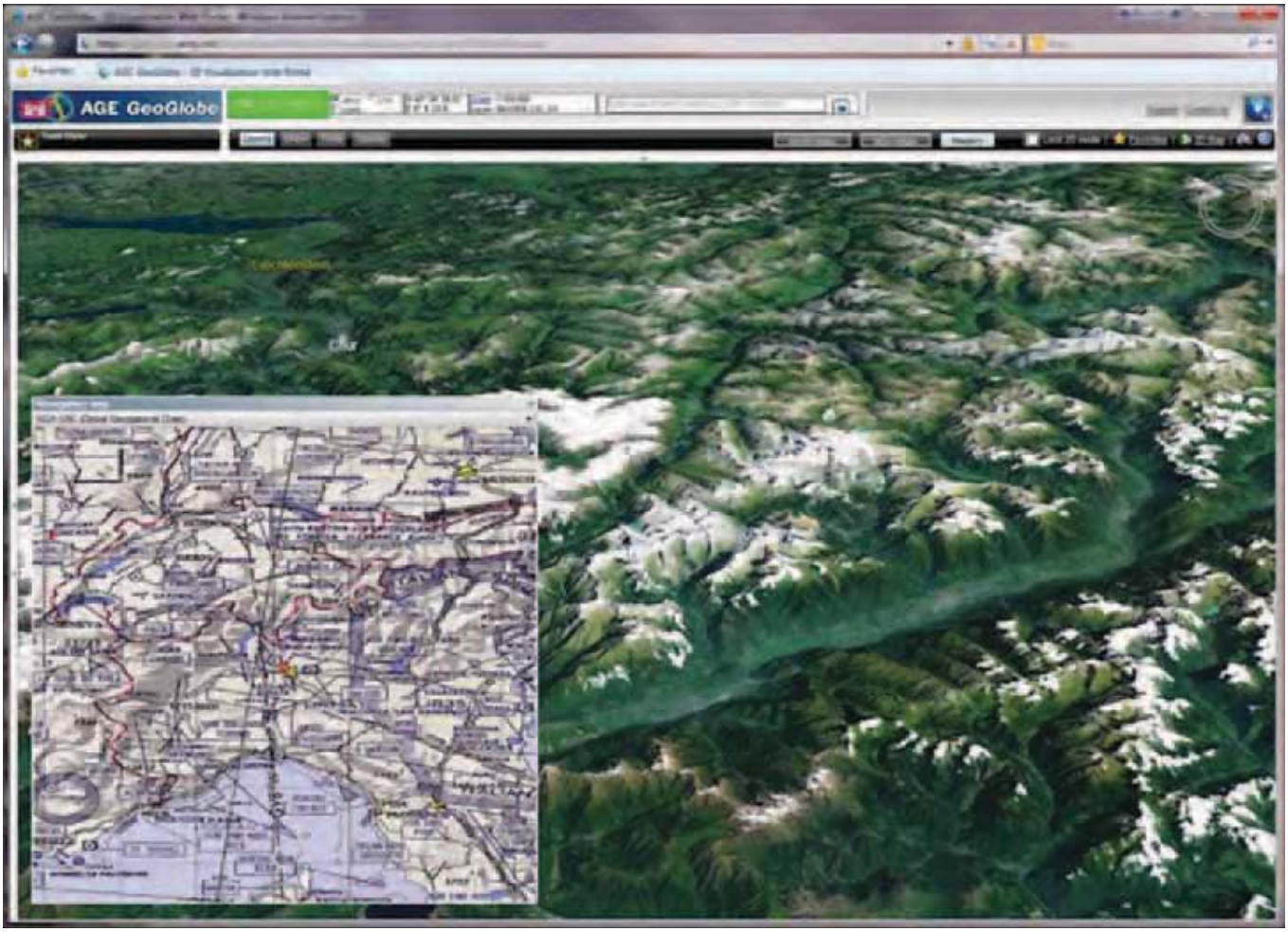
The Army GIO serves as the DA's central manager for Geospatial Information and Services and is responsible for coordinating, assessing, and synchronizing all Army policies and requirements for the AGE.

The GIO accomplishes GIO/GGB objectives through the Geospatial Enterprise Office, which comprises core representatives from the GGB's member organizations.

Additionally, the GIO, in cooperation with the ASA(ALT), established the Geospatial Acquisition Support Directorate (GASD) within the Army Geospatial Center (AGC) to work directly with program managers to address geospatial standards and help implement an AGE within the Army Acquisition community.

IMPLEMENTING THE ENTERPRISE

The AGC, a major subordinate command of the USACE, provides timely, accurate, and relevant geospatial information, capabilities, and domain expertise to implement the AGE in support of unified land operations. The enterprise provides the framework required to integrate the Army's systems and data seamlessly with those of the National



PIECES OF THE PUZZLE
This screen capture shows the AGE GeoGlobe, a 3-D terrain visualization and analysis tool that operates online using federated enterprise servers, as well as offline in a disconnected configuration. (Image courtesy of AGC Terrain Analysis Branch)

System for Geospatial Intelligence and its coalition partners.

The ultimate goal of a network-enabled AGE is to provide information that may be posted, processed, and used as required vertically and horizontally, from peer to peer, and bidirectionally from the international and national levels to the Soldier/user level. Managing all of these data and converting them to useful information are increasingly challenging as ground warfighters collect, exploit, and share greater volumes of high-fidelity geospatial data.

"We will concentrate on eliminating our Soldiers' frustration from the lack of interoperability between mission command systems," said Dr. Joseph Fontanella, Army GIO and Director of the AGC. "This is due, in part, to stovepiped databases forcing Soldiers working in tactical operations centers to perform many work-arounds or data translations to present the best common operating picture to the commander. With an enterprise solution deployed across the force, we can help eliminate these interoperability deficiencies, which will ultimately reduce redundancy, improve the probability of mission success, and save lives."

The AGC's programs and expertise are helping to build the SSGF required to generate the common operating picture that Soldiers need to plan contingency, crisis response, and humanitarian missions in CONUS and abroad. The development

THE ABSENCE OF AN ENTERPRISE HAS RESULTED IN BARRIERS TO RAPID DATA TRANSFER AND SHARING, DISCONNECTED UNIT TRANSFERS, AND A LACK OF UNIFIED GROUND FORCE SYNCHRONIZATION.

of interoperable data and systems requires a concerted, cooperative effort by strategic partners, Soldiers, and industry—a formidable challenge, given the plethora of programs, platforms, and other geospatial technology available to DOD today.

These operations must also be orchestrated within the development of capability sets to allow the Army to incrementally field fully integrated tools that support mission command while maintaining backward and forward compatibility with network operations and other warfighting functions.

For example, a key element of Army mission command is the creation of a shared understanding and purpose through collaboration with all elements of the friendly force, allowing Army leaders to integrate their actions and synchronize their operations. These operations may include intelligence, mission rehearsal, and training capabilities, each of which depends on an SSGF. This foundation, achieved through the AGE, is critical to the LandWarNet capability sets that support the fielding of geospatially interoperable Army Programs of Record (PORs) and non-PORs.

The AGC GASD is also contributing to the development of the AGE by building the Ground-Warfighter Geospatial Data Model (GGDM). The Army is moving toward a JIIM environment; the use of Coalition Forces emphasizes and elevates the need for enterprise operations that can collect and share information consistently across all echelons. GGDM version 2.1 contains the common geospatial concepts required to share data and support common geospatial applications and services across the AGE.

GASD serves as the geospatial domain experts for the Office of Chief Systems Engineer, ASA(ALT) to implement the AGE as the geospatial component of the COE. The COE provides the codified requirement for all Army acquisition programs to implement common geospatial standards, data models, and services to realize the AGE across the force.

For example, the GASD supported requirement reviews, map engine evaluation, and user juries, and provided geospatial support to the handheld platform demonstration for Joint Battle Command – Platform. The directorate also provides experimentation support for potential AGE solutions.

In November 2010, the GASD organized a Geospatial Summit, co-sponsored by the Army GIO and the ASA(ALT) System-of-Systems Engineer, to bring together the Army's geospatial leadership, Army materiel developers, and the GASD to develop a way ahead for implementing the AGE. In July, GASD held a geospatial synchronization meeting with all COE Computing Environment (CE) leads to identify each CE geospatial road map; the purpose was to ensure that AGE implementation was addressed holistically and facilitated geospatially as a cross-cutting capability.

The GASD works with industry partners and will be developing a catalog of existing geospatial capabilities to assist materiel developers. For instance, it supported the negotiation of an Enterprise License Agreement (ELA) with the Environmental Systems Research Institute Inc. that will save the Army more than $26 million in licensing fees over five years, and is looking at the possibility of other industry ELAs to support the AGE.

CONCLUSION

"It will take some time to standardize and synchronize the geospatial tools and data that commanders rely upon to accomplish their missions," Fontanella said.

"As we do, it will reduce cost and improve efficiency, giving our Soldiers, Marines, Sailors, Airmen, and special operators a terrific advantage over our adversaries. Solutions are here today, and it is possible to accelerate development, acquisition, and deployment."

For more information, go to ***http://www.agc.army.mil/***.

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DELIVERING TECHNOLOGY

Investment portfolios frame Army S&T priorities by aligning broad problems and challenges in operationally relevant areas

by Nancy Harned, Stephen Bury, and Kris Osborn

Imagine a next-generation, more-capable, and better-performing helicopter by the year 2030, lighter-weight armor composites protecting Soldiers and combat vehicles, protection against cyber threats on the battlefield, and smaller, more mobile, longer-lasting sources of electrical power for dismounted units on the move. Picture all that, and you've begun to envision a few of the many exciting technologies being pursued in the Army's science and technology (S&T) programs.

The Army has learned many things from a decade of warfare, including the need to focus on the Soldier and small units as the foundations for our fighting force. To meet the Army's challenges today and in the future, especially in new theaters suggested by DOD's strategic priorities for the 21st century, every future Soldier operating as part of a small unit must be equipped physically, cognitively, socially, and with the appropriate materiel to conduct full-spectrum operations.

The Army's S&T investment strategy has been developed to respond to these high-priority needs. It aligns areas of scientific exploration, investment, and research focus with a "top-down" approach according to specific groups, or "portfolios." Our investment portfolios address broad S&T problems and challenges that are prioritized by Army leaders and designed to focus research programs on operationally relevant objectives. The S&T portfolios are organized into areas including Soldier; Ground; Air; Command, Control, Communications, and Intelligence (C3I); and Basic Research.

SOLDIER S&T PORTFOLIO

Vision: Execute innovative science and technology programs that increase the effectiveness, health, and reliability of the human component of the total Army, allowing for rapid dominance in increasingly complex environments across a diverse range of operations.

SOLDIER SUB-PORTFOLIOS

Human Dimension	Human System Integration	Survivability	Individual/Small Unit Equipment	Combat Casualty Care

The Army S&T investment portfolios support Army modernization goals to develop and field affordable equipment in a rapidly changing technological environment by fostering invention, innovation, maturation, and the demonstration of technologies for the current and future fight.

By synchronizing our research and investment approach according to specific areas of capability, we are able to best position ourselves to develop new material solutions, discover "leap-ahead" technologies, and solve particular challenges confronting our force. Our priorities include networking our force; deterring and defeating hybrid threats; and empowering, protecting, and unburdening the Soldier.

The portfolio approach requires strategic planning, cooperation, and teaming across the Army's S&T community, which spans 16 laboratories, institutes, and research, development, and engineering centers with more than 12,000 scientists and engineers, plus significant partnerships with academia and industry.

This Army/industry/academic teaming is critical to generating innovative solutions that will enable the Army's next-generation capabilities.

For instance, our Technology Enabled Capability Demonstrations (TECDs) consist of these kinds of teams, dedicated to developing new capabilities to address near-term S&T challenge areas. The nine TECDs already under development include:

- Force Protection—Basing.
- Force Protection—Soldier and Small Unit.
- Occupant Centric Platform.
- Overburdened—Physical Burden.
- Surprise/Tactical Intelligence—Mission Command.
- Surprise/Tactical Intelligence—Actionable Intelligence.
- Sustainability/Logistics—Basing.
- Human—Individual Training and Tactical Tasks.
- Human—Medical Assessment and Treatment.

These TECDs are, quite deliberately, a byproduct of our portfolio approach.

TECDs are an example of programs that provide "bridging," or spiraling new technologies into existing systems as they emerge, when proven technically feasible. Other high-risk/high-payoff research, typically focused on the longer term, aims at finding new, paradigm-changing, leap-ahead capabilities. Maintaining this broad spectrum of S&T investment is important to meet today's recognized warfighting needs and shortfalls, and to provide innovative, game-changing technologies for the future.

PORTFOLIO DETAILS

Our **Soldier Portfolio** includes near-, mid-, and long-term projects designed to improve capability in a variety of ways. Cross-organizational S&T teams are immersed in efforts to increase Soldier protection and lighten the load they carry into battle, by developing lighter-weight uniform and body armor materials and generating smaller, more mobile sources of power.

For example, one key technological emphasis is researching, developing, and experimenting with battery chemistry to develop higher power-density solutions for dismounted individual Soldiers and small, tactical units on-the-move. One of the many S&T ideas here is to develop lighter-weight, smaller, more portable, longer-lasting battery technologies, such as lithium air batteries, that can deliver sustained amounts of power more efficiently and with less operational burden. (See related article, Page 58.)

The Soldier Portfolio also includes medical research, in which infectious disease is one

GROUND S&T PORTFOLIO

Vision: U.S. overmatch of offensive and defensive capabilities in weapons and military vehicles. The strategy is to invest in technologies that increase performance and affordability of Army Ground Systems.

GROUND SUB-PORTFOLIOS

Survivability	Weapons	Ground Platforms	Mobility / Countermobility

focus area. Infectious diseases historically cause more casualties than enemy fire in tropical regions.

The Military Infectious Diseases Research Program (MIDRP) manages research for DOD on naturally occurring infectious diseases, with an emphasis on protecting the warfighter through development of vaccines, drugs, diagnostics, and vector control. The U.S. military has had notable successes in this undertaking; since World War I, deaths from naturally occurring infections have not exceeded deaths from combat injury in wartime. MIDRP's role is of continuing importance because diseases such as malaria, dengue, diarrhea, and leishmaniasis continue to have an adverse impact on military operations and the health of service members.

MIDRP has supported human immunodeficiency virus (HIV) vaccine research and development (R&D) since 1985, as HIV remains a significant threat to service members deployed overseas and is a major source of regional instability in areas of U.S. force protection.

The MIDRP also develops preventive medicine products to reduce insect- and vector-borne disease transmission, such as improved repellents suitable for the military operational environment, bed nets. and other products for preventive medicine officers that enhance their ability to assess disease threats in the field. An example of such a success is the repellent DEET, developed in collaboration with the U.S. Department of Agriculture and introduced to the public in the 1950s. DEET has become by far the most common repellent used throughout the world.

Our **Ground Portfolio** spans a wide range of capability, including development of advanced composite materials for next-generation, lighter-weight armor protection for vehicles and dismounted individual Soldiers; exploring blast-deflecting vehicle configurations that can better protect Soldiers in transit; and initiatives to counter improvised explosive devices (IEDs), such as the deployment of ground-penetrating radar.

The S&T community helped develop the now-deployed Husky Mounted Detection System (HMDS), an advanced, high-performance, ground-penetrating radar that can detect nonmetallic and metal-cased buried threats.

The vehicle-mounted HMDS can detect buried IEDs consisting of bulk explosives and low-metal pressure plates. Begun in response to a Joint Urgent Operational Needs Statement from Afghanistan, the HMDS program has transitioned into a

THE ARMY HAS LEARNED MANY THINGS FROM A DECADE OF WARFARE, INCLUDING THE NEED TO FOCUS ON THE SOLDIER AND SMALL UNITS AS THE FOUNDATIONS FOR OUR FIGHTING FORCE.

AIR S&T PORTFOLIO

Vision: Be the global leader in providing game-changing range, payloads, speed, survivability, and lethality to maintain U.S. technical superiority and combat overmatch for vertical lift aviation systems.

AIR SUB-PORTFOLIOS

Platform Design & Structures	Engines & Drivetrains	Aircraft & Occupant Survivability	Maintain & Sustainability	Rotors & Vehicle Management	Aircraft Weapons & Sensors	Unmanned & Optionally Manned Systems

formal Program of Record (POR) with the Product Manager Countermine and Explosive Ordnance Disposal under Program Executive Office (PEO) Ammunition's Project Manager Close Combat Systems.

The Ground Portfolio also includes U.S. Army Research Laboratory efforts to identify composite materials or combinations of substances that increase ballistic protection at lighter weight, compared with current vehicle armor and Soldier body armor configurations. Some of the materials under consideration are Tensylon, a tapelike material that provides elasticity; ultra-high-molecular-weight polyethylene, a plastic with a dense, hard structure; carbon glass, a fiber and fabric composite; titanium; fiberglass; Kevlar; aramid fibers; and fiber-reinforced epoxies.

Our Ground Portfolio also includes the development of laser technologies, alternative fuel applications, and direct and indirect fire capabilities.

Our **Air Portfolio** comprises a number of ongoing efforts, including Future Vertical Lift (FVL), an S&T program designed to engineer, build, and deliver a next-generation helicopter with vastly improved avionics, electronics, range, speed, propulsion, survivability, operating density altitudes, and payload capacity. (See related article, Page 70.)

Partnering with industry and academia, Army S&T is working to engineer a new Air Vehicle able to sustain speeds in excess of 170 knots, achieve an overall combat range greater than 800 kilometers (with a combat radius of 424 kilometers), and hover with a full combat load at an altitude of 6,000 feet and temperature of 95 degrees Fahrenheit.

Plans for the next-generation aircraft also include a degree of autonomous flight capability or being "optionally manned"; successful weapons integration and compatibility; a core common architecture in terms of next-generation electronics, sensors and onboard avionics; manned-unmanned teaming ability; and shipboard compatibility.

The FVL program seeks to begin designing several "demonstrator" aircraft by 2013; the plan is to conduct a first flight in 2017, with an overall goal of developing a next-generation fleet of helicopters by 2030.

Air portfolio efforts are also exploring next-generation, more fuel-efficient engines for aircraft, and advanced composites for airframe materials to achieve greater protection for aircrew members at a much lighter weight, thus increasing lift and payload capability. Other initiatives are aimed at identifying and engineering advanced weapons, onboard sensors and electronics, and new mission equipment solutions.

Like all the S&T portfolios, the Air portfolio is aligned closely with the acquisition and requirements communities to lay the technical foundations for future systems. Success has been achieved recently in engine technology; the PEO Aviation Improved Turbine Engine Program is aimed at developing a next-generation, more fuel-efficient engine for the Apache and Black Hawk helicopters. (See related article, Page 64.)

This effort leverages the Advanced Affordable Turbine Engine S&T program, which demonstrated two new helicopter turbine engines with significant improvements in engine power and operating efficiency compared with the current T-700 turbine engine.

COMMAND, CONTROL, COMMUNICATIONS, AND INTELLIGENCE (C3I) S&T PORTFOLIO

Vision: Soldiers at the tactical edge have trusted and responsive sensors, communications, and information adaptable in dynamic, austere environments to support battlefield operations and non-kinetic warfare. Our strategy is to invest in technologies that increase capability, performance, and affordability of Army C3I Systems.

C3I SUB-PORTFOLIOS

Communications	Mission Command	Sensors	Intelligence / Electronic Warfare

The **C3I Portfolio** is focused on harnessing next-generation computing, sensing, electronics, and communications technology as a way to empower and unburden Soldiers by improving their situational awareness (SA) on the battlefield.

While also focused on mid- and long-term developments, the C3I Portfolio is heavily immersed in tracking and harnessing the latest commercial, government, industry, academic, and laboratory progress to accommodate the fast pace of technological change.

For example, our Nett Warrior program succeeded in harvesting the latest in technological innovation with respect to handheld, smartphone-like mobile technology. Nett Warrior is a Soldier-worn dismounted mission command system that provides unprecedented command and control and SA capability to support the mission of the dismounted combat leader.

Nett Warrior includes a smartphone-like electronic display device that graphically shows Soldiers' locations on a digital map that can be shared on the Army network. Nett Warrior also uses software-programmable radio capability in the form of a Joint Tactical Radio System handheld, single-channel Rifleman Radio.

Software-programmable radio can transmit larger Internet Protocol packets of voice, data, images, and video across the force in real time, in some cases using high-bandwidth waveforms.

Also, the S&T community successfully developed an improved, man-portable target acquisition and laser designation system called the Target Location Designation System. More powerful and lighter-weight than similar previous or existing technologies, the system transitioned to PORs in 2011 with PEO Soldier.

The new programs are called the Lightweight Laser Designator Rangefinder Block II and the Joint Effects Targeting System.

The C3I Portfolio staff is also working diligently on a number of key areas, such as tactical multifunction electronic warfare planning, jamming techniques for counter-IED missions, and electro-optic/infrared/radio frequency countermeasures for helicopter survivability.

Basic Research is a key portfolio wherein we look to identify or discover paradigm-changing, next-generation fundamental science and foundational technology that has the potential to provide the future Army with quantum leaps forward in capability.

We are now conducting Basic Research with a mind to what new capabilities might emerge in the 2030 to 2050 timeframe.

What is interesting about Basic Research is that it often uncovers substantial innovations that are not fully recognized at the time of discovery.

What we now know and value as lightweight laser designation has such a research history. While some of the laser-related research history reaches to the 1950s, in 1962 Robert Hall developed the semiconductor laser. Yet laser technology was not widely used in the U.S. military until the mid-1980s.

As a result, today we strive to inspire and empower our laboratories, academic partners, and industry colleagues to

BASIC RESEARCH PORTFOLIO

Vision: Advance the frontiers of fundamental science and technology and drive long-term, game-changing capabilities for the Army through a multidisciplinary portfolio that teams our technically skilled and agile in-house researchers with the global academic community.

BASIC RESEARCH SUB-PORTFOLIOS

Human Centric	Information Centric	Material Centric	Platform Centric	Enrichment Initiatives

explore next-generation research with a mind to changing the paradigm for the future.

OTHER S&T INVESTMENTS

S&T invests in additional areas that include technology development associated with environmental quality and installations. These investments focus on areas including sustainable ranges and lands, pollution prevention, military materials in the environment, and adaptive and resilient installations.

Additionally, the Army manages the DOD High Performance Computing Modernization Program (HPCMP), which supports R&D for the Army, Navy, Air Force, and DOD Agencies by making it possible for advanced computational capabilities to explore and evaluate new theories.

The HPCMP provides the hardware, software, and expertise to solve the complex problems faced by the research, development, test, and evaluation community. It also reduces the time and cost of acquiring weapon systems and platforms through advanced computing, simulations, and calculations in support of military operations.

CONCLUSION

While we champion our portfolio approach to exploring groups of potential emerging or next-generation technologies and capabilities, many of these groups overlap or inform one another. For this reason, we seek to integrate our thinking and various paths of discovery along a common conceptual thread, realizing that new solutions or capabilities are often more important than a particular material solution or technological application. We seek to harness emerging capabilities that address current challenges, while also seeking truly "paradigm-changing" solutions.

The value of Army S&T can be measured in terms of the technical capabilities we provide to warfighters, the data and information we provide to decision makers, and the quality of the research, development, and engineering conducted in our laboratories and centers.

Our S&T research helps ensure that the U.S. Army of the future will prevent, shape, and win future conflicts, and maintain its standing as the most dominant land force on the planet.

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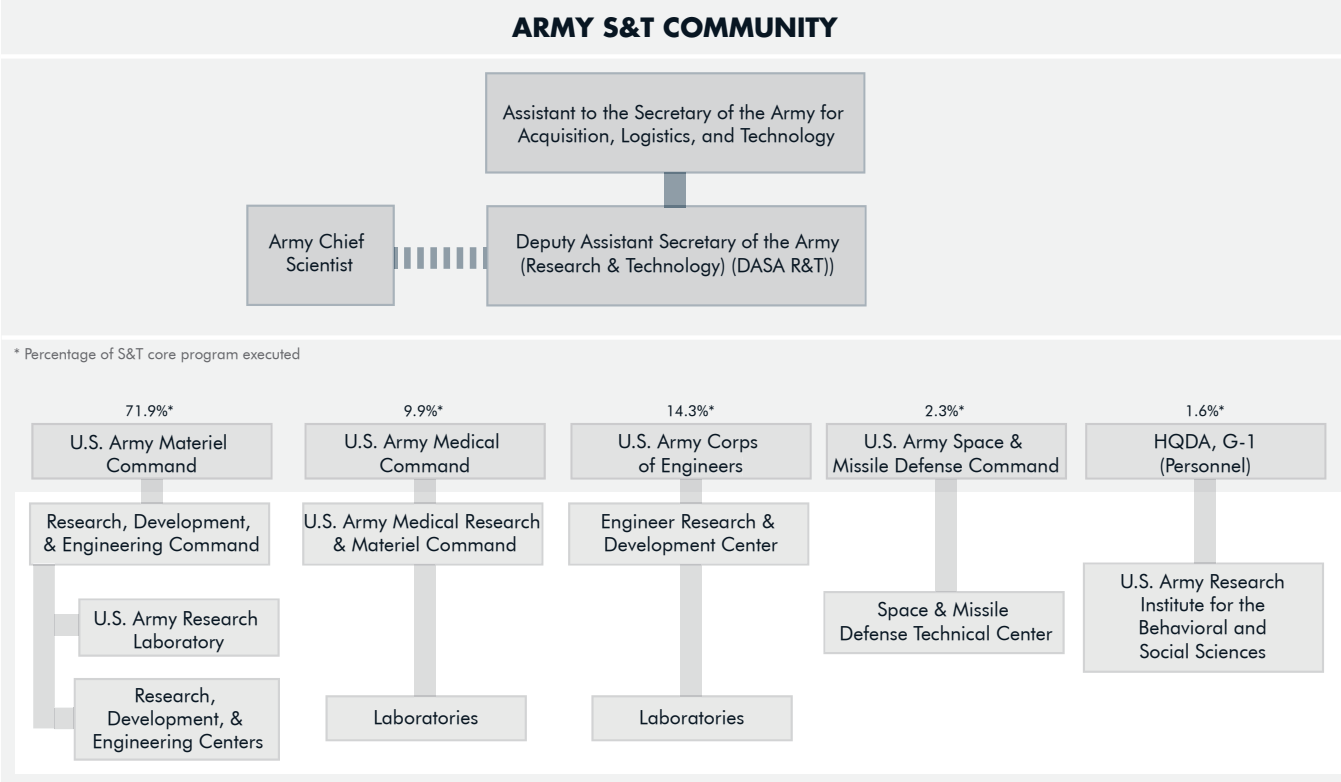
The Army S&T Enterprise

The Deputy Assistant Secretary of the Army for Research and Technology (DASA(R&T)) is charged with the responsibility for policy and oversight of the Army's research and technology program, spanning 16 laboratories, institutes, and research, development. and engineering centers with more than 12,000 scientists and engineers. The office oversees a yearly budget of just over $2 billion.

DASA(R&T) is responsible for developing an S&T strategy that is responsive to Army needs from the near term (five years) stretching out through the far term (more than 20 years).

The Armywide S&T programs are executed by the performing organizations within the S&T Enterprise: the Army's laboratories, research, engineering and development centers, academia, and industry partners.

— DASA(R&T) Staff



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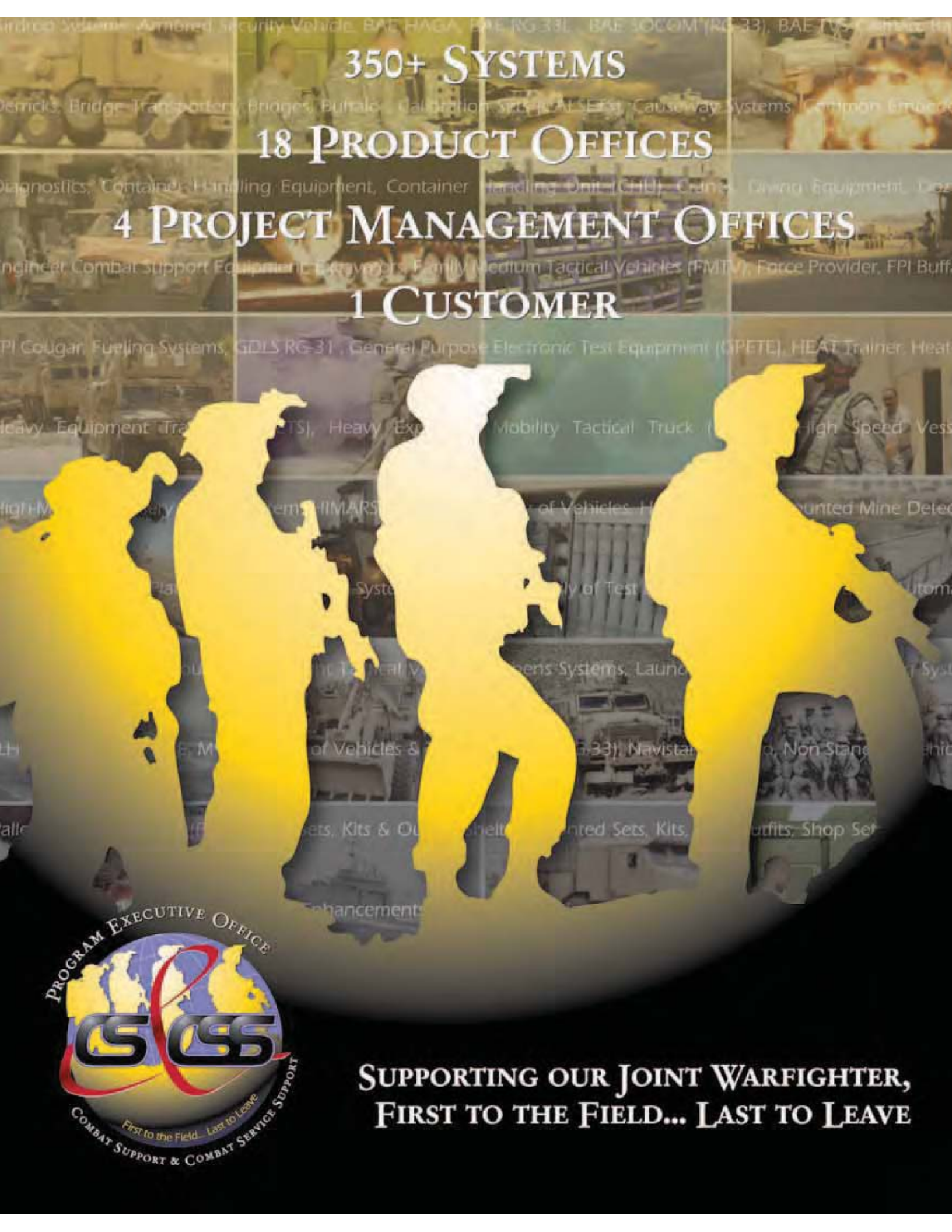
350+ Systems
18 Product Offices
4 Project Management Offices
1 Customer
Program Executive Office
Combat Support & Combat Service Support
First to the Field... Last to Leave
Supporting our Joint Warfighter,
First to the Field... Last to Leave

ROBOT RECONNAISSANCE

Technicians with the California National Guard's 217th Explosive Ordnance Disposal Company use the Talon Robot to do reconnaissance from a safe distance, July 10 during annual training at Camp Roberts, CA. "The robot is pretty much an extension of ourselves so we can manipulate the situation and stay safe," said SPC James Peabody, a Soldier attached to the unit. Currently, there are more than 3,500 small tactical robots in theater, and the Army is in the process of transitioning new technology by upgrading small, tactical cave- and building-clearing robots with new sensors and software packages to increase their autonomy. (Photo by PFC Brianne Roudebush, 69th Public Affairs Detachment)

From CONCEPT *to* CAPABILITY

How the Army S&T community transitions leading-edge technologies to improve Soldiers' advantage and protect them on the battlefield

by Kevin Flamm, Stephen Bury, and Kris Osborn

The Army's new Block III Apache attack helicopter is engineered with increased performance; small, tactical robots in Afghanistan are equipped with increasing levels of autonomy; and Mine Resistant Ambush Protected (MRAP) vehicles on patrol are now equipped with additional armor protections—all, in large measure, because of the Army Science and Technology (S&T) community's efforts to transition emerging technologies to warfighters.

These are merely a few of the numerous instances wherein new technology is developed, identified, deemed technically feasible, and transitioned through a number of avenues to the combat force in support of the Soldier. The S&T community transitions capability by working with the acquisition process, in some cases transitioning emerging technology directly into a formal Program of Record. It also conducts developmental efforts, called Technology Enabled Capability Demonstrations and Joint Capability Technology Demonstrations, responds to Joint Urgent Operational Needs Statements, and works with the Rapid Equipping Force.

Our primary mission is to develop technology that provides capability to better empower, protect, and unburden our Soldiers. Transitioning technology into workable capability for our Soldiers is a large part of this equation.

Other notable examples of successful technology transfers include the development of GPS-guided artillery, mortars, and rockets; indirect fire protection; ongoing plans to develop a stronger, more fuel-efficient helicopter engine through the Improved Turbine Engine Program; and the maturation of Deployable Force Protection, consisting of modular structures such as overhead protection engineered with additional ballistic protections.

TRANSITION METHODS VARY

Just as there are many ways to describe technology transition depending on where you are in the acquisition process, there are different ways to transition science and technology. Some are obvious, but many are not. To shed light on this subject, we are looking at a broad concept that characterizes, organizes, and articulates the development and transition of new capabilities. We refer to this concept as "Transition Characterization." (See Figure 1, Page 55.)

Technology can be complete systems, hardware items or components, or software components including waveforms and algorithms, things we can generally see. Transitions can take place through various rapid fielding initiatives designed to retrofit a system or fix a particular

LIFESAVING PROTECTION
Using a Mine Resistant Ambush Protected (MRAP) vehicle as cover, a paratrooper with the 1st Brigade Combat Team, 82nd Airborne Division (1/82) fires his M4 carbine at insurgents during a firefight on June 30 in Ghazni province, Afghanistan. The MRAP Expedient Armor Program, providing Soldiers with protection from lethal threats, exemplifies how the Army harnesses scientific innovation and transitions it rapidly to Soldiers in combat. (U.S. Army photo by SGT Michael J. MacLeod, Task Force 1/82 Public Affairs)

problem in theater, and move capabilities directly to a program executive office that manages acquisition programs.

Knowledge products are also an important part of technology transitions, and they are largely unseen or characterized. In some cases, "knowledge products" can inform requirements and ongoing assessments such as an Analysis of Alternatives. Knowledge products can also can take the form of Tactics, Techniques, and Procedures (TTPs) or provide support for follow-on development, demonstrations, experimentation, and various assessments.

Many times, technology transition is indirect, because the research and technology maturation funded by the Army and executed by industry or university partners often becomes technology engineered into solutions provided years later in response to competitive solicitations for systems.

As part of this characterization process, the S&T community works closely with our partners in the U.S. Army Training and Doctrine Command to help establish new requirements when a capability is shown to be technically feasible. Also, we help develop and refine the TTPs needed to accompany new technological solutions.

GETTING TECHNOLOGY TO SOLDIERS

The Apache Block III next-generation attack helicopter is engineered with some key performance-enhancing capabilities emerging from technologies developed for the improvement program. For instance, the Rotorcraft Drive System of the 21st Century Face Gear Transmission technology transferred from the S&T community to the Apache Block

Figure 1

TECHNOLOGY CHARACTERIZATION:

Depicts the nature of the S&T product that is provided to the recipient.

1: System. A complete, multicomponent system that will be used or produced by the recipient. [e.g., Extended Area Protection and Survivability (EAPS)].
2: Hardware End Item. A materiel product that will be used or produced by the recipient. [EAPS missile].
3: Component. A (sub-)component of a Hardware End Item. [e.g. EAPS missile warhead].
4: Software/Waveform/Algorithm.
5: Knowledge Product.
   a. Inform requirements (inform state of possible, technology trade-offs).
   b. Inform acquisition (proof of concept, Analysis of Alternatives, specification/basis for Request for Proposal, Technology Data Package, milestone decisions).
   c. Standards, certification, and accreditation (industry/military) (test methods, process methodology, etc.).
   d. Other data analysis, reports, documentation, publication (modeling and simulation/war-gaming, trade-off assessments, assessment reports, concept development/exploration).
   e. Science and Engineering support for follow-on development/demonstration/ experimentation/assessment (concepts, risk mitigation options, novel approaches, integration exploration).
   f. Training, Leadership and Education, Personnel, Facilities change requirements (Tactics, Techniques, and Procedures,, training, etc.).
6: People. Provide matrixed personnel/subject-matter experts to a non-S&T organization for technical expertise/knowledge.

III program in 2006. It improves efficiency by combining the output torque of two engines into a single power torque transmission. Having more torque pass through the transmission improves the lift and payload capabilities of the aircraft, allowing it to carry greater payloads than when it was first delivered.

Our U.S. Army Research Laboratory (ARL) has been working for years to develop algorithms that can increase autonomous navigation for robotic and unmanned vehicles. Now we are in the process of transitioning new technology by upgrading small, tactical cave- and building-clearing robots with new sensors and software packages designed to increase their levels of autonomy; the idea is for the robots to achieve a level of semiautonomy whereby they can perform certain functions without needing as much tele-operation or human intervention. The robots are able to enter hazardous areas and detect threats so that Soldiers do not have to. Currently, there are more than 3,500 small tactical robots in theater.

Working to harvest technological gains made by ARL and industry, the Robotic Systems Joint Program Office successfully delivered many of these software upgrades to small, tactical robots that are now helping the war effort in theater, enabling them to perform an increased range of missions with considerably reduced levels of tele-operation. This semiautonomous capability allows the robots to navigate certain terrain by themselves using infrared sensors to map an area. Having robots with greater autonomy frees Soldiers to focus on other mission-essential tasks while a tactical robot finds its own way from Point A to Point B, all the while minimizing risks to Soldiers by clearing hazardous areas and detecting potential threats.

The MRAP Expedient Armor Program (MEAP) is a prime example of how scientific innovation is harnessed and rapidly transitioned to Soldiers in combat. The MEAP effort developed an expedient armor solution that provides Soldiers with protection from extremely lethal in-theater threats. Before the requirement from theater was issued, MEAP had harnessed previous years' research on threat-focused armor materials and design, which was key to developing this particular needed ballistic capability. After the initial fielding, the S&T community continued technology

development to further decrease the armor weight, enabling the MRAP vehicles to perform better in executing the mission.

More than 500 MEAP armor kits were produced and deployed by Army depots and the U.S. Army Tank Automotive Research, Development, and Engineering Center, with thousands more produced and deployed by original equipment manufacturers (OEMs). The success of the MEAP effort for the warfighter is attributed to the readily available technology knowledge, the uniquely focused Army and Marine Corps team, and the rapid technology transition directly to the OEMs.

Deployable Force Protection (DFP) is another S&T program that transitions technology to warfighters. The community developed structures that incorporate advanced blast and ballistic protections to provide overhead cover for troops at forward operating bases (FOBs). The use of these DFP systems, which are being deployed this year with the 82nd Airborne Division, will help save time associated with establishing mortar pits and enhance force protection.

The S&T community is also in the process of transitioning a laser ignition system for 155mm artillery rounds, which provides a safer, cheaper, and more reliable means of firing projectiles. The diode pumped laser ignition, in development since the early 1990s, will replace the existing primer feed mechanism. The increased reliability of the laser ignition system creates a higher number of Mean Rounds Before Failure and Mean Rounds Between System Abort when firing the Army's M777 Howitzer artillery cannon.

TECHNOLOGY TEST FLIGHT

The AH-64D Block III Apache Longbow helicopter marked its first flight for the Army at the Boeing Co. facility in Mesa, AZ, July 9, 2008, piloted by then-Vice Chief of Staff of the Army GEN Richard A. Cody (front seat) and CW5 Rucie J. Moore of the U.S. Army Aviation Technical Test Center, both now retired. The Apache Block III next-generation attack helicopter is engineered with key performance-enhancing capabilities that emerged from the Army's science and technology program. (Boeing Co. photo)

IMPORTANCE OF KNOWLEDGE PRODUCTS

Knowledge products are also of great importance to our S&T efforts and go largely unseen or characterized. An example is our recent scientific research on noncognitive measures, which are now used in selection decisions for enlisted personnel and ROTC scholarships. This type of assessment measures an individual's temperament in areas such as cooperation, achievement, motivation, optimism, and sociability. The U.S. Army Research Institute developed this nonmateriel knowledge solution in the area of personnel selection.

These assessments add a new dimension to personnel decisions that have been based on traditional cognitive measures, such as the Armed Services Vocational Aptitude Battery, and medical screening. With these assessments, the Army is now able to better predict subsequent performance of incoming Army personnel, thereby reducing training and other associated costs. With an early estimated savings of approximately $211 million, this transitioned knowledge has changed how the Army determines who is likely to not complete training. Given the $50,000-to-$80,000 cost to train a recruit in the first year, the knowledge gained from these assessments has a significant impact on saving resources.

IN THE WORKS

The S&T community has made significant progress with an effort to develop a next-generation indirect fire protection capability through the Extended Area Protection and Survivability (EAPS) program. This

OUR PRIMARY MISSION IS TO DEVELOP TECHNOLOGY THAT PROVIDES CAPABILITY TO BETTER EMPOWER, PROTECT, AND UNBURDEN OUR SOLDIERS. TRANSITIONING TECHNOLOGY INTO WORKABLE CAPABILITY FOR OUR SOLDIERS IS A LARGE PART OF THIS EQUATION.

program gives forward-deployed forces more effective, mobile defenses against enemy rocket, artillery, and mortar fire. EAPS develops precise protection capability with a wider engagement envelope, compared with the already fielded Counter Rocket Artillery and Mortar system protecting Soldiers and FOBs in theater today.

The EAPS program is exploring three potential high-tech solutions engineered to intercept incoming fire. The missile solution options are command-guided and "hit-to-kill" interceptors. The "automatic cannon" command-guided option is designed to fire guided 50mm rounds. These options will provide the simultaneous capability to engage and destroy multiple incoming rockets, artillery rounds, and mortars, providing 360-degree coverage.

CONCLUSION

To maintain a leading edge in technology, the Army S&T community must continue broad investments in many technical fields to avoid tactical, operational, and strategic surprises. As the Army continues to diligently identify and harvest technologies suitable for transition to our force, we aim to protect Soldiers from potential and emerging threats.

We will continue to look for opportunities to sharpen the focus on those core capabilities needed to sustain the future force, and to identify promising disruptive technologies.

The real value of the S&T community to the Army lies in the contributions from its members, which extend far beyond the "widgets" or individual devices, components, systems, and subsystems and the knowledge products developed through our S&T programs.

Ultimately, our focus remains upon the Soldiers of today and tomorrow; we consistently seek new avenues through which to increase their capability, transition the best technology to them as fast as we can, and ensure their technological superiority—today, tomorrow, and decades from now.

For more information, contact Steve Bury at ***stephen.j.bury.ctr@mail.mil.***

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BATTERY POWER

U.S. Army Research Laboratory scientists bring new energy to critical area of study

by Dr. Cynthia Lundgren

Scientists studying new ways to squeeze more energy from batteries are making great strides in developing new methods and materials to potentially increase the energy density of batteries by 30 percent.

The electrochemistry group within the U.S. Army Research Laboratory (ARL) typically works on cutting-edge energy and power solutions for the Soldier, including batteries, fuel cells, fuel reformation, and capacitors. The battery group recently developed new materials that could change how much batteries weigh, how long they last, and how much power they provide.

We've done this through fundamental research. Army scientists have studied how batteries work for years, looking at how each component interacts with the others. As a result, we have designed materials that allow for stable operation at high voltages and increased energy density, a measure of the amount of energy per unit of weight or volume that can be stored in a battery.

We looked at how to control the interface between the electrode and the electrolyte. That's what determines how fast electrons can move back and forth; it dictates how fast a battery can charge and discharge, as well as how much power it can have.

At high voltages, batteries are extremely energetic, instable systems. At very high voltages, the electrode eats up the electrolyte. As a result, there has never been a single-cell battery that operated at 5 volts or higher.

Yet higher voltages can be a good thing. The higher the voltage, the more energy and power. Voltage is like water pressure in a pipe: The higher the pressure, the more powerful the stream.

A MUCH-NEEDED BREAKTHROUGH

The basics of battery technology haven't changed much over the centuries. Although we don't know exactly what early civilizations did with batteries, archeologists have discovered battery remnants in the ancient world. In 1800, scientists harnessed the power of the chemical battery.

Since the introduction of lithium-ion batteries in the 1970s, progress has been slow.

The three components in the electrochemical reactions of any battery are the anode, cathode, and electrolyte. An anode is an electrode through which electric current flows into a polarized electrical device, and a cathode is an

OBJECTIVE: HIGHER VOLTAGES
Materials Scientist Dr. Arthur Cresce works with Emily Wikner, an intern from Wake Forest University, in the Electrochemistry Branch of the U.S. Army Research Laboratory (ARL). Cresce is the co-inventor of an electrolyte additive that could increase lithium battery energy density by almost one-third. (Photo by Conrad Johnson)

electrode through which electric current flows out. An electrolyte is any substance containing free ions that makes the substance electrically conductive.

This is where our research team made a breakthrough: Our scientists designed an electrolyte additive that we half-jokingly call "magic pixie dust." When we add it to the electrolyte, it becomes a sort of sacrificial agent, preferentially reacting with the electrode and forming a stable interface that allows the battery to operate at 5 volts.

Army researchers Dr. Kang Xu and Dr. Arthur Cresce designed the substance two years ago, and ARL has filed patent applications for their work. "We started synthesizing the basic building blocks of the suspect interface components," Xu explained. "One by one, we pieced together the story and found out exactly what protects the electrolytes from decomposing. This fundamental knowledge enabled us to develop this new 5-volt electrolyte."

The laboratory held a battery industry day in February 2011, to show the Army's patent portfolio to the battery industry. More than 40 companies attended the event. Since then, nine have signed material transfer agreements, and the Army is providing additive samples to these companies. Ultimately, the goal is to license this technology for commercial use.

OPENING NEW DOORS

"This is what you would call a quantum leap," Cresce said. "We've gone from circling around a certain type of 4-volt energy for quite a while. All of a sudden, a whole new class of batteries and voltages are open to us. The door is open that was closed before."

Doors have opened beyond the ARL as a result of the group's discovery. Other scientists have developed high-voltage cathode materials, but they had no way to show the benefits of their materials because no electrolyte was stable at the higher voltage. Now the scientific community is talking about 5-volt cathodes using the additive developed by ARL.

SEEKING A BETTER BATTERY
Army researchers collect purified electrolyte additives in a dry-room facility at ARL in Adelphi, MD, where scientists are studying new ways to squeeze more energy from batteries and are developing new materials that could increase the energy density of batteries by 30 percent. (Photo by Conrad Johnson)

There is much more work to be done. One of our current projects deals with other lithium battery chemistries. Lithium air is a primary battery that researchers are examining to see if they can make it rechargeable. Unfortunately, lithium-air batteries have encountered difficulties with stability, in part because of the electrolyte. Our work focuses on a solid electrolyte—a ceramic that conducts lithium ions—that could improve that stability.

Lithium-ion batteries are also quite expensive on a large scale, so we're looking at other means to improve efficiency, lower costs, and increase safety. Our program on dual intercalation materials uses a carbon anode and a cathode.

Lithium-ion batteries rely on cations intercalating (tunneling) through both the anode and cathode when they charge and discharge, respectively, but cathode materials that intercalate lithium and are stable to mechanical changes when the lithium enters and exits are difficult to find and expensive.

An alternative is to use graphite, a form of carbon, as both anode and cathode, stably intercalating cations and anions simultaneously. Carbon is not stable at high voltages with a plain electrolyte, but our additive could make this dual-intercalation battery possible.

Before the additive, the average coulombic charge/discharge efficiency—the amount of electricity being used to charge compared with the amount that can be discharged—was quite low in a standard electrolyte, about 60 percent; much of that loss is due to reaction with the electrolyte. With the additive, we have been able to achieve a first charge/discharge of more than 99 percent. The ability to create high-voltage batteries using just

carbon electrodes has the potential to be a very big deal.

Starting this year, we are also working on molten lithium sulfur for grid storage. Microgrids are becoming increasingly important to the Army to manage power and energy in a smart way by reducing logistical burdens, increasing generator efficiency, and allowing for greater use of renewables. But using renewable energy requires storage; hence the need for new storage solutions.

REDUCING SOLDIERS' LOAD

What can a Soldier expect to have in the field that will be affected by our research today? All of the electronics—sight, night vision, guidance system, lasers, almost anything that is "smart"—has a battery. The average Soldier carries 16 pounds of batteries for a 72-hour mission. Depending on the Soldier's role in a platoon, it could be up to 32 pounds of batteries. The more electronics Soldiers carry, the more batteries they're going to have to carry. Our research has the potential to substantially reduce the battery weight, allowing for Soldiers to carry more ammunition or water.

Everything we do at the lab is done with the consideration of empowering, unburdening, and protecting Soldiers. Our main goal is to support the Soldier, whose needs are more stringent than what is needed commercially. For instance, Soldiers need batteries that operate in a wide temperature range, from -40 degrees to +70 degrees Celsius. Commercially, battery users generally are looking at a range of -20 to +40 degrees.

A lot of battery failures in the field are temperature-related. Working on the fundamentals and looking at the interface allows us to understand what limits operations at low temperatures. Through that understanding, we have been able to develop these new additives and materials.

We have been able to make only incremental improvements over the years, however. Typically, improvements in energy density have averaged about 1 percent a year, with a few step changes, such as the emergence of lithium-ion batteries.

Ultimately, we believe batteries will start looking more like fuel cells, such as the metal air batteries, or semi-fuel cells.

OVERCOMING LIMITATIONS

What limits us? Right now the Lithium 145 battery, which the Army uses, is rated at 145 watt-hours per kilogram. Our goal, which is achievable, is to increase that to 300 watt-hours per kilogram.

In battery chemistry, we are limited by the periodic table, with lithium on one end and fluorine on the other. We are thermodynamically constrained by the amount of power and energy that we can develop in a battery.

To counter that, we are looking at new strategic areas by designing systems to allow for ubiquitous energy—energy gained in any environment using indigenous or other available sources such as wastewater.

Some of our new programs are looking at how we could make fuel out of water. One of our long-term goals, for example, is to determine whether we can split water and make hydrogen that could be used as fuel in a fuel cell or small engine. Nature splits water, taking water and carbon dioxide and making energy. We are trying to short-circuit this process and take the components that nature uses—proteins that are found in spinach, for instance—and actually split water.

RESEARCH IN ACTION

Dr. Kang Xu, Senior Research Chemist at the U.S. Army Research Laboratory (ARL), is one of the inventors responsible for an electrolyte additive that allows batteries to operate at a previously unheard-of 5 volts, opening the door to a whole new class of batteries and voltages. (Photo by Conrad Johnson)

POWER SOLUTIONS FOR THE SOLDIER
Developments in battery research could change how much batteries weigh, how long they last, and how much power they provide. Here, a member of a Coalition and Afghan Security Force uses battery-powered night vision devices and a weapon-mounted aiming light to detain suspected insurgents July 9 in Kandahar province, Afghanistan. (DOD photo by Army SPC Kwadwo Frimpong, 55th Combat Camera)

We are researching fuel cells, solid-state capacitors for pulse power. In addition, we're looking at fuel reformation: How do we get hydrogen from a logistics fuel like JP8? Chemicals have the highest energy density. So it is beneficial to store energy in a chemical such as hydrogen or JP8, but it needs to be in a form that can be used. Fuel cells can use only hydrogen. To use JP8 as a fuel, we have to convert it.

We have a new initiative looking at computational methods of multi-scale modeling that we hope will accelerate the process of designing new materials. This initiative, funded by ARL, looks at multi-scale modeling of electronic materials, part of which is for electrochemical devices. The scientists will be working with our computational team to look at a range of possibilities, from the atomic scale to the systems scale.

Right now, we can look at an atom, or we can look at a system, but it's hard to draw the lines between them. One of the things we want is to speed up our ability to make changes.

CONCLUSION

In the future, our hope is not just to make better materials, but rather to design new types of power and energy devices that we cannot even fathom today.

We have only a small group of researchers working on these technologies—a small group, but very high-powered. Although the laboratory gives us a variety of effective tools, our best resource is our people.

The ability to do research that can make a difference for Soldiers has allowed us to attract and retain top talent.

A 30 percent increase in battery energy density gives us an idea of what lies ahead.

ARMY SCIENTISTS HAVE STUDIED HOW BATTERIES WORK FOR YEARS, LOOKING AT HOW EACH COMPONENT INTERACTS WITH THE OTHERS. AS A RESULT, WE HAVE DESIGNED MATERIALS THAT ALLOW FOR STABLE OPERATION AT HIGH VOLTAGES AND INCREASED ENERGY DENSITY.

For more information, go to ***http://www.arl.army.mil/www/default.cfm?page=556****.*

DR. CYNTHIA LUNDGREN is a chemist and Chief of the Electrochemistry Branch of the Power and Energy Division in the Sensors and Electron Devices Directorate of the U.S. Army Research Laboratory. Her group investigates energy storage and conversion of material components and their interactions in both large and small systems. The technologies include fuel cells, fuel reforming, primary, secondary, and reserve batteries, and capacitors. New areas of research include nanofabrication as well as taking advantage of biological systems in the development of novel power sources. Lundgren holds a B.S. in chemistry from Rutgers University, an M.S. in physical chemistry from Seton Hall University, and a Ph.D. in electrochemistry from the University of North Carolina at Chapel Hill.

HIGHER. *Farther.* CHEAPER.

Improved turbine engine S&T program promises a more powerful future for Army Aviation

by Bob Sheibley and Sofia Bledsoe

The Army will soon enable its rotor wing aircraft fleet to fly higher, farther, and at lower cost to the American taxpayers. Under the umbrella of the Program Executive Office (PEO) Aviation and the leadership of the Utility Helicopters Project Office, the Common Engine Product Office is heading the Improved Turbine Engine Program (ITEP) effort to develop the next-generation engine for rotor wing aircraft.

ITEP will reduce fuel usage, increase performance, improve reliability, and lessen maintenance for the attack and utility variants of the Army's helicopter fleet. It will provide significant fuel savings for current UH-60 Black Hawks and AH-64 Apaches by reducing operating cost and reliance on oil. ITEP also will improve the helicopters' range, endurance, and on-station (loiter) capability; lighten the logistics load; and mitigate the loss of life that can occur in moving and protecting fuel on the battlefield.

NEW CAPABILITIES

Both the Black Hawk and the Apache operate with the General Electric T700-GE-701C and D engines, which have 1,900 and 2,000 shaft horsepower. Engines developed through ITEP will provide 3,000 shaft horsepower, with a 25 percent decrease in specific fuel consumption and a 35 percent decrease

MORE POWER TO SAVE LIVES

With its advanced capabilities, the engine designed through the Improved Turbine Engine Program (ITEP) will improve UH-60 Black Hawk medical evacuation missions, especially when pilots have to fly at higher altitudes to retrieve injured Soldiers from the battlefield. Here, personnel with the 36th Combat Aviation Brigade (CAB) fly a Black Hawk on a joint air assault and MEDEVAC mission conducted with personnel from the Air National Guard and the 1st Battalion, 19th Special Forces Group at Camp McGregor, NM, June 24. (Photo by MAJ Randall Stillinger, 36th CAB)

in production and maintenance costs. It will incorporate a Condition-Based Maintenance plus (CBM+) package along with a 65 percent horsepower-to-weight increase.

CBM+ is a proactive equipment maintenance capability that uses system sensor-based health indicators to identify and predict functional failure before it occurs, providing the opportunity to take appropriate action. It is based on a set of rigorously defined maintenance tasks derived from reliability-centered maintenance analysis. More importantly, the ITEP will provide a 20 percent improvement in the operating lives of engine-critical rotating components for the current Black Hawk and Apache helicopter fleets.

In sum, the ITEP provides significantly increased operational capability, fuel efficiency, range, and payload to meet Army mission requirements, including operations in high or hot environments. The engine developed through ITEP has been identified as the potential engine for the Future Vertical Lift helicopter, the Army's next-generation vertical lift platform. The ITEP is also aligned with the Army's Operational Power and Energy Strategy efforts, DOD's Operational Energy Strategy, and the National Defense Strategy.

The program is currently in the science and technology (S&T) phase, managed by the Aviation Applied Technology Directorate of the U.S. Army Aviation and Missile Research, Development, and Engineering Center. Named the Advanced Affordable Turbine Engine (AATE) program, the S&T initiative aims to develop an engine that will provide a significantly advanced propulsion capability with its 3,000 shaft horsepower. AATE is focused on developing new turboshaft engine technologies that will bolster the modernization requirements necessary to ensure that the Apache and Black Hawk remain operationally effective well into the 21st century. The AATE program is also an integral part of the DOD/NASA/U.S. Department of Energy Versatile Affordable Advanced Turbine Engine program, which is guiding the development of advanced turbine engine technology to support the future operational capabilities of the Nation's air platforms. Air Force, Navy, and NASA personnel have supported design and test readiness reviews for the AATE program.

TODAY'S ENGINE
The General Electric 701D turbine engine, currently used in the UH-60 Black Hawk and AH-64 Apache helicopters, has 2,000 shaft horsepower. Engines developed through the Improved Turbine Engine Program (ITEP) will provide 3,000 shaft horsepower, with a 25 percent decrease in specific fuel consumption and a 35 percent decrease in production and maintenance costs. (Image courtesy of Program Executive Office (PEO) Aviation)

THE S&T VISION

The concept for the ITEP dates to more than 10 years ago, according to LTC Roger Kuykendall, Product Manager (PM) Common Engine. The AATE S&T program began four years ago, and the first Technology Investment Agreement between the U.S. government and industry was signed in 2008.

"Our basic goal was to develop a more powerful 3,000-shaft-horsepower engine with significantly reduced fuel consumption, such that if you were to use it at its maximum power design point, it would be 25 percent more efficient," Kuykendall explained. "At the same time, we wanted to keep the same weight as the current engine so that it would fit in legacy Black Hawk and Apache aircraft."

The ITEP engine is being designed so that the current engine can be removed and replaced without changing any major structural support in the aircraft, while maximizing the footprint of the engine

compartment. "The current engine fits in both aircraft, and the ITEP will as well. There may be some minor differences, but the basic installation will remain the same," Kuykendall added.

The T700 engine was originally designed in the 1970s; it has been decades since the Army designed a new centerline engine in this turboshaft class. (See Figure 1, Page 68.) "Certainly the technologies have increased tremendously since then," Kuykendall said. "So we're looking at new design tools and technologies for increased efficiencies in the compressor, gas generator, and power turbine sections, as well as improvements in inlet particle separators that remove sand and dust before it gets in the engine."

The big performance advantage is in high/hot conditions that characterize areas such as Afghanistan. At higher altitudes, the engine becomes a limiting factor. Therefore, even without changing anything else, the ITEP engine will enable the pilot to have more lift at higher altitudes and fly where aircraft are not able to go using the current engine.

The AH-64D Apache Block III, with its advancements in the Improved Drive System (IDS) known as the IDS-21 Face Gear transmission, can take advantage of the ITEP-developed engine; simply inserting it will provide Apache pilots with increased capability and lethality in the fight.

Engine-level demonstrations under the AATE program will conclude in FY13. The Army plans Low Rate Initial Production in FY21. "We're using S&T to prove out the components before [the engine] is even introduced into a Program of Record," said Gary Kellogg, the Common Engine Product Office Technical Chief. "When it is transferred, those technological risks will have been mitigated." The S&T program is expected to transition to PM Common Engine in summer 2013.

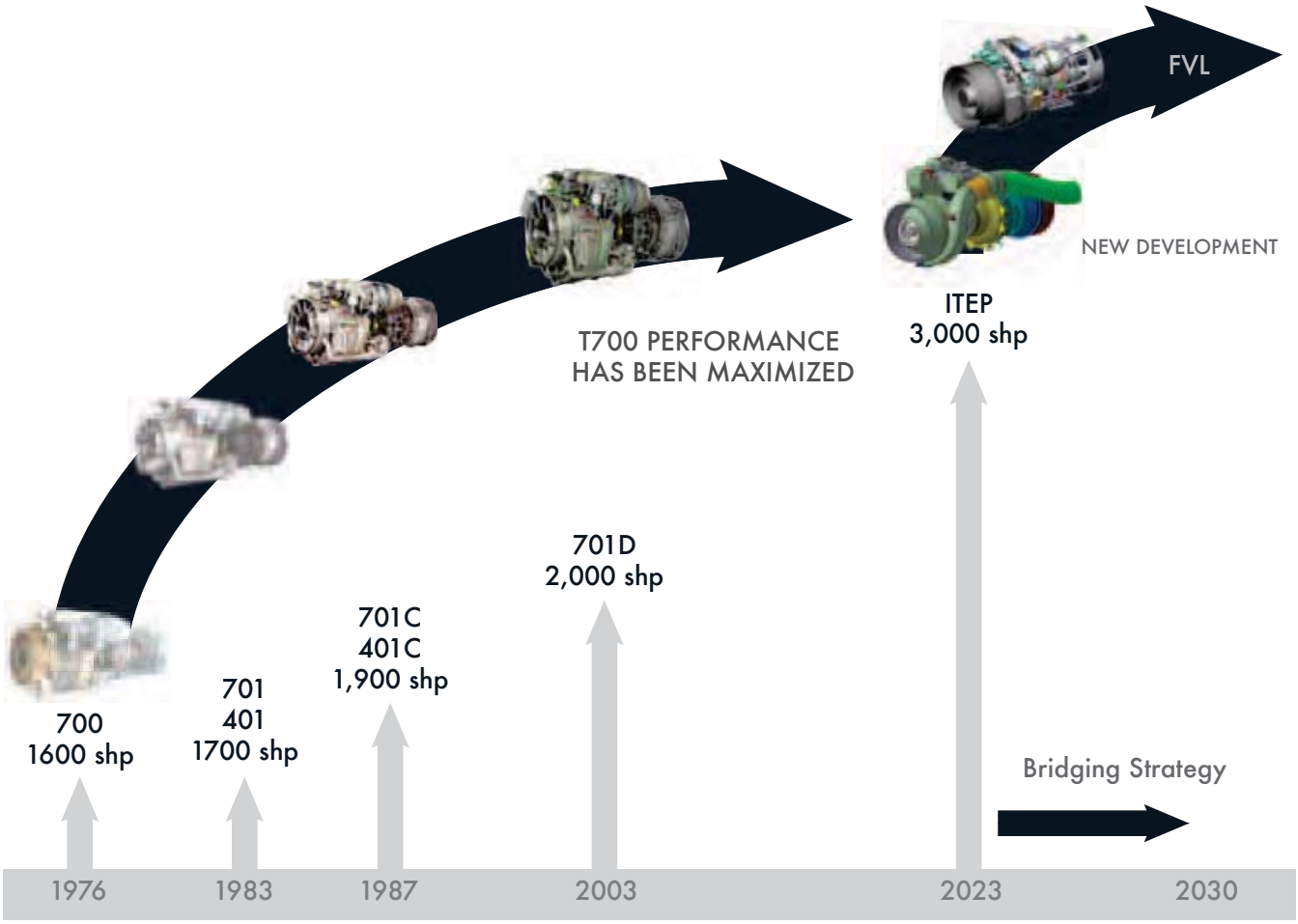
NEXT-GENERATION TECHNOLOGY
ITEP will provide significantly increased operational capability, fuel efficiency, range, and payload that will enable the Army's AH-64 Apache helicopter fleet to fly higher, faster, and longer, including in high altitudes and hot environments. (Photo courtesy of PEO Aviation)

CONCLUSION

Faced with uncertain strategic and operational environments coupled with declining resources, the Army must continue investing funds in S&T programs like the ITEP to save money in the future. As Kuykendall noted, "The Army will end up spending a lot more money on the sustainment side with the current engine."

As with the maintenance of any older-model vehicle, the Army will have fewer resources and parts to maintain and sustain an engine that is more than 30 years old. "Just in the fuel efficiency and the maintainability piece of it alone, the

Figure 1



The T700 engine was originally designed in the 1970s. The concept for ITEP, currently in the science and technology phase, is to develop new turboshaft engine technologies with 3,000 shaft horsepower (shp) that will enable the Apache and Black Hawk to remain operationally effective well into the 21st century. (SOURCE: Common Engine Product Office)

Army will benefit tremendously from the [ITEP] system in the long term," Kuykendall said.

For more information, contact LTC Roger Kuykendall, PM Common Engine, at ***roger.kuykendall@peoavn.army.mil*** *or 256-313-6875.*

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SOFIA BLEDSOE is the Acting Chief of Public Affairs for the U.S. Army Aviation and Missile Command. She holds a B.S. in English from the University of Great Falls and an M.A. in international relations from the University of Oklahoma.

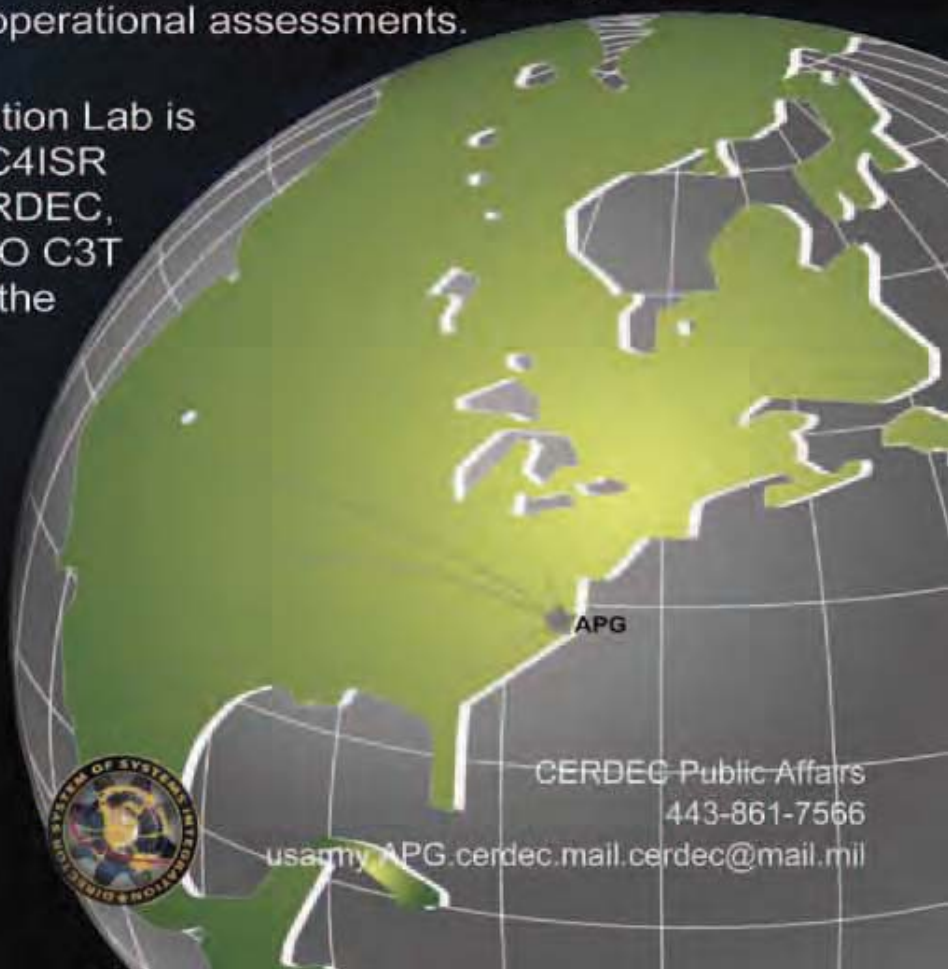
C4ISR systems integration Lab

CSIL: Technically Enabling Agile Acquisition

The C4ISR Systems Integration Laboratory at Aberdeen Proving Ground:

- Provides lab connectivity and technical expertise necessary to technically evaluate system-of-system C4ISR technologies in support of Agile Acquisition.
- Currently implements a slice of a Brigade Combat Team network which mimics the NIE network architecture and allows concurrent evaluation of end-to-end network system performance.
- Performs lab-based risk reduction by identifying network and application issues prior to systems being accepted for evaluation in the field, maximizing efficiency of resources and allowing field evaluations to focus on operational assessments.

The C4ISR Systems Integration Lab is a partnership within APG's C4ISR Center of Excellence of CERDEC, ASA(ALT), SOSI, ATEC, PEO C3T and PEO IEW&S; Ensuring the proper technical evaluation and characterization of networked systems.



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ARMY

REFINING SPECS *for* FUTURE AIRCRAFT

Performance parameters take shape for next-generation Air Vehicle

by Kris Osborn

The Army's ongoing science and technology (S&T) program to engineer a next-generation, more capable aircraft by 2030 is solidifying air-vehicle performance specifications that delineate desired capabilities and performance parameters.

"An S&T Air Vehicle Model Performance Specification [MPS] will be drafted to describe what it is we want the aircraft to do and will include a range of airspeeds that we could expect, how far it will be able to go, and some measure of internal and external payload," said Ned Chase, Chief, Platform Technology Division, Aviation Applied Technology Directorate and S&T Lead for the Joint Multi-Role Technology Demonstrator (JMR TD) program.

The Air Vehicle MPS, which will inform ongoing government and industry S&T initiatives exploring the potential attributes of a future Air Vehicle, will also address issues of altitude and air density as they pertain to lift, payload, elevation, and overall performance.

"Air density and altitude are important considerations, because the higher up you go, the less effective the rotors are. The density of the air decreases," Chase explained.

Internal and external payload likewise is an important consideration in the ongoing Air Vehicle studies, he said. For example, the shape and contours of a new Air Vehicle play a part in maximizing the potential to achieve greater speeds.

"Drag, for example, is a factor when it comes to external payload. In addition, external features such as guns and sensors increase vehicle drag, reduce aerodynamic efficiency, and require greater energy to push through the air," Chase said.

EXPLORING THE NEXT GENERATION
Three different concepts for the next-generation vertical-lift aircraft are among those being developed under the Joint Multi-Role Technology Demonstrator program. (U.S. Army graphic)

BALANCING CAPABILITIES

Although Future Vertical Lift (FVL) program officials are still refining the details of an Initial Capabilities Document (ICD), the preliminary blueprint of desired capability for the aircraft includes sustained speeds in excess of 170 knots, an overall combat range greater than 800 kilometers (a combat radius of 424 kilometers), and hovering with a full combat load under high or hot conditions (altitudes of 6,000 feet and/or temperatures of 95 degrees Fahrenheit).

A big part of the calculus of capabilities for the FVL Air Vehicle is the need to balance increased speed with the ability to hover, Chase said. "That is the rotorcraft challenge: achieving in-flight speed and efficiency while maintaining hover efficiency at the same time.

"The MPS will aggressively demand the implementation of technologies that will allow you to get maximum capability out of the system," he said.

The Army Aviation Center of Excellence, Fort Rucker, AL, is conducting operational analyses with a mind to FVL capabilities, Chase added.

"The goal is to consider the government and industry vehicle configurations of interest and plug them into a battle scenario," he said. "The user community is assessing how different capabilities manifest themselves in terms of battlefield value, as a way to help us resolve some of the trade studies we are doing."

Plans for the next-generation aircraft also include a degree of autonomous flight capability or being "optionally manned"; successful weapons integration and compatibility; a core common architecture in terms of next-generation electronics, sensors, and onboard avionics; manned-unmanned teaming ability; and shipboard compatibility.

DRIVING TECHNOLOGY FORWARD

Chase explained that the JMR TD program is an effort to harness technological innovation while looking beyond current force technology and identifying possible next-generation solutions in a variety of areas such as propulsion, airframe materials, rotor systems, engine technology, survivability equipment, and mission systems.

"What we are trying to do with this S&T program is identify the technological constraints and barriers. The MPS will drive technology development and maturation and must be flexible enough to accommodate different configurations with differing technology solutions," Chase said.

The FVL program, which includes plans ultimately to engineer light, medium, and heavy fleets of future aircraft, is starting with a medium-lift attack/utility variant. Current plans call for the development of prototype aircraft beginning in 2017, based on information in the current ICD, specs, and several ongoing studies.

Work on the JMR technology demonstrator MPS and the FVL ICD is being pursued concurrently with an ongoing 18-month Configuration and Trades Analysis aimed at having government and industry teams explore technological possibilities for a new Air Vehicle.

Alongside this effort, the JMR TD program is also focused on developing a next-generation Mission Equipment Package with advanced sensors, onboard electronics, and avionics.

> "AN S&T AIR VEHICLE MODEL PERFORMANCE SPECIFICATION WILL BE DRAFTED TO DESCRIBE WHAT IT IS WE WANT THE AIRCRAFT TO DO AND WILL INCLUDE A RANGE OF AIRSPEEDS THAT WE COULD EXPECT, HOW FAR IT WILL BE ABLE TO GO, AND SOME MEASURE OF INTERNAL AND EXTERNAL PAYLOAD."

CONCLUSION

Army JMR TD program officials are assessing industry responses to the Mission Systems Demonstration Request for Information (RFI) issued in November 2011. The RFI asked for industry feedback and potential solutions in the areas of mission systems and aircraft survivability equipment.

Information and propoals related to this RFI for advanced mission equipment solutions will inform the planned construction of a JMR TD demonstrator aircraft. The sensor, avionics, and weapon packages will be designed to accommodate the parameters of a new Air Vehicle, said David Weller, S&T Program Manager in Program Executive Office Aviation. Later this year, JMR TD program officials plan to award multiple Mission Systems Effectiveness Trades and Analysis Technology Investment Agreements to further develop and explore advanced solutions for the aircraft.

"We have the most capable aircraft in the world. Now, with the FVL program, industry is engaged and the services are engaged. The thing that is making this work is that there is a common acknowledgment that [FVL] needs to be developed. We are meeting a defense need, and that is exciting," said Weller.

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.

FVL *at a* GLANCE

The preliminary sketch of desired capability for the Future Vertical Lift aircraft includes:

- Sustained speeds in excess of 170 knots.
- Overall combat range greater than 800 kilometers and a combat radius of 424 kilometers.
- Hovering with a full combat load under high or hot conditions (altitudes of 6,000 feet and temperatures of 95 degrees Fahrenheit).
- A degree of autonomous flight capability.
- Successful weapons integration and compatibility.
- Core common architecture for next-generation electronics, sensors, and onboard avionics.
- Manned-unmanned teaming ability.
- Shipboard compatibility.

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ROTORCRAFT *Brain* TRUST

Vertical Lift Research Centers of Excellence: The future of Army Aviation

by Dr. John D. Berry

The scientific and technological development of vertical flight is critical to current and future Army operations. In 2011, the Vertical Lift Research Center of Excellence (VLRCOE) program selected 35 research tasks to fund through three university teams over the next five years. This investment in the future of vertical lift will help the Army develop future leaders and scientists in a crucial field.

The Georgia Institute of Technology, the Pennsylvania State University, and the University of Maryland lead these three teams. The research tasks focus on areas of rotary wing aviation in which DOD and NASA have common technical goals and can pool research funds.

Historically, the science of rotary wing flight has been taught at very few institutions of higher learning. In the 1980s, the Army Research Office established rotorcraft centers of excellence to ensure continuity of high-quality research and a source of well-educated scientists and engineers with a specialization in rotorcraft. Thirty years later, graduates of these centers are in leading positions in government and industry organizations that contribute to the advancement of vertical lift technology.

RESEARCH PRIORITIES

The U.S. Army Aviation and Missile Research, Development, and Engineering Center oversees the VLRCOE program through cooperative Technology Interchange Agreements with the three university teams. Specific research projects are supported for a five-year period in nine areas:

- Aeromechanics.
- Structures.
- Flight dynamics and control.
- Rotor design and concepts.
- Vibration and noise control.
- Propulsion.
- Affordability.
- Safety and survivability.
- Naval operations.

Technical specialists in these areas representing leading government laboratories collectively chose the most promising of the proposed tasks from universities bidding for matching funds. Each year, a formal review, supported by more than 40 government laboratory scientists who also serve as informal technical advisors to the university task investigators, looks at progress toward the proposed goals for each task. As a result, the objectives and approaches are adjusted.

The universities also teach courses in fields related to vertical lift technologies and support graduate students in these areas through work-study programs. In addition, the VLRCOE program enjoys a strong interaction with the American Helicopter Society (AHS), a professional organization that provides numerous venues for technical exchange and dialogue within the international rotorcraft community.

With the purpose of advancing the theory and practices of the science of vertical flight aircraft, the AHS serves as a primary forum for the interchange of information on vertical flight technology. Each of the three universities has an active student chapter of the AHS.

Following are highlights of ongoing rotorcraft studies at each university, and the scientific and professional relationships supporting them.

For more information, go to ***http://www.redstone.army.mil/amrdec/RD&E/AFDD.html.***

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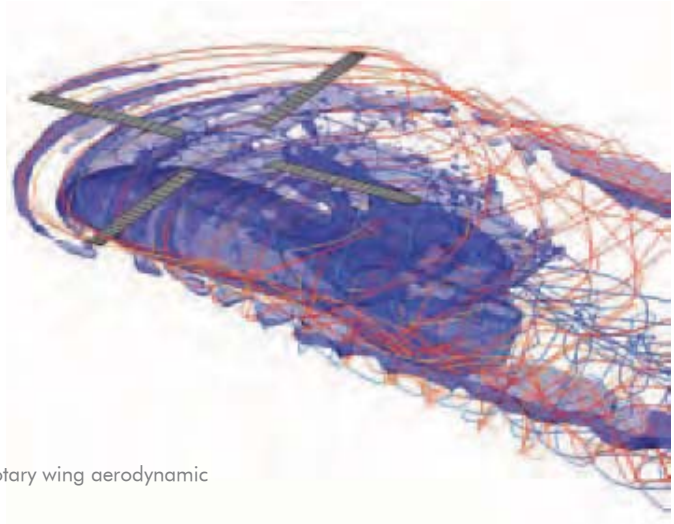
Georgia Tech

The Georgia Tech VLRCOE comprises a partnership between the Nation's two leading public schools of Aerospace Engineering—at Georgia Tech and the University of Michigan—combined with Washington University in St. Louis, which is known for its contributions to vertical lift technology. This VLRCOE includes faculty, staff, and management leaders with a proven track record of pioneering advances in vertical lift technology, who are intimately familiar with what is needed for its further advancement.

An example of results from this sponsored research is the development of a Variational Asymptotical Beam Sectional analysis, which has become the industry standard in composite beam analysis. Georgia Tech researchers, through the development of overset, unstructured grid adaptation methods and advanced turbulence and transition methods, have made significant advances in the ability of computational methods to solve complex rotorcraft problems.

Through the collaboration between these researchers and experimentalists, significant advances have been made in the understanding and prediction of rotor-fuselage interaction and dynamic bluff bodies, such as rotor hubs and sling loads.



COMPUTATIONAL MODELING
Hybrid computational models at Georgia Tech reduce the cost of complex rotary wing aerodynamic simulation. (Image courtesy of Georgia Tech and Continuum Dynamics Inc.)

PENNSTATE

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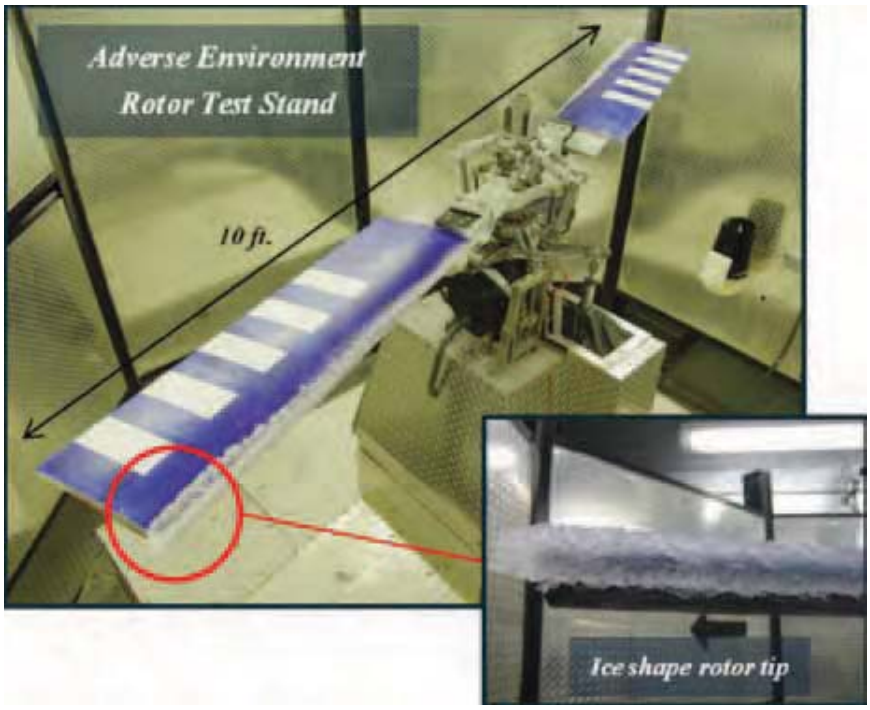
Pennsylvania State University is engaged in a wide variety of research and educational activities related to vertical flight technology. In addition to being a VLR-COE, Penn State receives strong support from the Office of Naval Research, the Vertical Lift Consortium of industry and academia, NASA, and numerous industrial sponsors.

More than 20 faculty members and 40 graduate students are working on projects related to dynamics, aerodynamics, acoustics, flight control, simulation, autonomy, icing, health and usage monitoring systems, and design of rotary wing vehicles.

Drivetrain technologies, smart structures, advanced materials, active control of noise and vibration, and high-performance computing are also among the program's technical thrusts. Major facilities include an instrumented active rotor test stand with icing cloud capabilities, a high-fidelity piloted flight simulator, a low-turbulence subsonic wind tunnel, composite and nano-materials labs, airframe dynamics and structural health monitoring labs, and unique water tunnels.

Penn State's Applied Research Laboratory (ARL) offers high-energy processing, materials science, and repair technology to the Institute for Manufacturing and Sustainment Technologies, a U.S. Navy Manufacturing Technology Center of Excellence with research groups in mechanical drivetrains.

Penn State ARL researchers are also engaged in rotorcraft computational fluid dynamics, drivetrain, crashworthiness, and Condition-Based Maintenance projects. Additionally, Penn State's Department of Aerospace Engineering offers an annual weeklong short course on Rotorcraft Technologies.



FOCUS ON ICING

Among numerous areas of rotorcraft study, researchers at Penn State are examining ice formation on rotors using the Adverse Environment Rotor Test Stand. (Images courtesy of Pennsylvania State University)

When Professor Alfred Gessow joined the faculty of the University of Maryland in 1980 as Chair of the Department of Aerospace Engineering, he was already widely recognized as a preeminent rotorcraft researcher. At Maryland, he founded the Center for Rotorcraft Education and Research in 1981; it was renamed the Alfred Gessow Rotorcraft Center (AGRC) in 1997.

The AGRC has been at the forefront of rotorcraft education, research, and technology since its founding. A U.S. Army Center of Excellence in helicopter technology for many years, the AGRC is a two-time recipient of the AHS' Glover Bell Award for fostering research and experimentation in helicopter development. More than 250 students have graduated from the center, which employs an interdisciplinary team of faculty members to carry out the VLRCOE's five-year multidisciplinary research and educational program.

Currently 25 graduate students and 16 faculty members at the University of Maryland are working on 12 research tasks. The program is advancing fundamental understanding, predictive, and design optimization capabilities in a number of areas of rotorcraft aeromechanics, with a balance between analysis and experimental testing. Partner universities are the U.S. Naval Academy, the University of Texas at Austin, the University of Wyoming, and North Carolina A&T State University.

INTO THE WIND
Students and faculty members prepare a rotorcraft model in the University of Maryland wind tunnel. (Photo courtesy of Alfred Gessow Rotorcraft Center)

KILLING A FLY *with a* SLEDGEHAMMER

Combining mission command and actionable intelligence for overmatch at the tactical edge

by Osie David and LTC(P) Richard J. Hornstein

REDUCING SURPRISES
The Army science and technology (S&T) community is working to increase overmatch and reduce tactical surprise at the small unit level. Here, SPC Curtis Mattingly of 1st Battalion, 17th Infantry Regiment, 2nd Infantry Division scans his sector with his M-249 squad automatic weapon during *Operation Southern Strike II* in southern Afghanistan June 6. The Afghan Border Police-led operation focused on disrupting enemy formations in the vicinity of major passes. (U.S. Army photo by SGT Brendan Mackie, 117th Mobile Public Affairs Detachment (MPAD) (Hawaii))

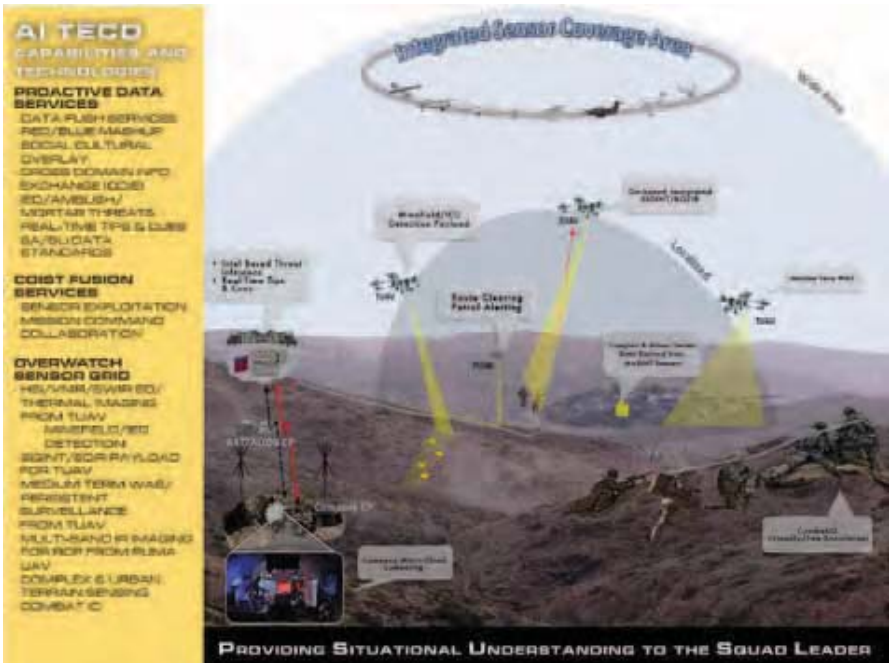
The Army never wants a fair fight in combat. Its goal is always to maintain tactical overmatch, like killing a fly on the wall with a sledgehammer.

This overmatch exists at the corps, division, brigade, battalion, and even the company levels. However, as LTG Robert B. Brown, Commanding General, I Corps and Joint Base Lewis-McChord, WA, has noted, "The infantry squad has been excluded from the technological development that provided combat overmatch for the remainder of our forces." The greatest parity in the fight still exists at the tactical edge with the dismounted Soldier, operating outside the network once he leaves his combat outpost or vehicle.

The Army wants to change this by increasing overmatch and reducing tactical surprise at the small unit. The Army's new science and technology (S&T) construct called Technology Enabled Capability Demonstrations (TECDs) can help converge operational and intelligence information for the small unit. The TECDs are helping to address the challenges of unifying the information and data flow from mission command and intelligence systems, integrating fires and other warfighting functions (WfF), and improving situational understanding. This goal will be achieved with automated options and timely tips and cues sent across the network and out to the tactical edge where the information can be leveraged to improve a squad's survivability and lethality.

The U.S. Army Research, Development, and Engineering Command's Communications-Electronics Research, Development, and Engineering Center (CERDEC) is uniquely positioned to support the Army's new TECD initiative. CERDEC has the in-house expertise and has fostered enduring relationships across government, industry, and academia to effectively execute this S&T effort.

Figure 1



Technology Enabled Capability Demonstrations (TECDs) will help to address the challenges of unifying the information and data flow from mission command and intelligence systems, integrating fires with other warfighting functions, and improving situational understanding. One important example is the ability to provide near-real-time intelligence hits from the Integrated Sensor Coverage Area on potential enemy locations and to extend them out to the mission command domain and the dismounted Soldier on patrol. (SOURCE: Communications-Electronics Research, Development, and Engineering Center (CERDEC))

A FUNDAMENTALLY NEW APPROACH

The concept of TECDs is a new one and warrants further discussion. The Army is changing the way it has normally approached some of its S&T development and is now aligning the expenditure of 6.3 money, designated for advanced technology development and demonstration, to more effectively fill the operational gaps and priorities defined by Army senior leaders.

In July 2011, the Army Science and Technology Advisory Group, chaired by the Vice Chief of Staff of the Army and the Army Acquisition Executive, established the top 10 Army challenge areas for investment of 6.3 S&T funds. To concentrate on these challenge areas, the Assistant Secretary of the Army for Acquisition, Logistics, and Technology instituted the TECD process to accelerate the identification, maturation, and transition of technical solutions that address Army gaps.

The TECDs represent a fundamentally new way for the Army to enable rapid

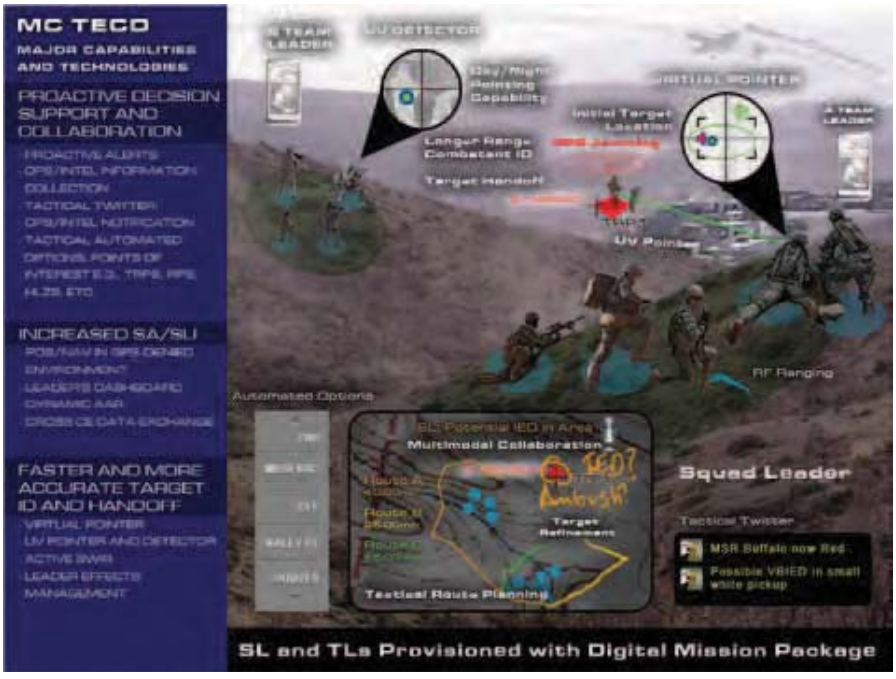
development and transition of integrated capabilities that focus on specific operational challenges identified and prioritized by Army senior leaders. Historically, the S&T community used the Army Technology Objective (ATO) construct. The ATOs were proposed research and development efforts that generally sought transition opportunities for individual capabilities focusing on individual materiel solutions.

TECDs take a broader programmatic approach to developing, integrating, and demonstrating a multitude of technologies to deliver a collective capability that will address real-case operational gaps. The TECDs seek technology solutions that can improve formation effectiveness, not just enhance individual Soldier capabilities.

ENHANCING THE FORMATION

Aligning this intent with the goals of mission command (MC) and actionable intelligence (AI) TECDs, the payoffs are much higher. The intended TECD solution goes beyond empowering the individual Soldier; it allows the Army to integrate a suite of tools and capabilities across a broad set of requirements and give them to a formation to enhance its collective capability.

Figure 2



The greatest parity in the fight still exists at the tactical edge with the dismounted Soldier. The Army's TECD construct seeks to change this by increasing overmatch and reducing tactical surprise at the small unit level. The capabilities that the TECDs intend to demonstrate include proactive decision support and collaboration tools; faster and more accurate target identification and handoff; automated options; and enhanced low-visibility capability for threat discernment and day/night targeting pointers. (SOURCE: CERDEC)

Unencumbered by a specific requirements document, the S&T communities can work efforts across the broad spectrum of MC, AI, and other WfF needs to develop and demonstrate integrated solutions that will help fulfill those requirements.

CERDEC's Command, Power, and Integration (CP&I) Directorate has been identified as the lead for two of the top 10 S&T challenges: MC and AI. CP&I is planning to manage the development of these efforts as one unified endeavor, to improve integration and efficiencies.

The effort is aligned with the Army's migration strategy of extending the network beyond the company to the squad with the deployment of the Rifleman radio to each Soldier and the deployment of a handheld capability down to the team leader level.

The capabilities that the TECDs intend to demonstrate are unique and game-changing. One important example is the ability to provide near-real-time intelligence hits from the Integrated Sensor Coverage Area on potential enemy locations and to extend them out to the MC domain and the dismounted Soldier on patrol. (See Figure 1, Page 79.) This will empower small unit leaders with improved situational understanding and reduce surprise.

Some other MC technology examples include proactive decision support and collaboration tools; faster and more accurate target identification and handoff; automated options; and enhanced low-visibility capability for threat discernment and day/night targeting pointers. (See Figure 2.)

Additional AI efforts include proactive data services; company intelligence support team fusion services; and overwatch

ASSESSING THE DANGER
One of the focal areas of Army S&T is unifying the data flow from mission command and intelligence systems to improve overall situational understanding at the small unit level. Here, CPT Joseph Driskell, 1st Battalion, 504th Parachute Infantry Regiment, scans for an insurgent sniper as his radio telephone operator, SPC Justin Vnenchak, communicates the situation to other U.S. elements in the area, July 23 in Ghazni province, Afghanistan. (U.S. Army photo by CPT Thomas Cieslak, 1st Brigade Combat Team, 82nd Airborne Division Public Affairs)

sensor grid capabilities and technologies that will include lighter and more effective unmanned aerial vehicle sensor payloads for improved threat detection. The overall TECD aim is unique: to empower the squad and provide operations/intelligence (OPS/INTEL) updates for their mission overwatch area.

There is a need to understand that the outcome should not hamper the small unit with automation, but rather offer critical situational understanding while reducing the cognitive burden on the leaders. This will be accomplished by taking advantage of the extended network and offering Soldiers options for critical decisions they need to make on combat patrols. Fundamentally, we want to get the right data to the right squad at the right time.

OPERATIONAL VIEW

To start the effort, CERDEC CP&I and its sister organization, the Intelligence and Information Warfare Directorate, have cooperatively developed a unified TECD operational view (OV) to achieve a converged OPS/INTEL concept of operations (CONOP). This CONOP also aligns with the Army's Common Operating Environment and with several Programs of Record (PORs) that represent the Title 10 leads for developing and deploying capability to the Army formations.

The TECD OV is the basis for defining and depicting the environment, challenges, and how we intend to influence and fill some of those gaps technologically. This approach highlights incremental development and upfront integration to reduce the risks of redundancy of effort and separate one-off functional solutions.

CERDEC also recognizes that a multitude of organizations are working in this same problem space. To stay synchronized and to better understand and de-conflict our efforts, we have and will sustain engagements with the key stakeholders.

To help reduce the risk of duplicative efforts, we continue to meet with POR

Figure 3

The Army recognizes that the convergence of operational and intelligence information is critical for reducing tactical surprise and increasing overmatch at the small unit level. CERDEC's Command, Power, and Integration Directorate, as the lead for mission command and actionable intelligence, plans to merge these as one effort in order to improve integration and efficiencies. This three-year, three-phase strategy will culminate in FY15 with a fully networked unit having integrated capabilities and data flow up and down the tactical echelons. (SOURCE: CERDEC)

leads and the U.S. Army Training and Doctrine Command (TRADOC), seeking to leverage the commercial sector for emerging solutions. We have also cross-walked and validated our requirements against the TRADOC warfighting outcomes, the Mission Command Essential Capabilities and the Intelligence community's blueprint for the Army of the 21st century.

Additionally, the TECD team has compared technology development with the capabilities at the Network Integrated Evaluations and continues to do so, to avoid duplicating development efforts with industry and our sister PORs.

The TECDs also have a great deal of Army leader support; all current TECD efforts have been approved by the Army Science and Technology Advisory Group. Additionally, the U.S. Army Deputy Chief of Staff (DCS), G-3/5/7, LTG John F. Campbell, and the former DCS, G-2, now-retired LTG Richard P. Zahner, endorsed the effort and its intended outcomes.

We plan to sustain a close cooperative effort with our stakeholders and execute periodic demonstration and experimentation events, which are an important aspect of this effort. These frequent demonstration and experimentation events are intended to measure and validate TECD concept capabilities and to minimize transition and deployment risks.

We've sequenced our technical approach through three phases. This three-year strategy focuses first on developing capabilities for the austere squad, separated from the enterprise, in FY13. Phase II, in FY14, focuses on the networked platoon. The effort will culminate in FY15 with Phase III, focused on a fully networked company with integrated capabilities and data flow up and down the tactical echelons. (See Figure 3.) The intent is to demonstrate and deliver incremental capability for each of those years, not just one big bang at the end of FY15.

CONCLUSION

The real determination of success is always adoption of the capability by the operational user. The TECDs' continual planning and synchronization with TRADOC capability managers, program executive officers, program managers, and TRADOC Centers of Excellence (COEs) will help to ensure that these solutions remain complementary and have an established path for transition to the Soldiers in the fight. The TECDs also will incorporate Soldier feedback before and after exercises, to ensure that the capability is usable and provides value to the Soldier and small teams.

The S&T community is in the business of taking risks to discover what's in the realm of the possible, to help inform Army decisions in the future and help to address gaps today. The TECD effort is intended to complement PORs, not to compete with them or simply support their existing development trajectory.

This can be done by working collaboratively to establish collective capabilities that integrate across a multitude of WfFs.

The overall TECD effort is a cooperative arrangement involving several of the U.S. Army Research, Development, and Engineering Command's R&D centers and multiple directorates within CERDEC. Cutting-edge technology improvements developed by CERDEC's Night Vision Directorate are making low-visibility enhancements, pointer capabilities, and sensor technologies available for integration.

Our other partners from the U.S. Army Armament Research, Development, and Engineering Center, Edgewood Research, Development, and Engineering Center, and Natick Soldier Research, Development, and Engineering Center are delivering fires, geospatial tools, and handheld user-style guides, respectively, for integration.

We recognize the possibility that not all of these unique capabilities will transition. However, by sustaining the support of the COEs and the PORs, we can posture both of these stakeholders for increased success.

Demonstration and deployment of an integrated baseline of capability will help reduce tactical surprise and increase overmatch. This TECD strategy and intended outcome will result in a win-win situation for the S&T community, the PORs, and, most importantly, our Army small unit formations on the tactical edge.

For more information, send inquiries to ***usarmy.apg.cerdec.mbx.mc-tecd@mail.mil.***

SUPPORTING THE SMALL UNIT
SPC Blaine Templeton (left) and PFC Rodney Heater of 1st Battalion, 23rd Infantry Regiment take a knee before stepping off on a foot patrol in southern Afghanistan Aug. 1. The TECDs will incorporate Soldier feedback to ensure that the capability provides value. (U.S. Army photo by SGT Matt Young, 117th MPAD (Hawaii))

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LTC(P) RICHARD J. HORNSTEIN was the Military Deputy for CERDEC's Command, Power, and Integration Directorate at the time this article was written. Hornstein, now a Colonel, is currently a student at the U.S. Army War College. He holds a B.A. in history from the University of Rhode Island and an M.S. in acquisition and contract management from the Florida Institute of Technology. Hornstein is Level III certified in program management, and Level II certified in both information systems and contracting.

INNOVATION MARKETPLACE

TATRC's Technology Transfer/Commercialization Program could be a model for speeding viable medical innovations to the warfighter

by Ronald Marchessault Jr., Dr. Charles M. Peterson, and COL Karl E. Friedl

The goal of the Telemedicine and Advanced Technology Research Center (TATRC) of the U.S. Army Medical Research and Materiel Command (USAMRMC) is to translate research into new products to advance the care of the Nation's warfighters. TATRC is deeply aware that it must encourage that next breakthrough to enhance military health, while making effective use of the federal funds that it stewards.

To determine what it should fund, TATRC must decide whether a new technology solves an important problem and who would purchase it. While all TATRC project proposals are expected to provide detail on commercial potential, the reality is that many researchers do not have the knowledge or resources to assess this effectively and develop a commercialization strategy on their own.

To date, DOD has had no formal program to guide and assist them. For this reason, TATRC developed a comprehensive commercialization program for the more than 1,800 research projects it manages at universities, government laboratories, and high-tech start-up companies. It was an ambitious undertaking.

A BLANK SLATE

A funded research project is only half the journey in providing a solution for Soldiers or bringing the lessons learned from war to the benefit of society. TATRC set out to develop a holistic Technology Transfer/Commercialization Program (T2/C) that would help achieve three primary objectives:

- Assess and guide the commercial potential of new discoveries and technologies.
- Connect federally funded researchers with investors.
- Evaluate and promote the economic impact of the precious research dollars that the center manages for the military.

It faced a blank slate in all three areas.

In 2009, TATRC started a formal program leveraging federal investment with private-sector capital to commercialize federal medical research and development (R&D) technologies. It examined similar efforts at the National Institutes of Health and began networking exhaustively to reach out to groups with the right ideas and right capabilities to support these objectives. TATRC chose only not-for-profit partners so as to minimize any potential conflicts of interest or risk in sharing proprietary information. It also emphasized quantifiable measures of outcome that will allow tracking and continuous improvement of the program.

The hope is that TATRC's pilot program will become a blueprint for others in DOD. This strategy of "convergence management" parallels the innovative approach to fostering "convergence science" as developed by TATRC and described in "Promoting Innovation and Convergence in Military Medicine: Technology-Inspired Problem Solving" (*IEEE Circuits and Systems Magazine*, Volume 12, Issue 3).

PROJECT ASSESSMENT

T2/C sought out several strategic partners and resources to provide the business expertise that must marry with

science to create a marketable product. Fifteen TATRC small business partners that demonstrated technologies with strong commercial potential were selected in 2011 for market overview analyses by FirstLink, a DOD technology transfer partner. The information has helped the inventors identify their competitors and hurdles to market. Approximately half of the projects were Small Business Innovation Research (SBIR) Phase II, Phase II Enhancement, and Commercial Pilot Program award recipients.

Leveraging a memorandum of agreement between USAMRMC and the Johns Hopkins University for R&D, TATRC worked out a collaboration in which Hopkins' Carey Business School would provide commercialization consulting services to select TATRC partners as part of the school's curriculum.

Student teams from the Global Master of Business Administration program presented commercialization plans for eight TATRC projects in 2011. The students gained vital experience in applying business theory, while the researchers gained free intellectual property research and in-depth marketing analyses that otherwise could have cost them thousands of dollars. Students in this year's Discovery to Market class are working with a second group of TATRC-funded investigators.

For online commercialization assessment tools, TATRC explored several programs and introduced several of its partners to EquityNet, a proven, metric-based program for determining commercial viability. EquityNet offers patented business planning and funding software along with expert business support and research services. Ten companies are now participating in the program, which includes a business plan analysis, assistance in refining the plan, a market analysis, a competitive analysis, and an intellectual property survey. Certain companies have developed their business plans and are now accessing private equity investors listed with EquityNet.

In light of competing technology concepts and proposed solutions for funding certain R&D projects, TATRC is trying to develop a systematic method with appropriate metrics to support the early-stage, quantitative evaluation of the relative merit of proposed concepts and feature sets for given technology areas. The framework will be demonstrated on a specific technology area, video laryngoscopy, with the goal of creating a tool that TATRC can apply to other areas in its portfolio.

EDUCATING RESEARCHERS

The best way to help translate research into a commercial product is to consider the market potential from the outset. A key challenge has been to train small businesses to take this perspective. TATRC has developed several educational programs to encourage investigators as well as reviewers to incorporate business analyses throughout their project timetables.

TATRC has partnered with the Larta Institute, a not-for-profit firm in Los Angeles that has assisted several federal agencies with commercialization efforts. Larta helped design a pilot program to assess TATRC projects and to help a subset of companies advance their commercialization strategies.

The program takes a two-step approach. In Phase I in 2011, 25 candidate companies were selected to receive a Landscape Analysis Briefing. Each then earned a commercialization readiness level (CRL) score, which TATRC uses as an objective metric to convey the commercial maturity of a particular project and company management team.

NETWORKED TO FUNDING
As a result of TATRC-sponsored networking through the National Association of Seed and Venture Funds, Sonivate Medical Inc. obtained the funding needed to pursue U.S. Food and Drug Administration approval for its SonicEye finger-mounted ultrasound technology. (Photo courtesy of Sonivate Medical Inc.)

A BOOST FOR X-RAY TECHNOLOGY
GE Healthcare's FlashPad is a next-generation wireless detector used in connection with X-ray and funded by TATRC. (Photo courtesy of General Electric Co.)

In Phase II, 10 companies from the pool of candidates with high CRL scores were chosen to participate in a Commercialization Assistance Program. These TATRC projects were matched with external industry experts, who evaluated the projects' commercialization potential, served as mentors, and developed strategies for

REHABILITATION THROUGH GAMING
"The Treasure of Bell Island," a game created by the Blue Marble Game Co., is designed for the physical and cognitive rehabilitation of patients diagnosed with mild traumatic brain injury. (Images courtesy of Blue Marble Rehabilitation Inc.)

future private-sector investment. These companies are completing their mentorship closeout process via webinar and are demonstrating their markedly improved preparedness to network with private equity firms. These companies will now be tracked and assisted by Larta for 12 months.

This year, 50 companies, primarily SBIR Phase II recipients, were invited to participate in the Landscape Analysis; 20 companies have been selected based on their CRL scores to participate in the Commercialization Assistance Program. To bring inventors and investors together in a risk-free environment, TATRC organized a two-day symposium with the University of Nebraska Medical Center in May 2011. The Midwest Medical Technology Exchange enabled TATRC researchers in the Midwest to network with regional investors and discuss critical elements of technology commercialization.

In this purely educational exchange, inventors were the audience as investors presented information pertaining to commercialization. Presenters included representatives from the venture capital and angel investor community, the legal profession (patent and corporate law), and state economic development agencies.

The event generated ideas that will help TATRC prioritize future projects based on their commercial potential. The hope is to offer similar symposia in the future in multiple regional hubs to assure nationwide participation in developing the best medical products for Soldiers and their families.

To bring market analysis capabilities to all of TATRC's small business partners, T2/C is working with the Proof of Concept Institute Inc. and the Jacob Tyler Creative Group to develop a microsite with customized content focused on commercialization strategies. This online "toolbox" will feature free project management evaluation tools as well as educational resources for both researchers and reviewers.

The Broad Agency Announcement (BAA) is an annual open solicitation for submission of pre-proposals from members of academia and industry seeking TATRC's collaboration and DOD funding. During the pre-proposal stage of the BAA application process, the idea is that investigators would be directed to commercially oriented questions. Their responses would

be made available to TATRC personnel to assess the proposed projects' current stage, as well as its military and nonmilitary commercialization potential.

Grant recipients would then have access to an online TATRC Commercialization Training Guide. This will educate investigators in the commercialization process and will detail activities that the principal investigator should undertake at various project milestones, to increase the likelihood that funded projects could transfer successfully to the private sector.

CONNECTING PROJECTS WITH INVESTMENTS

For those technologies ready for "prime time," networking is another essential aspect of T2/C. TATRC has teamed with the National Association of Seed and Venture Funds (NASVF), based in Philadelphia, PA, to connect promising research with private investment.

First, the NASVF developed a marketing campaign to aid in TATRC's commercialization goals. Through careful messaging and positioning in the health care business, TATRC-funded companies with commercially viable technologies are being promoted to investors.

TATRC has also co-sponsored NASVF meetings in Baltimore, MD, and Arlington, TX, in which a total of six small business partners seeking private-sector capital have pitched their companies to angel investors and the venture capital community. Panels of industry, law, and investment experts engaged in question-and-answer sessions. Four similar Technology Showcase opportunities are being provided to 10 TATRC companies in 2012, in Philadelphia, PA; Los Angeles, CA; Boston, MA; and Cleveland, OH. They are open to *Army AL&T* Magazine readers.

ECONOMIC IMPACT BENCHMARKS

With accountability as the watchword, TATRC is integrating a final pillar into the T2/C. As a first step, a tracking program was established to document TATRC commercialization successes. Results through FY11 showed that of approximately 1,800 projects funded through TATRC since 2000, 2.3 percent have resulted in a commercial product, generating $209 million in sales from a total federal investment of $74 million.

TATRC chose Econsult Corp., a Philadelphia firm with extensive experience in economic impact modeling, to conduct an economic impact analysis of 10 companies. Econsult is gathering validated data on TATRC-funded medical R&D expenditures, including job creation and retention, salaries, follow-on funding, published patents, state and federal tax revenue, and sales revenue.

The first report is expected to be complete this fall. Econsult is actively gathering data from and compiling metrics on four companies.

CONCLUSION

For TATRC, it's not enough to have good science alone. Projects must meet a clinical need and often have commercial viability. The Technology Transfer/Commercialization Program is making this more likely.

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RADIOLOGY ON THE MOVE
With support from Congressional Special Interest funding, the Definium AMX 700, a mobile digital X-ray platform made by GE Healthcare, is commercially available. (Photo courtesy of General Electric Co.)

(Illustration by U.S. Army Acquisition Support Center)

NOT JUST FUN *and* GAMES

U.S. Army Reserve Command sees vast potential for virtual training and simulations from multiple locations at once

by MAJ Chris Daniels and Melissa Russell

As contingency operations draw down, the Army is racing against time, available dollars, and land space for ways to preserve the vital and often perishable skill sets gained by our battle-tested force.

LTC Kevin Brown, Training Support Systems Branch Chief at U.S. Army Reserve Command (USARC), is betting that virtual games and simulations are the solution. From medical training to battlefield scenarios, games and simulations can be used for virtually any military occupational specialty in the Army.

The Army currently does distributive training across installations, but not beyond. Expanding this capability could fundamentally change the training model at brigade and battalion levels.

The successful incorporation of gaming into the training strategy could save the Army billions of dollars, according to Brown, who provides training aids and devices for individual and collective use.

The fielding of "Virtual Battle Space 2" (VBS2) was a huge step forward in the training arena, he said. The Army gaming system, which debuted more than three years ago, can be used for both individual and collective training.

"The goal now is to take systems like 'Virtual Battle Space 2' to the next level," said Brown, "to allow for simultaneous virtual gaming and training from multiple locations."

COVERING THE DISTANCE

With units and commands dispersed across multiple states, the USAR has a vested interest in testing Brown's theory. Brown and a team from Distributed Learning Systems traveled to a Digital Training Facility (DTF), a classroom in Jacksonville, FL, for Web-based personal and professional education and virtual training, to test the concept with another DTF in Richmond, VA. Their success resulted in what would be designated the Army's first-ever distributive training session using VBS2.

Since then, larger-scale sessions have been conducted. The only limitations Brown sees are in the amount of available hardware, software, and distributive capacity.

"We've enhanced the capability so we can increase the numbers of Soldiers we train in a single session, even if they're clear across the country," said Brown. "And in these economic times, we need to find ways to maximize virtual training and gaming."

Still, the idea that games and simulations could compare to live training has its detractors. "There are doubters, because there are people who only believe in live training," said Brown. "But the reality is that virtual training doesn't relieve that requirement. It just gives the commander the ability to rehearse, refine, and master the 'crawl' and 'walk' phases of training, so when [Soldiers] do get to a live event, they will be more proficient."

Another benefit of the gaming system is that VBS2's after-action review capability allows leadership to film all events of the scenario, including sounds and commands, and play back any given sequence of events. "No one remembers every detail that took place in a live exercise," said Brown. "In VBS2 it's recorded, so we can replay the total scenario. You will see the tracer round and who fired on the sniper first."

Brown said that USARC is working to overcome limitations and kinks, such as settings and resolution, so that this kind of distributive capability can be part of the future training of platoon-, company-, or expeditionary-size elements, possibly in conjunction with a combat support training exercise or warrior exercise. This is a goal of the G-3/7 for next year.

CLOUD CAPABILITY

The USAR is concurrently spearheading a related program, the Distributed

PRACTICING FOR LIVE ACTION

SPC Sloan Marsh, 2LT Zackery Sutton, and CPT Eugene Miranda of 3rd Battalion, 7th Infantry Regiment conduct a simulated fire control mission using the "Virtual Battle Space 2" (VBS2) training platform March 29, at Evans Army Airfield, Fort Stewart, GA. The training was designed to prepare Soldiers for a live fire control exercise. (Photo by SGT Mary Katzenberger, 4th Infantry Brigade Combat Team, 3rd Infantry Division Public Affairs)

TRAINING IN A DIGITAL WORLD

A screen capture generated for U.S. Army Europe's Joint Multinational Simulation Center depicts an unfolding combat situation in a digital world, similar to what the U.S. Army Reserve Command hopes to provide to its Soldiers for simultaneous virtual gaming and training from multiple locations. This scenario was constructed for Soldiers of the 18th Combat Sustainment Support Battalion to move through Feb. 23 at the Joint Multinational Training Command's (JMTC's) Camp Aachen, Grafenwoehr, Germany. The battalion exercise was the first command post exercise since 2010 that integrated VBS2 scenarios with other simulation models to create a realistic scenario for a non-deploying training unit. (U.S. Army graphic by David Meyers/Courtesy of JMTC Public Affairs)

Simulation Capability. The USAR'S 75th Training Division (Mission Command) is taking the lead on the program, which will provide a cloud capability that enables the division's five mission training centers to provide distributive training and exercise capabilities across the USAR, or anywhere a signal can be transmitted and received.

"The Army Reserve has geographically dispersed Soldiers, units, and commands, and only a fraction of the funding" compared with the active component, said MG Jimmie Jaye Wells, Commanding General of the 75th. "Our mission is to provide staff training to ensure Soldiers are proficient at battalion level and above. Distributive training simulation is a means to deliver that capability while reducing travel time and the cost of meals and hotels.

"Once this capability has been achieved, imagine the five Mission Training Centers as major hubs with the ability to provide their capability to our 50 spokes," the DTFs, said Wells. "The digital training facilities actually become extensions of the mission training centers for exercise- and training-related events, as well as offering a day-to-day individual training capability for courseware."

CONCLUSION

By testing this pilot application over the USAR's Non-Secure Internet Protocol Router Network, the 75th gains logistical and cost efficiencies. Future plans are to expand to a shared network, creating a pathway with far broader implications.

THE VIRTUAL BATTLE SPACE
VBS2 marked a major step forward in the Army training arena. The Army gaming system, which debuted more than three years ago, can be used for both individual and collective training. Here, warrant officer candidate Justin Shipman works through a VBS2 scenario in July 2011 at the Camp Atterbury Joint Maneuver Training Center, IN. Candidates are required to complete VBS2 training. (Photo by Jill Swank, Camp Atterbury Public Affairs)

According to Wells, his command is weeks away from providing a proof of principle that could be the catalyst for a transition to extensive use of games and simulations or simulators across the entire Army.

Meanwhile, within the USARC G-3/7, an effort is underway to refine current gaming and simulation strategies. Brown said the command very well may look at defining what tasks in the Army Force Generation cycle could be accomplished using VBS2 to help unit commanders achieve their goals in a cost-effective and timely manner.

"This capability provides us the ability to conduct low-cost, realistic, viable, interesting, and enjoyable home station training on a moment's notice," said Brown. "Units that may be separated by miles and/or states now have the ability to train together, possibly without ever having to leave their own Reserve Centers."

"NO ONE REMEMBERS EVERY DETAIL THAT TOOK PLACE IN A LIVE EXERCISE. IN VBS2 IT'S RECORDED, SO WE CAN REPLAY THE TOTAL SCENARIO. YOU WILL SEE THE TRACER ROUND AND WHO FIRED ON THE SNIPER FIRST."

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MELISSA RUSSELL, a U.S. Army Reserve Public Affairs Specialist for 25 years, works in Army Reserve Communications, Office of the Chief, Army Reserve, and is Editor-in-Chief of Warrior-Citizen Magazine. Russell has attended numerous Defense Information School courses, including Broadcast Journalism and the Public Affairs Qualification, Editors, and Joint courses.

For USAR Medical Soldiers, a Cutting-Edge Opportunity on the Horizon

by COL Richard C Swoope Jr. and MSG Enid Ramos-Mandell

AN ALMOST-REAL 'PATIENT'

High-tech, highly tactile mannequins offer the advantage of realism to Soldiers in medical training, which is especially important to Army Reserve Soldiers, who provide 68 percent of the Army's medical care. Here, SPC Dean Buetikofer (left) and PFC Gage McVicker, both health care specialist students, assess a simulated patient's vital signs while Medical Battalion Training Site Instructor SFC Christina Sisk controls the automated mannequin, June 12 at Fort Indiantown Gap, PA. The computer-controlled mannequins speak, breathe, and respond to treatment from the students. (Photo by SSG Shawn Miller, 109th Mobile Public Affairs Detachment)

The recent opening of the University of South Florida's Center for Advanced Medical Learning and Simulation (CAMLS) at Tampa General Hospital presented MG Robert J. Kasulke, Commander of Army Reserve Medical Command, with a unique opportunity to leverage cutting-edge simulation technology for his Soldiers.

The viability and logistics of incorporating CAMLS into medical training are currently being considered by U.S. Army Reserve Command Surgeon's Office and G-3/5/7. Ultimately, the additional opportunity and venue for medical Soldiers to sharpen their skills in combat medicine could pay dividends across the force.

Given that the Army comprises more than 1 million Soldiers and 68 percent of medical care is provided by Army Reserve Soldiers, "in order to maintain this high level of potentially lifesaving proficiency, medical specialists require consistent battlefield-focused medical training," Kasulke said.

Soldiers at all levels of their medical careers could benefit from CAMLS. The 90,000-square-foot facility offers surgical and interventional training, education, virtual patient care, and the Tampa Bay Research and Innovation Center.

The recent completion of CAMLS marks the beginning of a bold initiative to improve health care delivery by offering every possible opportunity for simulation-based education and training. This is particularly appealing to the military, because a facility that is 100 percent simulation-based allows leaders to build and tailor training to meet any requirement. For example, they could

LOOKING TO THE FUTURE

MG Robert J. Kasulke, Commander of Army Reserve Medical Command (AR-MEDCOM), examines a training mannequin during a recent tour of the University of South Florida's Center for Advanced Medical Learning and Simulation (CAMLS) at Tampa General Hospital. The U.S. Army Reserve Command Surgeon's Office and G-3/5/7 are looking into the viability and logistics of incorporating CAMLS into Army Reserve medical training. (Photo by MSG Enid Ramos-Mandell, AR-MEDCOM Public Affairs)

create a scenario based on Afghanistan, allowing trauma care teams and forward surgical teams to enhance and hone their skills.

"A significant amount of trauma-centric clinical knowledge, treatment protocols, and skill sets can be acquired through the use of what this program offers," said Kasulke. What sets simulation-based training apart from virtual training is how advanced—how high-tech and tactile—the mannequins are. "I tend to think virtual [training] is computer-based; this training allows a more hands-on approach," said Kasulke.

"You have the sensation of real skin tissue you can touch and feel as you reach your hand into a body, and the surgical suites can be tailored to mimic what the Army has in the field."

Dr. Deborah Sutherland, CEO of CAMLS, said the center's intent is to open the facility to the military for advanced medical training. "This facility allows training of health care professionals in a real-life learning lab," she said. CAMLS can be used seven days a week, depending upon availability.

According to Sutherland, CAMLS training, validation, and accreditation meet both civilian and military medical professional requirements in continuing education.

For more information, go to ***http://www.camls-us.org/****.*

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Welcoming a Couple of New Additions To the Trophy Case

2012 APEX® AWARDS FOR PUBLICATION EXCELLENCE

A Bronze Anvil and an APEX award

The U.S. Army Acquisition Support Center (USAASC) has recently won a Public Relations Society of America Bronze Anvil Award, recognizing outstanding elements in successful public relations programs, for *Army AL&T* Magazine, the flagship publication of the Army's Acquisition, Logistics, and Technology (AL&T) community. The Bronze Anvil Awards annually recognize outstanding tactics and elements that create successful public relations programs in multiple fields.

Army AL&T Magazine ALSO recently won a 2012 APEX Award for Publication Excellence. The award was given for excellence in graphic design, editorial content, and overall communications effectiveness. The APEX Awards for Publication Excellence, sponsored by the editors of Writer's Web Watch, are a competition for communication professionals who create print, Web, electronic, and social media.

USAASC's publications are available online at http://asc.army.mil

ASYMMETRIC TRAINING

PEO STRI weighs the possibilities and trade-offs in developing autonomous live fire target system

by Michelle K. García Gómez and James Todd

Former SMA Glen E. Morrell stated, "Training then—both good and bad—is habit-forming. The difference is that one develops the battlefield habits that win; the other gets you killed." To extend this thought, static and linear training prepare only for static and linear conditions.

In a world driven by asymmetric conditions, static and linear training translate to a readiness gap for Soldiers facing adverse, unpredictable circumstances. Within the Army's live fire training environment, this gap is evident in the limited (static and linear) target training systems used to prepare Soldiers, from weapon familiarization to maneuver and tactics, from basic marksmanship to advanced sniper training. This gap is defined by the inability to represent an asymmetric threat independent of terrain and simulating escalation of force, actions and reactions, and group dynamics.

Based on feedback from training units, static position and linear-based rail moving targets provide Soldiers with an unrealistic and limited training, especially with respect to urban operations and escalation-of-force environments.

The primary issues lie in the targets' linear constraint of motion, which allows Soldiers to reliably predict the movement and future positions of the targets.

PERFORMANCE OBJECTIVES

To overcome these limiting conditions would require development of an autonomous live fire target system. The system technology would support a high-fidelity, immersive capability within the live training domain, providing a more accurate and realistic portrayal of individual-, group-, and vehicle-based threats.

The performance objectives for an autonomous live fire target system would include:

- Realistic convoy (with oblique angles of approach), escalation-of-force (featuring asymmetric behaviors and group behaviors), and close-quarters live fire training with trackless, nonlinear moving targets.
- A realistic behavior pattern, through implementation of Semi-Automated Forces (SAF) behavior models coupled with sensor and external data inputs.
- Real-time control for individual and group target representations.

LIVE-FIRE POWER

Maneuverability over a variety of improved and unimproved terrains, as well as in urban areas, is one performance objective for an autonomous live fire target system. Here, Soldiers of 4th Battalion, 118th Infantry Regiment (4/118) of the South Carolina Army National Guard engage targets after assaulting and clearing a trench system, during a platoon live fire exercise July 31at the Udairi Range Complex in northern Kuwait. (U.S. Army photo by SFC Raymond Drumsta, 4/118)

QUALIFYING ROUNDS
Soldiers of the 100th Missile Defense Brigade shoot down pop-up targets during the brigade's semiannual 9mm range practice at Fort Carson, CO, Sept. 3. The range consists of five tables in which Soldiers must hit 16 out of 30 targets to qualify. (U.S. Army photo by SGT Michael Cost)

- Maneuverability over a variety of improved and unimproved terrains, as well as throughout an urban area.
- An accurate, reliable system to score hits and near misses.
- A self-powered, ruggedized system that can survive the lethality of the live fire training environment.

In short, the system could allow for 3-D representations of either virtual or constructive training entities to be extended into the live fire training environment and act within an integrated training event. The system would be free to move, act, and react based upon the initial conditions, training focus, and changes in either the live, virtual, or constructive training domain, making each event unique and ensuring a greater variety of training. This would also help avoid the negative training associated with on-deck Soldiers gaining insight into the targets' locations and behaviors before they start the exercise.

TECHNOLOGY FOCUS

There are multiple underlying challenges to achieving these performance requirements for an autonomous target system.

The core technology focus for an autonomous target system would be on achieving adaptive individual, group, and vehicular behaviors. This focus should seek to embed or integrate the autonomous target platforms with a SAF simulation model, allowing the target presentation to behave and react in line with the standard models while also allowing for various scenarios.

This synchronization would define the reaction behaviors and behavior probabilities as well as the difficulties and modes of operation to support different styles of learning. If the SAF models are run centrally, they could be used to create group behaviors and dynamics. If the SAF models are decentralized (on the target system), then a mesh communication system would have to be integrated to support the creation of group behaviors and dynamics.

A secondary focus would be on developing and integrating sensor arrays for ballistic proximity and hit detection as well as obstacle identification and avoidance. The ballistic sensors would be used to define the targets' behavior for near-miss events, determine the lethality for hit events, and generate valuable after-action review data. By contrast, the obstacle avoidance sensor would be used primarily to allow the target system to move autonomously in a training venue and in conjunction with other autonomous systems. This would be required to increase realism and meet safety requirements, including concerns regarding ricochet, tripping, and other factors.

The autonomous target system would also require a mechanism to track its geoposition, for internal use or reporting purposes. These data would be synchronized with terrain map and/or other tracking technology to allow for direct manipulation of the autonomous target system virtually, using real-time controls.

POSSIBLE SOLUTIONS

The technologies required for an autonomous target system exist today; the challenges lie in the integration, protection, and affordability of the solution, posing a dilemma of trade-offs. The more technology is integrated into the solution, the more protection will be required, and the more the system will cost. Inversely, attempts at a more cost-effective solution are likely to come at the expense of multiple performance and survivability requirements; thus an affordable solution may be lacking in both protection and performance.

A quick market survey shows that multiple solutions are readily available, but they generally represent one of the three dilemmas noted above. One high-end solution meets the protection and function requirements but is unaffordable, for either immediate

procurement or sustainment, given current funding constraints. There do exist several lower-end solutions; while affordable, these systems lack the adaptive and group behaviors, as well as the required sensor arrays, needed to stimulate reactive behaviors. A great but unaffordable solution is about as meaningless as an affordable solution that does not provide adequate training.

Therefore, the solution will have to strike a balance capturing most of the adaptive functionalities at a low per-unit cost. This optimal autonomous target system would provide an abstraction of real-time control functions to a centralized processor, a simplistic real-time radio control motor, and a simple array of hit/miss detection and obstacle avoidance sensors. A significant challenge still to be considered with the optimal solution, as well as the existing systems, will be related to radio frequency allocation and bandwidth use for real-time control of the targets; this challenge will only intensify as the number of deployed autonomous target systems increases.

CONCLUSION

A truly autonomous target system would allow for scaled training events, taking into account individual differences in learning style, experience, knowledge, skills, and readiness in a small-unit environment while providing accurate, realistic feedback through movements, representation, and engagement behavior (acting and reacting based on trainees' actions). The autonomous target system would also provide dynamic, nonlinear, and asymmetric training, resulting in a higher level of preparedness, readiness, and survivability.

Overall, the autonomous target system would provide Soldiers with more realistic training in open-air live fire conditions, and the unpredictability of the target system would drive more adaptive learning. Moreover, each training event would result in new and fresh objectives that would better support live fire training for individuals and teams. These events also would support enhanced after-action reviews and reporting by proving a highly adaptive, high-fidelity, immersive training system.

To prepare for dynamic and nonlinear conditions, Soldiers must have dynamic and nonlinear training. Autonomous target systems would provide the "good" training that develops battlefield habits that win.

For more information, send inquiries to ***TargetMod@us.army.mil.***

STATIC TARGETS

An autonomous live fire target system would provide Soldiers with more realistic training in open-air conditions, and the unpredictability of the target system would drive more adaptive learning. Here, a Soldier conducts marksmanship training with static distance targets at Fort Eustis, VA. (U.S. Army photo by James Todd, Program Executive Office Simulation, Training, and Instrumentation)

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The FUTURE *of* COUNTER-RAM

Army missile and gun development enhances the current force and enables the future force with cutting-edge engineering

by C. Stephen Cornelius and Loretta Painter

The Army has always required protection against enemy indirect-fire rocket, artillery, and mortar (RAM) attacks. Today we have the capability to protect Soldiers well beyond what was even dreamt of decades ago.

Our Soldiers stationed around the world, conducting missions from warfighting to stability operations, from remote forward operating bases (FOBs) in the mountains of Afghanistan to the Demilitarized Zone, use a rapidly assembled and mobilized system composed of detection sensors, alarms, and a ground-based version of the U.S. Navy's MK 15 Phalanx Close-In Weapons System to counter RAM threats.

Now the Office of the Deputy Assistant Secretary of the Army for Research and Technology has initiated a technology development program for a next-generation counter-RAM (C-RAM) system that could provide greater lethality across an expanded area of coverage, a reduced footprint, and a smaller logistics burden in terms of cost, size, and transportation requirements.

Engineers in the U.S. Army Research, Development, and Engineering Command (RDECOM) are developing technologies to intercept RAM threats in mid-flight before they can affect our Soldiers on the ground, in a program called the Extended Area Protection and Survivability Integrated Demonstration (EAPS ID).

SPLIT-SECOND ENGINEERING

In the time it takes to read this sentence, a RAM attack on U.S. Soldiers dug in at a remote FOB can begin and end with destruction, injury, and maybe death. In the blink of an eye, the incoming rounds must be detected, a decision made to fire, and the counterattack initiated; a fast interceptor. moving up and out, is needed to meet and destroy the incoming threat.

Such is the complexity of the engineering challenge taken on by RDECOM's U.S. Army Armament Research, Development, and Engineering Center (ARDEC) and the U.S. Army Aviation and Missile Research, Development, and Engineering Center. To accomplish our goal, the

COMMAND GUIDED INTERCEPTOR
The Command Guided Interceptor is one of three very different concepts being developed and demonstrated under the Extended Area Protection and Survivability Integrated Demonstration (EAPS ID) program. Here, LTG Keith C. Walker (left), Deputy Commanding General, Futures and Director, Army Capabilities Integration Center (ARCIC), U.S. Army Training and Doctrine Command; BG(P) Robert M. Dyess Jr., Director, Requirements Integration Directorate, ARCIC; and Dr. Charles Lind, Chief of Staff, Program Executive Office Missiles and Space, receive a briefing on the interceptor from Paige Walker, Protection Capability Area Lead for the U.S. Army Aviation and Missile Research, Development, and Engineering Center (AMRDEC), Feb. 15 at Redstone Arsenal, AL. (U.S. Army photo by Merv Brokke, AMRDEC Public Affairs)

RDECOM team is collaborating with industry, academia, and the Army's program managers to develop, mature, and transition technology that can enhance the current force by arming Soldiers with reliable, flexible, and affordable technology vastly superior to what is currently deployed.

The EAPS ID program will improve the acquisition, tracking, discrimination, engagement, and defeat of RAM threats through the development of missile- and gun-based technology, which ultimately will be transitioned for use by the Indirect Fire Protection Capability Increment 2 – Intercept, one of the first new starts under the *Weapon Systems Acquisition Reform Act of 2009*.

PROGRAM PARAMETERS

Teamwork is very important in this undertaking. It began by working with the program managers and Soldiers who eventually would use the new systems. It was vital for us to understand the Soldiers' requirements so we could transform the requirements into engineering solutions.

Before starting the EAPS ID program, we worked closely with our air defense stakeholders to define and refine performance goals from the warfighter's

MINIATURE HIT-TO-KILL INTERCEPTOR

Heidi Shyu, Assistant Secretary of the Army for Acquisition, Logistics, and Technology, inspects the Miniature Hit-to-Kill Interceptor, one of the three concepts being developed and demonstrated under the EAPS ID program, Nov. 10, 2011, at AMRDEC, Redstone Arsenal. With Shyu were MG Larry D. Wyche, Deputy Chief of Staff for Logistics and Operations, U.S. Army Materiel Command, and Gabriel Camarillo (right), Special Assistant to Shyu. (U.S. Army photo by Merv Brokke, AMRDEC Public Affairs)

perspective, then translate those into system architecture and component design goals that engineers could use to develop a significantly improved capability. A map exercise at Fort Bliss, TX, in 2006 helped define kill range, kill rate, ammunition cost per kill, stored kills, and required lethality to defeat RAM, providing insight into potential system requirements.

Affordability and feasibility of manufacturing have also been key early considerations for the EAPS ID team. In FY06, the ammunition production cost-per-kill of the fielded C-RAM capability

ENGINEERS IN THE U.S. ARMY RESEARCH, DEVELOPMENT, AND ENGINEERING COMMAND ARE DEVELOPING TECHNOLOGIES TO INTERCEPT RAM THREATS IN MID-FLIGHT BEFORE THEY CAN AFFECT OUR SOLDIERS ON THE GROUND.

was $16,000. For the EAPS ID program, this was the nonnegotiable goal, and so a team was established to work with the contractors on reducing manufacturing costs to achieve it.

The cost-per-kill goal has been the basis for many of the decisions and designs on each of the concepts in the EAPS ID program.

Other EAPS ID program goals and resulting designs focus on additional benefits:

- An increase of up to 18:1 in stowed kills per platform.
- A 45:1 reduction in ammunition weight per engagement, at comparable cost.
- A 4:1 reduction in transport load-outs.
- A smaller footprint and significant reduction in manpower, vehicles, and other ground support equipment.

Improvements over the current system include 360-degree hemispherical protection at a greater effective range, from 3 to 10 times the current capability, at a cost per kill no greater than that of the current C-RAM capability.

Technology improvements being developed within EAPS will enable the future system to have a reduced tactical footprint and smaller logistics burden.

THREE SYSTEM CONCEPTS

Three very different concepts are being developed and demonstrated in near-tactical configurations under the EAPS ID program: a Command Guided Interceptor, a Miniature Hit-to-Kill Interceptor, and an Auto Cannon Command Guided Projectile. Other battle elements of the architecture, including fire control sensors and technical fire control nodes, are being developed for each concept.

Field demonstrations began in FY12 and are scheduled to conclude in FY15.

With the **Command Guided Interceptor**, surveillance radars scan an area of operations on watch for an attack. When incoming objects are detected and determined to be a threat, a state-of-the-art fire control radar is cued to begin precision tracking of the threat.

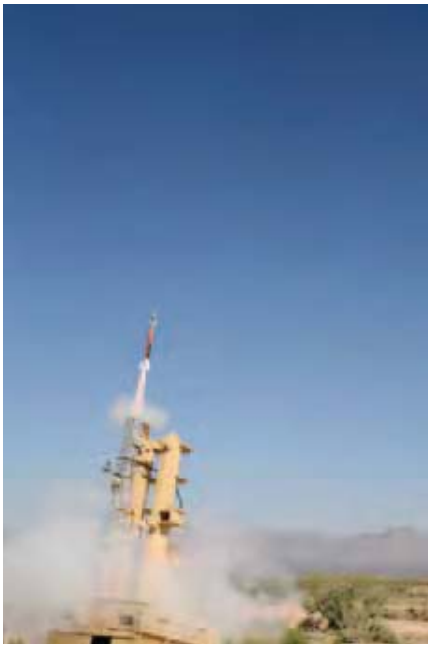
The technical fire control node calculates an engagement solution and commands an interceptor to launch. Designed to launch vertically, then quickly pitch over toward the threat, the Command Guided Interceptor is able to defend against attacks from any direction.

The system is approximately 60 inches long and less than 5 inches in diameter, and weighs about 70 pounds. The objective launcher for defense has numerous interceptors stowed in a launcher, allowing multiple missiles to defend against attack from multiple threats in the air at one time.

Once interceptors are in the air, the fire control sensor tracks both missiles and threats simultaneously. To achieve the cost-per-kill goal of the EAPS program, the idea behind the Command Guided concept is to leave the more costly battle element "smarts" on the ground and keep the complexity and cost of the expendable interceptors low.

The Command Guided concept does not have a seeker onboard, but rather relies on the technical fire control node to transmit fire control sensor track data to the interceptor. The interceptor performs onboard calculation of guidance corrections, steering the system toward the target.

The interferometry or interferometric radar technology of the sensor provides highly accurate measurements of the interceptors and small RAM threats. Interferometric technology has been used in astronomy and oceanography to map objects at long distances. The Command Guided concept is taking this technology



TEST MANEUVERS
The Miniature Hit-to-Kill Interceptor was launched vertically and then conducted a series of maneuvers to demonstrate required performance while capturing data, during tests in May at White Sands Missile Range (WSMR), NM. (Photos by Michael A. Smith and Louis A. Rosales, WSMR Electronic Documentation Branch)

TECHNOLOGY IMPROVEMENTS BEING DEVELOPED WITHIN EAPS WILL ENABLE THE FUTURE SYSTEM TO HAVE A REDUCED TACTICAL FOOTPRINT AND SMALLER LOGISTICS BURDEN.

in a new and novel direction by bringing it to the battlefield.

Once guided to the target, the interceptor's onboard proximity fuze detects when the threat is near and initiates detonation of a forward-firing, blast-fragmenting warhead. The blast and the metal fragments impacting the RAM threats work together to effectively neutralize the threat.

The **Miniature Hit-to-Kill** Interceptor (MHTK) missile-based concept has the same basic set of battle elements as the Command Guided concept: fire control sensor, technical fire control node, and interceptor. Vastly different, however, is the way the MHTK concept implements the interceptor and sensor elements.

The MHTK emphasizes affordability and miniaturization of interceptor components to achieve the program's stringent cost goals. As its name indicates, the system is approximately 2 feet long and 1.5 inches in diameter, and weighs approximately 5 pounds at launch. This fast-flying miniature interceptor destroys the RAM threat with kinetic energy, imparting a powerful direct-hit, body-to-body impact in lieu of using an exploding warhead.

A surveillance sensor identifies a threat and, through the tactical fire control node, cues the fire control sensor to pick up track. Though threat tracking is a function of the sensor, its most important function is to "illuminate" the threat with a radio frequency (RF) beam. Instead of eyes detecting visible light, the MHTK interceptor is equipped with a miniature, semiactive RF seeker that can "see" the target because of the RF energy it reflects.

The tactical fire control node calculates a fire solution and commands the interceptor to launch. The interceptor receives commands from the ground to guide it to the vicinity of the target. When the interceptor is nearing the target, the RF seeker begins operation by "opening its eyes," looking for the energy reflected by the target. The seeker picks up on the reflected energy and begins tracking the target, whereupon the interceptor takes over responsibility for calculating its guidance commands. The highly accurate target tracking provided by the RF seeker provides the precision required to accomplish a direct hit on the RAM.

A successful initial flight test of the MHTK interceptor was demonstrated May 26 at White Sands Missile Range, NM.

The **Auto Cannon Command Guided Projectile**, a gun-based concept, includes twin 50mm Bushmaster automatic cannons mounted to a 360-degree slewable turret and capable of firing 400 rounds a minute.

AUTO CANNON COMMAND GUIDED PROJECTILE
A 50mm projectile exits the muzzle of the 50mm Auto Cannon Command Guided Projectile, one of three concepts being developed and demonstrated under the EAPS ID program, during ballistic test firing at Yuma Proving Ground (YPG), AZ, in January. (Photo by Ryan Hyatt, YPG)

The concept, given the auto cannon's high rate of fire, is to intercept and destroy incoming RAM with a short salvo burst of up to 10 projectiles per threat. Each of the projectiles is command-guided and -detonated.

During an engagement, the EAPS ID fire control sensor receives a cue from a surveillance radar, tracks the incoming threat, aims the guns to an engagement point, fires up to a 10-round burst from the two cannons, and tracks the outgoing projectiles while continuing to track the incoming target.

As the 10-round burst converges around the target, the EAPS ID fire control system calculates the miss distance for each projectile and, if necessary, commands each interceptor to execute a midcourse flight correction.

When the projectiles approach the target, each warhead is individually commanded to detonate, hitting the threat target with lethal, high-velocity penetrators and causing it to break up or explode.

The course-correcting capability reduces the required burst size from several hundred interceptors to 10 or fewer, reducing collateral damage and unexploded munitions while extending the protected zone and increasing the probability of threat intercept.

CONCLUSION

Upon completion of the program, requested EAPS component technologies, integrated design concepts, and documentation will be transitioned to the materiel developer, the Cruise Missile Defense Systems Project Office of Program Executive Office Missiles and Space, in support of a Milestone B decision.

The EAPS missile-based technologies will provide protection from RAM attack at ranges up to 10 times greater than the current C-RAM system, and EAPS gun-based technologies will provide improved defense at ranges up to three times greater. This increase in lethal range, combined with the capability to provide the needed 360-degree hemispherical coverage, translates into a 25:1 increase in defendable area.

Imagine a bullet hitting a bullet in the blink of an eye. What once was not even conceivable is now becoming a reality, thanks to a team of RDECOM engineers and their partners in the Fires Center of Excellence at Fort Sill, OK; the project office; industry; and academia.

Soldiers set a high standard for us to meet. Our mission is to enhance the current force and enable the future force through collaboration and cutting-edge engineering.

For more information, contact Merv Brokke, AMRDEC Public Affairs Officer, at ***mervin.e.brokke.civ@mail.mil*** *or 256-313-5742; or go to* ***http://www.redstone.army.mil/amrdec/****.*

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ADVANCED PROTECTIVE STRUCTURES

Modular systems meet deployed Soldiers' demands for quick assembly, portability, and versatility

by Pam Kinnebrew and Dr. Jerry Ballard

Soldiers at combat outposts want force protection technologies that they can assemble rapidly without heavy equipment, are lightweight, provide protection from various threats, and are mobile. Although this sounds like science fiction, it is now an engineering reality that is saving lives.

Researchers with the U.S. Army Corps of Engineers' research organization, the U.S. Army Engineer Research and Development Center (ERDC), developed and are continuing to refine and improve the Modular Protective System (MPS) for use at forward operating bases and combat outposts. This system consists of an expandable metal frame that holds high-performance panels constructed of high-strength concrete and E-glass fibers.

RAPID DEVELOPMENT

The initial criteria for developing the MPS were far-reaching, but they were based on what Soldiers in theater were asking for: a lightweight, man-portable protective wall system. No construction assets should be required to emplace the system, allowing it to be used in austere combat environments. Also, it should offer protection from a wide range of threats, such as direct and indirect fire, shoulder-fired rockets, and even explosive charges, including vehicle bombs. It should be recoverable and reusable.

Soldiers wanted this fast. Work began on the MPS concept in FY05. At the time, most protective measures were high-mass, high-logistics soil berms, revetments, or concrete barriers, including Hesco structures. These structures took time and heavy equipment to build, and once built, they were not moving.

Because Soldiers' lives were at stake, researchers fast-tracked the MPS effort; improvements were identified quickly and incorporated into evolving designs.

Validation tests on the panels and the system concept, including numerical modeling and explosive experiments, proved the capability of this technology, and in 2008, the first MPS protective wall was fielded in Iraq.

Each wall section (8 feet by 10 feet) could be assembled by four Soldiers in about 15 minutes without special tools. The initial MPS provided quick, high-level protection for units operating without heavy equipment assets. Also, when a unit moved, it could easily take the MPS components for reuse at the next location. This version of the MPS got great reviews, but Soldiers and Army researchers wanted more—more capabilities, more protection, and more MPSs.

ADAPTABLE FORCE PROTECTION

U.S. Soldiers are well-known for adapting items on hand in the field to solve problems. Army researchers have the same heritage. It was not long before ideas were being developed in the field and in the labs for using MPS beyond perimeter wall protection. The modularity of the MPS technology—expandable frames, sliding panels, and sectional

A VALUABLE DEMONSTRATION
The Modular Protective System Overhead Cover (MPS OHC) was a key part of the Deployable Force Protection Program demonstration at Fort Polk, LA, in April, with static mortar rounds exploded on top of it. (Photos courtesy of U.S. Army Engineer Research and Development Center)

PROVEN CAPABILITY
Soldiers fire away from an MPS mortar pit in eastern Afghanistan.

components—soon had people referring to MPS as the "Legos" of force protection. This nickname proved accurate.

Command posts and similar high-value assets have always been targets for mortars and other threats. ERDC researchers soon started adapting MPS components to provide Overhead Cover (OHC) protection for such assets.

Another round of initial design and validation experiments, again using both numerical models and blast experiments, helped refine and prove the MPS OHC kit system. Researchers optimized the design components, the methods to construct OHC using MPS, connection of the MPS OHC components to MPS side wall protection, and how to package the kit in shipping containers to ease transportability.

Researchers and Soldiers were also looking at additional vulnerabilities at forward bases, specifically mortar pits, guard towers, and entry control points. From past experience and previous attacks, vulnerable combat outpost areas that are critical to force protection and military operations were examined for possible MPS applications. Again, the key requirements were light weight (helicopter-transportable), rapid construction with no heavy equipment (hours instead of days), and increased protection.

An initial MPS mortar pit kit was devised that went through the same quick validation processes as the OHC system. Researchers also started working on MPS Entry Control Point designs and a "pop out of the box" guard tower design. MPS was living up to its "Lego" moniker.

DEMONSTRATIONS LEAD TO FIELD USE

As these new MPS designs were being developed, technology transition efforts were ongoing at various levels, from high-level Army officials to the Engineer School to briefings for deploying engineer units.

One of the biggest technology transition linkups was with the Deployable Force Protection (DFP) Program. This high-profile, multiservice force research program is promoting promising emerging passive and active protection technologies for use by Army, Navy, Marine Corps, and Air Force units.

Through the DFP Program, the Army conducted a very successful demonstration of force protection technologies in September 2011 in cooperation with the Joint Readiness Training Center (JRTC) at Fort Polk, LA. At that demonstration, both an MPS OHC and an MPS mortar pit were constructed in a simulated combat outpost setting. As part of the

EXPLOSIVE PROTECTION
The OHC configuration is subjected to an explosive test to validate its protective performance.

A FIERY TEST
The MPS wall, with a pre-detonation screen, survives a hit by a rocket-propelled grenade.

DEPENDABLE SAFETY
The first MPS OHC structure in theater was constructed in June.

demonstration, statically placed mortar rounds were detonated directly on top of the OHC and within 20 feet of the mortar pit. A rocket-propelled grenade (RPG) was also fired at an MPS perimeter wall with a detonation screen in place.

These "explosive" demonstrations provided graphic visual proof of the success of the MPS technologies. The occupied space beneath the OHC was protected and survivable; the interior of the MPS mortar pit was not pierced by any fragmentation, and with the pre-detonation screen in place, the interior MPS wall was not punctured by the RPG.

Not only did the DFP demonstration highlight MPS force protection for DOD officials, but it also garnered additional attention and support from the JRTC staff who train brigades before they rotate into theater. JRTC officials were training a brigade of the 82nd Airborne Division for deployment into Afghanistan and suggested that MPS OHC and mortar pits would provide great additional protection for the units.

The 82nd agreed, and ERDC researchers provided initial training to the Soldiers in January. ERDC also facilitated the limited user assessment of four MPS mortar pit kits, each self-contained in one shipping box, and one OHC kit self-contained in three shipping boxes, and transport to theater. The mortar pits were constructed in theater by the 82nd in April and May, and the OHC kit was constructed in June.

An ERDC Army officer working on force protection research and development also deployed with the 82nd to assist with the initial installation of the mortar pits and to conduct field assessments of how the systems worked in theater. The officer gathered feedback on the MPS technologies from the end users, the Soldiers. The 82nd's warfighters liked the systems, which were easy to put up; they liked the MPS utility where there is a lack of engineer support or heavy equipment; and, most important, they felt safer.

ERDC is sending another MPS OHC kit to theater that is slightly larger (with the 20-foot span increased to 27½ feet, after modeling verification) for another protective application.

A second DFP Program demonstration of new force protection technologies was conducted in April, with the support of the JRTC at Fort Polk. In addition to new sensor technologies and MPS OHC and mortar pits, MPS designs were demonstrated for a personnel inspection lane and an MPS guard tower that is self-contained and deployable from a single shipping container.

In addition to static mortar rounds exploded on top of the MPS OHC and near the MPS mortar pit, a simulated vehicle bomb was detonated by an MPS perimeter wall, and a simulated person-borne explosive device (a "suicide" vest) was detonated in the MPS personnel inspection lane design. Again, the MPS components provided successful protection for these threats.

LOOKING TO THE FUTURE

ERDC is working with Army acquisition organizations to make the MPS kits more readily available to units deploying or already in theater. All of the MPS wall components have National Stock Numbers (NSNs) and can be ordered through the Defense Logistics Agency. There are also MPS wall kits with enough material for a wall 8 feet high and 45 feet long.

The MPS mortar kit components recently received NSNs, and ERDC is pursuing NSNs for the MPS OHC components.

THE KEY REQUIREMENTS WERE LIGHT WEIGHT (HELICOPTER-TRANSPORTABLE), RAPID CONSTRUCTION WITH NO HEAVY EQUIPMENT (HOURS INSTEAD OF DAYS), AND INCREASED PROTECTION.

The MPS OHC and MPS mortar pits will soon have an NSN for the individual kits. ERDC researchers continue to hone and refine the MPS capabilities and performance. Efforts will continue to focus on ease of use, lighter weight, rapid construction, and enhanced protection. Recent tests have included vehicle impact tests to simulate ramming by the enemy. Current and future designs using the MPS concept for force protection will be improved and standardized for Soldier use. Other ERDC efforts in force protection design are also available now for Soldier use.

TOWER VIEW
The MPS guard tower is self-contained and deployable from a single shipping container.

The *Joint Forward Operating Base (JFOB 6) Handbook* was released in October 2011, and more than 9,500 copies have been distributed. The *Small-Base Entry Control Point Guide* CD was released in August 2010, and a hard copy was released in May with more than 20,000 copies distributed to date.

These documents are widely available: The *JFOB 6 Handbook* (GTA 90-01-011) is on the Antiterrorism Enterprise Portal of Army/Defense Knowledge Online (AKO/DKO) at **https://www.us.army.mil/suite/page/591038**. *JFOB 6* also can be accessed at the AKO Army Engineer Professional Forum (click on "Documents and Videos") at **https://forums.army.mil/SECURE/CommunityBrowser.aspx?id=66001&lang=en-US**. The hard-copy *Small-Base Entry Control Point Guide* (GTA 90-01-034) is available at the AKO Army Engineer Professional Forum (click on "Documents and Videos") at **https://forums.army.mil/SECURE/CommunityBrowser.aspx?id=1741946&lang=en-US**; and the CD version is linked to the guide online (through the Army Training Network) at **https://atn.army.mil/media/docs/Small-Base_Entry_Contol_Point_Guide/index.html**.

CONCLUSION

As always, ERDC's force protection research is focused on saving Soldiers' lives. We are committed to providing protection in hours rather than days, lightweight technologies that can be air-transported into forward bases, and emerging technologies as they become available for immediate use in the field.

For more information, go to http://www.erdc.usace.army.mil/.

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STRENGTH THROUGH SUSTAINABILITY

On installations and contingency bases, technologies to unburden the Soldier

by Martin J. Savoie

To achieve the sustainability goals mandated by multiple national and defense directives, including net zero energy, water, and waste, Army installations face a complex set of challenges. Strategic decisions about which approaches to use and which technologies to adopt must be based on an integrated analysis at the community level. For example, a renewable energy technology may require a very high volume of water to operate, so while fossil fuel use can be reduced, it will hurt water conservation efforts.

Sustainability will bring numerous benefits, such as limiting reliance on foreign oil, reducing greenhouse gases, and ensuring environmental stewardship to sustain installations for future generations. From an operational perspective, a self-sufficient military installation means that Soldiers can continue to accomplish their missions in the event of a natural disaster or terrorist attack on the infrastructure.

Contingency bases will gain the same advantages by becoming sustainable, with an important added benefit: Conserving and producing energy on-site, maximizing water conservation, and reducing waste equate to fewer supply convoys required, eliminating risk for Soldiers and freeing them to focus on more mission-related tasks.

The U.S. Army Engineer Research and Development Center (ERDC) Construction Engineering Research Laboratory is involved in research and development (R&D) addressing all facets of sustainability. In partnership with other experts from government, academia, and industry, ERDC is on track to deliver products that will help installations and contingency bases meet sustainability requirements while improving Soldiers' quality of life.

Following are details of key initiatives in this arena.

SUSTAINABLE FIXED INSTALLATIONS

Toward net-zero installations: A new planning tool ready to be launched this year is the Net Zero Installations Energy (NZI-E) virtual testbed for energy analysis that generates optimal, life-cycle effective system configurations. NZI-E analyzes energy generation, reuse, and conservation strategies using nonlinear network energy models and clustering algorithms for identifying and configuring facilities with complementary energy consumption profiles.

Net Zero Installations Energy Waste and Water (NZI-EW2) builds on the NZI-E framework to support installation master planning for energy, water, and waste through an integrated modeling capability for optimizing resources.

To run NZI-E, an installation needs only to input information that already exists: geographic information system maps to show building types and uses, weather data, economic factors (utility rate structures, equipment installation and maintenance costs, fuel prices), and documentation for existing equipment. Once the data and facilities have been added to the program, baseline energy intensity and potential energy efficiency measure (EEM) packages are simulated. Cost/energy curves and savings-to-investment ratios (SIRs) are generated for EEM packages. Optimal EEMs are suggested for each building type, and load profiles are produced to pass to the next step for cluster analysis.

After the tool optimizes all facilities, the user can identify clusters of buildings suitable for district energy solutions. NZI-E then produces potential cluster equipment packages based on the installation and region. It also generates alternative equipment configurations, including centralized and decentralized options. The tool then determines and optimizes equipment and pipe sizes (electric, thermal, hydraulic) and performs economic simulations. It also calculates SIRs for clusters and EEMs.

The result is an integrated demand reduction and supply solution that provides the sizing along with initial and operating costs of every piece of equipment in the lowest-cost solution. In addition, installations receive a prioritized list of projects with suggested phasing plans.

Preventing energy losses through building envelopes: The airtightness of a building enclosure or envelope is a major factor in the building's overall energy consumption. Energy required to heat, cool, and control humidity increases significantly through uncontrolled air transfer through the enclosure as well as by convection.

An intact, continuous air barrier can reduce a building's energy consumption by as much as 45 percent, usually at little or no extra cost to a construction or

A HOLISTIC VIEW

The Virtual Forward Operating Base set of tools uses a holistic systems approach to planning sustainable contingency bases. (Photo by U.S. Army Engineer Research and Development Center (ERDC) Public Affairs Office)

INSTALLING SAVINGS
Properly installed continuous air barriers can reduce a building's energy consumption by as much as 45 percent. (Photo courtesy of ERDC)

renovation project. However, the lack of accurate simulation inputs for dynamic response material properties and complex multidimensional heat transfer in building envelopes precludes a high degree of confidence for implementing mitigation strategies.

In addition, innovative materials with the potential to improve building envelope insulation are available, but most have not been tested to determine their efficacy and service life as air barriers. Examples are phase change materials (PCMs), nanomaterials, aerogel insulation, and thermal bonding materials.

A multidisciplinary team at ERDC is addressing these issues. Products being developed are:

- Models and algorithms to quantify energy losses in building envelopes.
- Forecasts of the long-term thermal performance and durability of advanced materials.
- Three-dimensional modeling of thermal bridges.
- Dynamic heat transfer models for PCMs.
- A process for modeling mitigation strategies to reduce energy losses.

During the past year, the team has developed an initial set of two- and three-dimensional heat transfer models for each of the most common thermal bridge types found in Army facilities. The models were constructed using HEAT3 software based on previous thermography surveys at Fort Carson, CO, to estimate high heat loss locations, and building drawings (wall cross-sections, floor plans, window and door framing details, etc.).

Currently, these model scenarios are on a generic level, taking into account standardized Army facility building details to develop a catalog of thermal bridges. The catalog, whose development is in progress, will contain generic Army facility sections having thermal bridge data such as thermally relevant component dimensions and material properties, temperature contour profile with respective psi-value, and guidelines recommending best practices to avoid occurrence of thermal bridging problems.

On the materials side, the team is conducting accelerated testing of emerging insulation materials in the controlled conditions of ERDC's environmental chamber. These commercially available products include aerogel blankets, closed-cell spray polyurethane foam, extruded polystyrene foam, and fiberglass batts. Baseline testing on PCMs is underway, and during 2013, these materials will be subjected to thousands of phase change cycles to simulate 20 years of use and evaluate performance.

SUSTAINABLE CONTINGENCY BASES

The Army and Joint community do not currently have planning systems or processes to develop base camps as complete integrated systems. The ability to understand the interoperability characteristics of base camp component systems is lacking. This leads to problems with planning and design, construction, closure, operations, and management. To meet present and future Army mission needs, the ability to establish effective, efficient base camps will be critical.

Typically, base camp planning focuses on the strategic level, while tactical planning is ad hoc. Tactical planning needs to consider base camp siting and local environmental issues, holistic systems design and interrelationships, and mission type and duration. This will increase combat capability and flexibility and act as a force multiplier through effective and efficient use of all resources (personnel, material, equipment, and monies). The lack of a holistic systems approach wastes resources and reduces combat capability.

In tactical situations, wasted resources increase the burden on security and safety teams. Additional supplies are required, increasing the convoys, flights, and personnel (often local populations) needed to move and secure material and manage its storage on-site. These actions increase the vulnerability of the Army as well as Joint or Allied forces by allowing additional opportunities for enemy action.

To address these and other gaps, ERDC is working to create an adaptive system that provides a real-time virtual capability through a set of automated contingency base (CB) planning tools. ERDC has made significant progress in

developing the Virtual Forward Operating Base (VFOB™), an integrated modeling and analysis program that captures the complex adaptive behavior of a CB, providing a foundation for the fielding of base camp planning, design, and operations tools.

The first VFOB component ready for user evaluation is the Contingency Base Resource Calculator, a user input tool that captures and analyzes CB subsystem interrelationships and the associated inputs and outputs. The calculator tracks 12 characteristics, or "flows," within the CB camp: power, fuel, potable water, bottled water, storage area, personnel, gray water, black water, solid waste, food, maintenance, and area (facility type and footprint).

Those flows are then related across the facility types associated with each "build" of the CB. Camp size and facility types can be varied within the build types to the extent of the facilities included as a baseline, which affords enough flexibility to adequately represent the majority of potential camp builds.

ERDC is concurrently developing a resource "accounting tool" for CB planning, called VFOB-Lite, which will be part of the VFOB suite of tools. VFOB-Lite contains a graphical user interface that allows system types and/or components to be individually placed as part of a base camp virtual build. Each of these systems or components will have resource requirements assigned to them so that the resource needs of the entire camp can be determined based on the final design. This will provide an order-of-magnitude determination of the resource requirements for the CB's day-to-day operations.

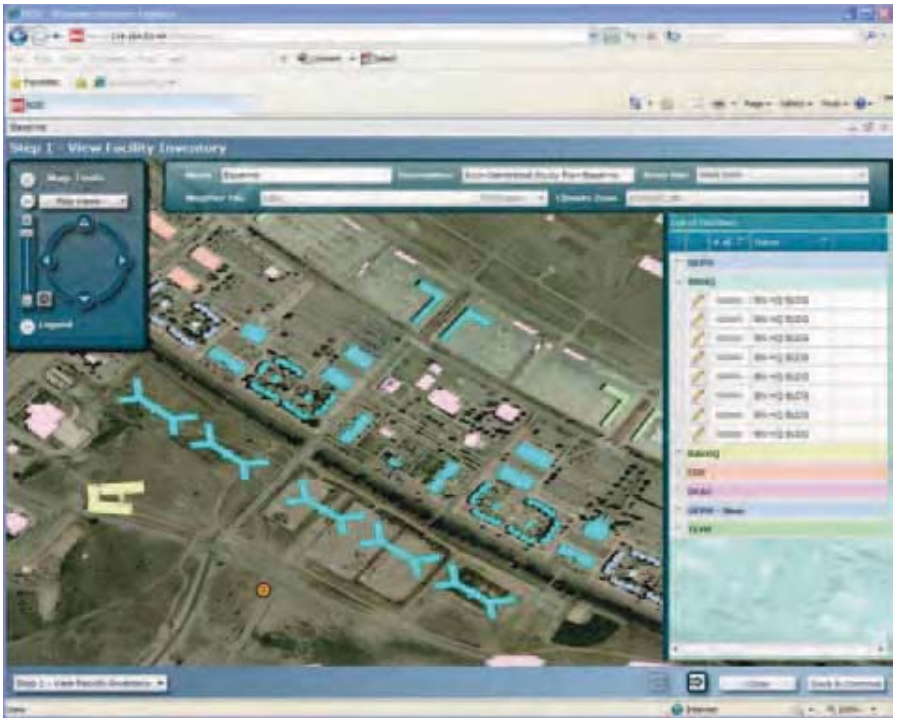
Another tool in the VFOB suite that is nearing initial completion is the power system model using OpenDSS, an open-source, script-based, comprehensive simulation tool for electric distribution systems developed by the Electric Power Research Institute. This tool can accurately model electric components, including generators, loads, line cables, transformers, loads, protection, and switches.

As part of the simulator development, ERDC has developed a user interface to automatically populate the OpenDSS script-based input feed, as opposed to manually entering lines of data. Testing of this simulator began this fall. Future development within the VFOB suite that is scheduled for 2013-15 includes a water systems model for potable, sanitary, and non-potable water; a waste management model; and a protection requirements model.

For more information, go to ***http://www.cecer.army.mil****.*

ANALYZING THE INVENTORY

The Net Zero Installations – Energy tool allows planners to optimize resources and use clustering to develop community-level analysis. (Image courtesy of ERDC)



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RESEARCH AND DEVELOPMENT, CLOSE UP

The U.S. Army Engineer Research and Development Center (ERDC) hosts many school science and engineering groups in its seven laboratories to highlight the critical impacts that research and development has on the Armed Forces and the Nation. Here, students from Vicksburg High School and Warren Central High School hear about scale-model projectiles that ERDC constructs in-house for various military research projects, at the ERDC Directorate of Public Works Machine Shop in Vicksburg, MS, March 28. (Photos courtesy of U.S. Army Corps of Engineers)

WORLD-CLASS WORKFORCE

Shaping an engineer research and development capability for an uncertain future

by Dr. Jeffery Holland

The Army science and technology (S&T) laboratories have a major and significant role in supporting the warfighter and the Nation. S&T enhance Army capabilities and will help prevent, shape, and win conflicts in an increasingly complex world.

Each research and development (R&D) organization and laboratory has specific core competencies and makes individual or collective contributions to technological improvements, but we all share some enablers and some challenges as we move into an uncertain future. Our number one asset now, and for the future, is a world-class team of engineers, scientists, and support staff. Army research cannot survive without retaining our current top-notch professionals while concurrently developing the next generation of scientists and engineers.

Army S&T Reinvention Laboratories operate under a variety of laboratory personnel demonstration programs that have helped us attract and retain some of the best science and engineering talent. Each personnel demonstration is unique to various laboratories and organizations; together, these initiatives have allowed laboratory directors great flexibility in shaping our individual workforces to meet our mission goals and future objectives.

BEST FOR SUCCESS

Every organization realizes the importance of its team members, and hiring and retaining top-notch scientists and engineers is critical for R&D. At the U.S. Army Engineer Research and Development Center (ERDC), the research organization for the U.S. Army Corps of Engineers, we recognize that our people are our major resource, and we are planning for two major social challenges in maintaining a world-class research workforce.

One, we are facing the retirement of "baby boomers" as our workforce ages. This is a challenge that DOD, other agencies, and even industry are facing as people, and their long-term expertise, leave the workforce. Some organizations are better prepared than others for this inevitability, but Army research organizations are not immune. Second, the number of American college students majoring in engineering and sciences is declining. This is having a major impact on our organizations, as we must compete with industry and other agencies for the best and the brightest among a dwindling number of graduates.

Every organization has recruitment efforts of various types and scope, and they achieve varying success. Army laboratories are no different. But almost all such efforts focus only on recruitment; not many go beyond that. Several years ago, ERDC realized that to be a world-class research organization now and in the future, we had to change our strategy. We had to focus not only on hiring the best, but also providing life-cycle career management. We had to become not only a hiring destination, but more importantly, a career destination.

THE NEXT GENERATION
ERDC has supported the USA Science and Engineering Festival in Washington, DC, as part of ERDC's Science, Technology, Engineering, and Mathematics program. More than 150,000 attended the three-day festival in 2011, where the busy ERDC booth demonstrated various research technologies.

To meet this new shift in career focus, we created a Human Capital Office charged with coordinating the design, development, and implementation of new processes across the full-career life cycle. The mission of this office includes strategic alignment for our organization and career support for employees from start to finish. This means recruitment, integration, development, performance management, succession planning, and even separation.

Our organization partners with experts across the spectrum of research to tap the best capabilities available. Human Capital was no different. We benchmarked 12 organizations to help us identify the essential elements needed to design and develop this new initiative. We then selected Watson Wyatt (now Towers Watson), one of the world's leading human resource development consulting firms, to help us set up the framework for this critical effort.

With Watson Wyatt's help, we realized several key items early on: Employees want and expect great careers and exciting work challenges. We also have to empower them to be involved with decisions affecting their entire career path. Because Human Capital is a life-cycle career effort, if one piece of the puzzle is missing or does not fit right, it will affect the whole effort. Most importantly, the Human Capital process takes commitment, both from the employees and from the research organization. It is a partnership in achieving our common vision: being one of the world's premier engineering and science R&D organizations by being a premier career destination.

CAREER FOCUS

Human Capital teams were formed within our workforce across employee and management lines. These teams cut across all positions and career levels: engineers, scientists, and support personnel; new hires, mid-career employees, and those nearing retirement. Our Senior Executive Service lab directors championed each team's efforts, but

the work of each team was a joint effort using the ideas and input of all members. Not only did this incorporate key input from across the workforce, it also aided in employee participation, buy-in, and communication.

Each team focused on one aspect of the career path. Team input and suggestions are being incorporated and implemented in our organizational actions across the board. The teams covered six career areas in Human Capital:

- **Recruitment**—how to attract the best and brightest personnel in our fields, and how to provide a work environment where they truly want to stay.

- **Integration**—assimilating new hires into the work life and culture so they can quickly succeed in their new positions. (First impressions are everything: Research shows that 90 percent of employees decide whether they will stay with their new organization within the first few months of employment.)

- **Development**—investing in education, training, and professional development. Just as no research organization can excel if it remains static, no scientist or engineer can excel if they do not learn and grow professionally from Day One in their career until they retire.

- **Performance Management**—a research-oriented performance culture that communicates the research mission and goals, and links them to individual and team performance.

- **Succession Planning**—continuous, regular assessments of key leadership positions and the readiness and interest of employees to compete for these positions. Not only must we define the competencies needed for such positions, we must also ensure that programs are in place for employees to develop and acquire these competencies and skills.

- **Separation**—tapping into the employees' experiences to determine what we can learn and do to improve careers for all employees, which in turn will help the organization as a whole.

Human Capital processes are helping us provide great careers, inspiring work environments, and collegial and

SETTING THE STAGE FOR SUCCESS

The ERDC Human Capital Office sponsors weekly new employee luncheons that cover a wide variety of topics, to help integrate new hires into the organization. Research shows that 90 percent of employees decide whether they will stay with their new organization within the first few months of employment. Here, the author talks informally with some of ERDC's newest team members.

supportive work relationships. Employees are seeing exciting new career possibilities in a family-friendly environment that is revolutionizing the way we act as an organization, as teams, and even as individuals. We are incorporating the entire Human Capital life cycle into our daily culture.

OUTREACH INCREASES

To increase youth science and engineering awareness, the Human Capital Office also consolidated much of our educational outreach. Not only did this increase our effectiveness, it also enlightened and involved our employees across the spectrum.

We designated funding within Human Capital to multiply and increase the effectiveness of our student outreach efforts. We are using a wide variety of programs such as Science, Technology, Engineering, and Mathematics (STEM) and other initiatives to reach students from kindergarten to college. ERDC has always been a strong proponent of STEM, annually hiring more than 300 students through our college student program. This past year, these students represented 30 states and 70 universities.

With Human Capital emphasis, we are improving our outreach. In FY11, STEM programs served 7,500 students and 200 teachers. In the first half of FY12, we have attracted more than 9,000 participants and are involving a larger number of our scientists and engineers from all

SERIOUS FUN IN SCIENCE AND ENGINEERING

ERDC supports a wide variety of science and engineering camps and student activities to foster vital research disciplines in our youth.

seven ERDC laboratories in four states. Human Capital is leveraging our outreach efforts and including a much more diverse cross section of employees in educational outreach that will certainly aid our organization, Army, DOD, and the Nation.

CONCLUSION

We will continue to emphasize Human Capital as the single most important thing our organization is doing. We think it is a key element as we strive to be a benchmark for excellence among R&D organizations. More importantly, we think the Human Capital efforts will help make ERDC a premier employment destination for engineers and scientists who want to solve tough challenges and have exciting careers.

EMPLOYEES WANT AND EXPECT GREAT CAREERS AND EXCITING WORK CHALLENGES. WE ALSO HAVE TO EMPOWER THEM TO BE INVOLVED WITH DECISIONS THAT AFFECT THEIR ENTIRE CAREER PATH.

Our Human Capital efforts were one of the key reasons ERDC received the 2011 Research and Development Laboratory Management Award from the U.S. Army Acquisition Corps.

It's not rocket science. It is recognizing that your people are the key to being a world-class research organization. It is supporting them through the full career cycle, putting processes in place to support them, getting their feedback, and making their career paths smoother, enjoyable, and fulfilling—basically just doing what is right for them and the organization.

We all want to do it, but the hard thing is committing to the process, supporting it for the long term, and getting buy-in by the organization, managers, and most importantly, the employees.

For more information, contact Dr. Peggy Wright, Headquarters, ERDC, Vicksburg, MS, at ***peggy.b.wright@usace.army.mil*** *or 601-634-3390.*

DR. JEFFERY HOLLAND is the Director of Research and Development and Chief Scientist for the U.S. Army Corps of Engineers and Director of the U.S. Army Engineer Research and Development Center. He manages seven laboratories located in four states, with more than 2,500 employees, $1.2 billion in facilities, and an annual program exceeding $2 billion. He has a B.S. in environmental engineering, from Western Kentucky University, an M.S. in environmental and water resources engineering from Vanderbilt University, and a Ph.D. in civil engineering from Colorado State University.

HEALTHY COMPETITION

To help foster science and engineering in our schools, ERDC supports science fairs with a multitude of judges, and sponsors awards to promote science, physics, engineering, and related disciplines.

BUILD. NURTURE. SUSTAIN.

Strengthening the Army's cadre of contracting professionals drives top priorities for new ACC leader

MG Camille M. Nichols became the first Commanding General (CG) of the U.S. Army Contracting Command (ACC) on May 17. Headquartered at Redstone Arsenal, AL, ACC is a major subordinate command of the U.S. Army Materiel Command (AMC). ACC has two subordinate commands: the U.S. Army Mission and Installation Contracting Command and the U.S. Army Expeditionary Contracting Command, along with six major contracting centers that support AMC's other major subordinate and life-cycle management commands.

Nichols previously served as Program Executive Officer Soldier, at Fort Belvoir, VA; CG, U.S. Central Command Contracting Command in Iraq; and as the first CG of the Expeditionary Contracting Command at Redstone Arsenal, AL. Nichols is a 1981 graduate of the U.S. Military Academy at West Point and has more than 20 years' experience in DOD acquisition.

Army AL&T *Magazine had the opportunity to ask MG Nichols about her perspectives on Army contracting and her priorities as ACC's first Commanding General. Here are her answers.*

ASSUMING COMMAND

MG Camille M. Nichols receives the flag of the U.S. Army Contracting Command (ACC) from GEN Ann E. Dunwoody, then Commanding General (CG), U.S. Army Materiel Command, May 17 at Redstone Arsenal, AL. Nichols, ACC's first CG, wants the command "to be recognized as the preeminent and extraordinary contracting organization in all of DOD." (Photo courtesy of ACC)

'BUYER, SOLDIER, GUARDIAN'

The motto on the ACC insignia reflects the command's responsibilities as the provider of global contracting support through the full spectrum of military operations.

Q. Please talk about your background and experience. How are they informing the way you approach leading the U.S. Army Contracting Command?

A. It is a great honor to be selected and serve as the first Commanding General of Army Contracting Command. I can honestly say that every job I have had as a leader and a staff officer has helped me prepare for the challenges and responsibilities of this command. Watching and learning from great leaders in the Corps of Engineers, my basic branch, being mentored and led by great leaders in the Acquisition Corps, and my recent time serving in *OIF* and *OEF* have provided the grounding and focus I need to take up the mantle of this great organization.

The men and women in the ACC make it easy to be their leader. They are dedicated, hardworking professionals who want our Army to be successful. With this great foundation, all they need from me is some guidance, resourcing, and top cover to execute our mission.

Q. ACC is a fairly new command, stood up in 2008. How has the office evolved in that short time? How does that set the stage for the ACC's next five years?

A. The Army Contracting Command has accomplished some amazing things since we first stood up in January 2008. Establishing a new command, staffing our workforce, and a move to our new location at Redstone Arsenal—completed less than a year ago—are a lot to accomplish in such a short time. This could be a challenge for any new organization. When I take a step back, I am blown away at the progress of this command and the positive energy of our workforce.

Their passion, strength, and commitment are a great foundation upon which we will make ACC a preeminent and extraordinary contracting organization. This is our goal for the next five years.

Q. ACC performs most of the contracting work for the Army. What percentage of Army contracts do you create?

A. For FY11, Army Contracting Command awarded 68 percent of the Army's contracting dollars. ACC awarded more than $85 billion of the Army's more than $125 billion contracting dollars.

Q. Could you talk about the Army's recent progress in building up the contracting profession? What would you say are the three greatest accomplishments in this area?

A. The Army has made tremendous progress in the contracting profession since ACC was established in 2008. We have grown our civilian workforce by almost 1,000 positions and expanded the Army cadre of military contracting specialists to nearly 800 officers and NCOs. The Army now has five general officers in contracting leadership positions, and we've established a special procurement course for all new Army brigadier generals.

Training continues to be a top priority. We have created an online proficiency guide for contracting officers, introduced an annual contingency contracting training exercise, and now provide our units with online contingency contracting training. Now that we have a leadership

THE MEN AND WOMEN IN THE ACC MAKE IT EASY TO BE THEIR LEADER. THEY ARE DEDICATED, HARDWORKING PROFESSIONALS WHO WANT OUR ARMY TO BE SUCCESSFUL. WITH THIS GREAT FOUNDATION, ALL THEY NEED FROM ME IS SOME GUIDANCE, RESOURCING, AND TOP COVER TO EXECUTE OUR MISSION.

structure in place, we are working closely with the Army Materiel Command to garner resources and provide guidance and procedures for consistent, transparent contracting operations. We need to mature this newly obtained military and civilian workforce into the contracting expertise our Army needs.

Q. In response to the Gansler Commission Report, the 2008 *National Defense Authorization Act* contained specific provisions for creating incentives and attracting and training high-quality personnel for the acquisition workforce. What is the Army currently doing to meet this goal?

A. Section 852 of the 2008 *National Defense Authorization Act* is a very important piece of legislation, because it established the Defense Acquisition Workforce Development Fund (DAWDF). Last year, the ACC executed $3.3 million in DAWDF funds to provide training for more than 5,800 civilians and Soldiers at more than 115 locations worldwide.

To ensure that ACC attracts the best and brightest to our civilian workforce, ACC participates in outreach events that target diverse populations. We have used the DAWDF funds to hire more than 900 intern and journeymen acquisition personnel since the legislation passed.

DAWDF funds have been used to develop curriculum and teach "boot camps" for our newly hired contracting personnel, contracting officer (KO) refresher courses, and professional skills training, including analytics, business writing, and critical thinking skills. Funds have been used to provide developmental assignments to our personnel to ensure expandability of skill sets.

Our goal is to develop subject-matter experts with the required technical and leadership tools needed to meet the Army's current and future contracting requirements.

Q. ACC has a Facebook page. How has your use of Facebook, and other social media in general, helped ACC with internal and external outreach?

A. ACC has a presence on several social media sites, including Facebook, Twitter, Google+, LinkedIn, YouTube, and Flickr.

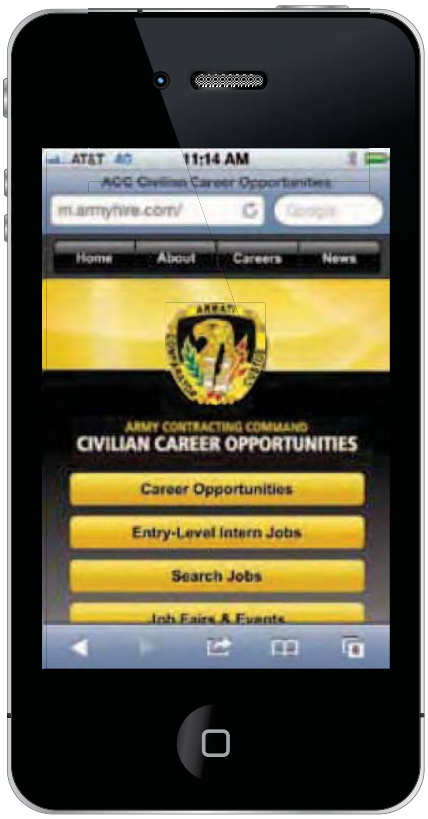
ACC is able to spread our stories to the general public, who may not otherwise know who we are or what we do, by utilizing the existing audiences of these popular websites. We use the sites to share our latest photos, make announcements, spotlight employees, and even provide live event coverage.

We've found that using social media sites has helped spread our internal message as well. Employees featured in stories, photos, or videos can easily share them with friends and family, further spreading the message and boosting morale.

One of the biggest challenges in any organization is communication. This is especially true for us, in that we are a global organization with a collection of various military and civilian skills in a dynamic and ever-changing rule set. So we reach out and across our organization through all modes of communication to reach everyone.

Recruiting is also a big piece of our social media initiatives. Although we have a dedicated civilian career website, **www.ArmyHire.com**, we also use social media sites to cross-promote vacancies and answer hiring questions.

Q. The contracting world and the acquisition world are very dynamic. What parts of your job do you find the most challenging?



GATEWAY TO SUCCESS

Actively recruiting people to career opportunities in ACC through a variety of means, including the Internet and social media, is a key part of the command's strategy for the next five years, said Nichols, who believes AAC's workforce is the foundation of its success.

A. The two biggest challenge areas we have in the ACC are having the capacity and competency in our contracting workforce to provide the expert contracting advice and solutions our Army needs. This takes adequate resources, manpower, and money.

We need to continue to build, nurture, and sustain a cadre of career Army contracting professionals, civilian and military.

THE ARMY HAS MADE TREMENDOUS PROGRESS IN THE CONTRACTING PROFESSION SINCE ACC WAS ESTABLISHED IN 2008. WE HAVE GROWN OUR CIVILIAN WORKFORCE BY ALMOST 1,000 POSITIONS AND EXPANDED THE ARMY CADRE OF MILITARY CONTRACTING SPECIALISTS TO NEARLY 800 OFFICERS AND NCOS.

ACC is continuing to work hard to make contracting a core competency within the Army. We have actively worked with the Army in developing an officer and NCO force of nearly 800 active-duty Soldiers who will help ensure that the Army maintains a professional, competent military contracting officer component of the Army Acquisition Corps.

Both our military and civilian workforce must have the tools and training to continue to develop within the Army acquisition career field. We are looking at a few different approaches on how to do this in a restrictive budget environment that may impact training funds. One initiative we are reviewing is a virtual mentor program that will match our junior employees with our senior contracting professionals. This is still a work in progress, but we are excited about the benefits it will provide our employees.

Other initiatives involve our Communities of Practice, which collect best-in-class solutions and advisors in various contracting functions who can guide our junior KOs and help them create better contract solutions by exposing them to approaches from our more seasoned experts.

Q. What sort of processes are in place to be responsive to the constant changes in mission and the demands of Congress?

A. The acquisition environment in which we operate has always been very dynamic. We've optimized our structure and capabilities so we are able to support both the operating forces and the generating forces and quickly respond to changes in mission sets and workload that our customers require.

We're implementing new tools and business processes that will give us greater visibility and capability to manage workload across the command and track the readiness of our workforce. These tools we call the Virtual Contracting Enterprise will also provide greater transparency to our customers so that they can become a full partner and team member and take proactive ownership of the contracting process as we execute the contracting functions for them.

Congress continues to require greater accountability and is one of the many external stakeholders that impact how we operate, and we will continually strive to the best of our ability to respond to its requirements and inquiries.

Q. Where do you want the ACC to be at its 10th anniversary?

A. To be recognized as the preeminent and extraordinary contracting organization in all of DOD. We want the public to know we are more than just paper pushers; rather, we are efficient and effective solution providers. If a Soldier shoots it, drives it, flies it, carries it, or wears it, ACC buys it. Our Army contracting professionals use sound judgment, diligence, and care in acquiring the best possible equipment and services for the Soldier. We are agile, proficient, and trusted—always vigilant in our use of taxpayers' dollars and implementing public policy.

Q. What would you like to see *Army AL&T* Magazine cover more of?

A. Two things: the essential role the requiring activities and our customers have throughout the entire contract life cycle; and more features on our contracting offices and our great employees. Too often, customers view the contracting function as the only element of importance, when in fact, defining the requirement properly is crucial to the success of any contracting process as well as monitoring the vendors' performance to make sure the Army is getting what it asked for and what it needed. Individual professionals define the contracting function and make the process work; I would like to see their efforts highlighted more.

For more information, go to ***http://www.acc.army.mil/today/****.*

PEO AMMUNITION

PM
Combat
Ammunition
Systems

PD
Joint
Services

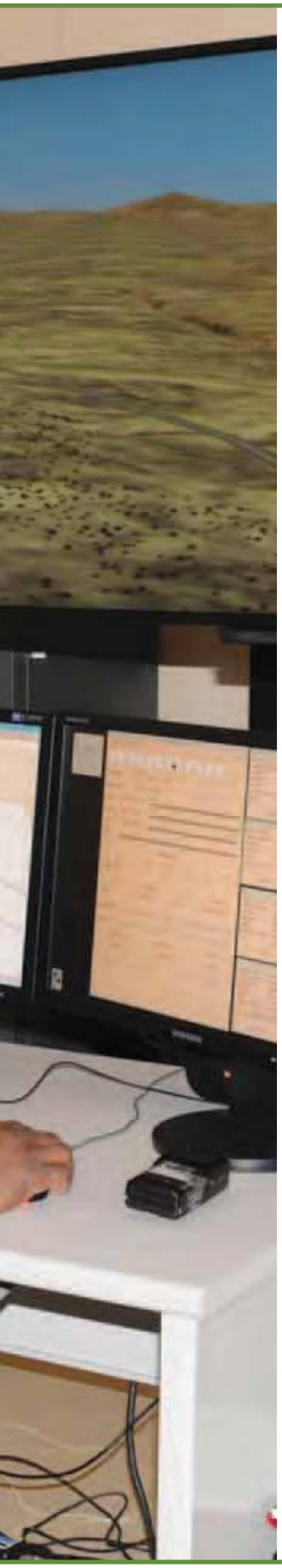
PM
Close
Combat
Systems

PD
Joint
Products

PM
Towed
Artillery
Systems

PM
Counter
Explosive
Hazard

PM
Maneuver
Ammunition
Systems



A FRAMEWORK *for* IT

ACC governance process aligns information technology requirements, resources

by Gino Magnifico and Larry D. McCaskill

In a vast organization loaded with information technology (IT), the U.S. Army Contracting Command (ACC) Chief Information Officer (CIO)/G-6 has the task of corralling the various information tools to ensure that they are aligned with the command's tasks and missions. This process is known as IT governance.

"Information technology governance is a method of ensuring that you have a requirement [and] the necessary funding to build or buy it, and to ensure it aligns with the overall plan and structure," said Adrianne Day, Chief, IT Governance, Program Management Office and Business Management in the Office of the ACC CIO/G-6.

"It's like deciding if you need a new washing machine and drier. Do you have a requirement, the need or desire, to replace the old or broken ones? What is actually wrong with what you have? What is the cost to replace them or fix them? Do you even have the budget to do either?"

The IT governance process is driven by the *Clinger-Cohen Act of 1996*, designed to improve the way the federal government acquires, uses, and disposes of IT, as well as by recent Office of Management and Budget, Government Accountability Office, and other federal mandates.

Day said the IT governance process is a necessary function within any organization and reaches well beyond the G-6. "G-6 is responsible for the IT governance process, but all of ACC will participate if they have IT requirements," she said.

PREPARING FOR MISSION SUCCESS

U.S. Army Contracting Command (ACC) personnel run a variety of simulations designed to mimic a joint operating environment during *Joint Dawn 2012*, a contingency contracting exercise conducted at Fort Bliss, TX, Jan. 19-Feb 3. The exercise, for which this was the third iteration, gives Soldiers experience in the use of information technology (IT) systems that they will use in the field. (U.S. Army photo by SSG Kristen Duus)

TRAINED AND READY WORKFORCE

IT governance affects every IT solution across ACC, from fielding to enhancements. Here, a Soldier checks the radio equipment in one of the vehicles used during *Joint Dawn 2012* at Fort Bliss, TX, Jan. 19-Feb 3. (U.S. Army photo by SSG Kristen Duus)

A PRIORITY-SETTING TOOL

"Introducing a standardized process to capture IT requirements helps an organization align to its strategic plan and helps an organization rack and stack IT requirements and fund the most critical ones first," Day said. "Essentially, IT governance is a way of providing visibility into the acquisition, use, and disposal of IT equipment across the command."

As funding is reduced across DOD, Day said the process will help decision makers in spending IT dollars on systems that do the most to ensure that the mission continues unhampered.

"Additionally, it gives ACC IT users a liaison or advocate for having their needs addressed at an enterprise level," Day said. "The process incorporates all the ad hoc processes and encapsulates them into one main process that allows a structure for capturing IT requirements and, if approved, a solution that can be delivered to the end user." (See Figure 1.)

GETTING THE WORD OUT

The IT governance process is now in effect. Day said that word needs to get out to the ACC workforce that its use is a high priority.

"The IT governance process consists of four boards that each requirement must go through to ensure that the requirement ultimately aligns with the ACC strategic plan. It has a start and completion [and] is then handed off to a team that will either extend, build, or buy a solution and then deliver that solution to the customer," she said.

The governance process is based upon a three-tier structure that optimizes business across all ranks, Day said. Those tiers are executive leadership, G-6, and users.

"The executive leadership is the mechanism to gain insight and inject foresight into the acquisition, use, and disposal of IT. The G-6 generates, integrates, communicates, and controls the IT life-cycle management process and data, to include program financial management. Users have a voice for their IT needs, and the process is their liaison and advocate into the G-6," Day said.

The governance board also leverages the roles and relationships of ACC's parent and subordinate commands. Each provides specific services to drive IT governance efficiency and effectiveness.

IT Governance Core

Figure 1

ACC's IT Governance process is at the core of its IT Enterprise Service Model, capturing the standardized life cycle that the G-6 applies to the products and services provided to the ACC Enterprise. From conception, through implementation, to optimization, the ACC IT Enterprise Service Model takes the requirements of ACC and evolves them into enterprise capabilities. (SOURCE: ACC CIO/G-6)

CONCLUSION

Day said that by streamlining the requirements processes, IT governance is helping ACC leadership assess the current portfolio for opportunities to standardize and optimize IT.

"It also helps us recognize and manage the risks, constraints, and return on investment of other IT service strategies, and implements a centralized, enterprise-wide IT forecasting capability and capital investment decision framework," Day said. IT governance "also allows us to inject innovation into the business of acquisition for the Army, and provide a strategic alignment of IT investments with ACC's business objectives and the Army's strategic vision for IT."

"Ultimately, this process will ensure that customers receive a solution for their requirement," Day said. "It's important to understand that governance drives and affects every IT project across ACC. It is the key to fielding, satisfying, and enhancing all IT solutions to needs across the enterprise, the cornerstone to a fully optimized ACC IT service model."

For more information, go to ***www.acc.army.mil.***

GINO MAGNIFICO serves as the U.S. Army Contracting Command (ACC) Chief Information Officer. An Air Force veteran, Magnifico has a B.A. in business management from Peru State College and a Master of Political Science from Auburn University at Montgomery.

LARRY D. MCCASKILL is Senior Command Information Officer in the Office of Public and Congressional Affairs at ACC, Redstone Arsenal, AL. He is a U.S. Army veteran and a graduate of Queensboro Community College and the Defense Information School.

LEADING IT GOVERNANCE

Adrianne Day, ACC's Chief of IT Governance, describes it as "a way of providing visibility into the acquisition, use, and disposal of IT equipment across the command." Day said that word needs to get out to the ACC workforce that its use is a high priority. (U.S. Army photo by Larry D. McCaskill)

NOT QUITE *a* DONE DEAL

How the U.S. Army Corps of Engineers has tackled the overdue closeout of contingency contracts

by Carl L. Stubbert

NEXT STEP: CLOSEOUT PROCESSING

Boxes of contracts from Afghanistan, shipped to the document storage warehouse of the U.S. Army Corps of Engineers (USACE) – Transatlantic Division in Winchester, VA, await closeout processing. (USACE photo by Donna Sherman)

The timely closeout of completed contracts is a major acquisition issue being addressed within DOD. In accordance with *Federal Acquisition Regulation (FAR)* Part 4.804, "Procedures for closing out contract files," fixed-price contracts are required to be closed within six months after the government's acceptance of the project. Completed contracts not closed within the six-month period are listed as over-aged contracts for closeout.

The closeout process is important in any contracting organization. It is even more important to an organization operating within a contingency environment, because it allows for the return of unexpended funds that can be used for other urgent and necessary projects. The timely closeout of completed contracts is a key component of the overall contractual life cycle, providing financial data, a history of logistical, security, and construction concerns, and vital information for project delivery teams (PDTs) that work on the suitability of design and construction for future contingency operations.

The closeout phase of a contract begins when a contractor has physically completed a project and the government has accepted it.

Generally, a PDT is intimately involved in the closeout at every stage. The team normally includes a team leader from project management, a contract specialist, a financial representative, an engineer, and a person from the Office of Counsel. The PDT ensures that all actions required by the *FAR* and specific agency procedures are completed properly: that the project is accepted, the contractor receives a final performance rating, a final payment is made, and a release of claims is completed and signed by the contractor.

STAYING CURRENT

Along with tackling the closeout of over-aged contracts, the U.S. Army Corps of Engineers – Transatlantic Division is using a two-phased approach to close out more recent contracts, such as those for Camp Sayar, in a timely manner so they don't become over-aged. Here, workers erect structures at Camp Sayar, a $63.3 million complex of about 135 buildings providing offices, housing, maintenance facilities, utilities, recreational areas, and a helicopter pad for the Afghan National Army's 207th Corps in Farah province, Afghanistan. (USACE photo by Karla Marshall)

Once these four steps are complete, a Contracting Officer (KO) closes the contract, and the files for the completed contract are archived in the document storage warehouse.

ATTACKING THE PROBLEMS

The U.S. Army Corps of Engineers – Transatlantic Division (TAD), Winchester, VA, supports the U.S. Central Command (CENTCOM) Area of Responsibility, comprising 20 countries from Egypt through the Arabian Gulf to Central Asia. TAD's major emphasis is on awarding contracts for the construction of facilities that support CENTCOM's

OLD CONTRACTS, NEW INSIGHTS

Information gathered during the closeout process from projects like this one, to build housing for the Afghan National Army at Tarin Kowt, can provide vital insights for project delivery teams into the suitability of design and construction for future contingency operations. (USACE photo by Mike Beeman)

contingency operations in Afghanistan and, previously, in Iraq.

Most of TAD's over-aged contracts are for the construction of facilities that have been completed and provided to customers in Iraq and Afghanistan. In most cases, the required closeout documents were completed; in other cases, the documents were not verified or maintained properly in a central file, and the contract closeout procedures were not completed because of the operational tempo in the war zones and the focus on continued project execution.

Beginning in 2011, TAD took a two-phased approach in tackling over-aged contract closeouts. The first phase began in January, when specialized contract closeout groups, called TIGER teams, were established and deployed to TAD's contingency districts and area offices in Iraq and Afghanistan. Each TIGER team included a KO, a contract specialist, and an accounting technician, who reported directly to the regional contracting chief at TAD headquarters.

The TIGER team's mission was a simple one: close out over-aged contracts.

The second phase was to address the hundreds of Iraq and Afghanistan contracts that had been boxed and shipped to TAD without having been closed out properly.

To complete this phase, TAD established a PDT at its Middle East District, co-located with TAD in Winchester. The PDT's main responsibilities included reviewing and researching the files, ensuring that they contained all required documentation, and finally completing proper contract closeout procedures.

The use of deployed TIGER teams and the specialized PDT in Winchester, along with the technical and contracting support in Iraq and Afghanistan, helped TAD increase its average monthly closeouts from 51 to 253. The contract closeout team in Winchester is in charge of closing out the remaining 1,100 over-aged contracts by Dec. 31.

PREVENTING ADDITIONAL CLOSEOUT DELAYS

TAD is also using a two-phased approach to close out contracts in a timely manner so they don't become over-aged. To do this, TAD's first phase of action is to reemphasize the responsibility of

contracting offices within the Corps of Engineers' districts and area offices to provide comprehensive, top-quality services that cover the full contract life cycle. This requires that a KO be able to perform both pre- and post-award services, including contract closeouts.

TAD is helping its districts and area offices meet these responsibilities by reorganizing their organizations to include project delivery teams of acquisition personnel dedicated to providing contract administration through the post-award phase, including project closeout of completed contracts. The PDTs for contract administration also must include contracting, project management, engineering, and construction management personnel.

TAD is completing the second phase by establishing business oversight branches (BOBs) within the Corps' districts and area offices. The BOBs are responsible for oversight of the contracting organization and project delivery administration teams to ensure that high-quality support is provided and that all required processes are performed throughout the life cycle of the contract, as well as timely closeout.

CONCLUSION

The creation of TIGER contract closeout teams was the key to TAD's success in closing out more than 3,200 over-aged contracts in Iraq and Afghanistan. However, the creation of these teams would not be necessary if contingency organizations were fully resourced with project delivery contract administration teams and a contracting BOB.

The project delivery teams' responsibilities include all aspects of contract administration, including closeout. The BOB's role is to provide oversight of pre-award contract functions and post-award contract administration by PDT teams. In doing so, the BOB can ensure that contracts are properly awarded and administered, and that completed contracts are closed within the standard timeframes established in the *FAR*.

FINANCIAL BENEFITS

Closing out projects often allows for the return of unexpended funds that can be used for other projects, like this wastewater treatment facility constructed by the USACE to support U.S. and international forces at Tarin Kowt. (USACE photo by Mike Beeman)

For more information, contact the author at ***carl.l.stubbert@usace.army.mil****, or Eric Horcick at* ***Eric.S.Horcick@usace.army.mil****.*

CARL L. STUBBERT is Deputy Regional Contracting Chief, U.S. Army Corps of Engineers –Transatlantic Division. He holds a B.S. in secondary education from Western Montana College and an M.B.A. from the University of Phoenix. Stubbert is Level III certified in contracting and Level I certified in program management. He is a member of the U.S. Army Acquisition Corps.

BREAKING IT DOWN

How stratified sampling of a bill of materials can help determine pricing for large government buys

by Anthony J. Nicolella

PRICING POWER

This article uses the equipping of an installation electrical substation, much like this substation owned and operated by NV Energy Inc., to illustrate the utility of stratified sampling in arriving at appropriate costs for multiple purchases of varying values. (Photo courtesy of Anthony J. Nicolella)

You are a buyer for a large buying activity. Your installation continues to grow substantially because of a recent Base Realignment and Closure decision. To keep up with the energy demands of the base, your installation commander was able to secure funding to build a state-of-the-art, high-voltage electrical substation. You have been given the task to buy all the equipment for this substation.

You received the purchase request packet for the substation equipment from your customer; it includes a large bill of materials (BOM), such as in Figure 1. This is just one of many procurements you are working on, and you are wondering how you will ever find the time to develop your government objective for such a large buy.

Well, you are in luck. You can develop your government objective using stratified sampling.

Bill of Materials

Figure 1

DESIGNATOR(S)	QUANTITY	DESCRIPTIONS	ROHS?	SOURCE	PART NUMBER
C4	1	0.022uF capacitor 0805	Yes	Digi-Key	399-1163-1-ND
C1, C2, C3	3	0.1uF capacitor 0805	Yes	Digi-Key	BC1300TR-ND
C5, C6	2	100uF electrolytic capacitor	Yes	Digi-Key	PCE3853CT-ND
R2	1	13k 0.1% resistor 0805	?	Digi-Key	P13KZCT-ND
R1	1	91k 0.1% resistor 0805	Yes	Digi-Key	P91KZCT-ND
R3, R4, R5, R6, R8	5	1k resistor 0805	Yes	Digi-Key	RHM1.00CCT-ND
R7	1	560 resistor 0805	Yes	Digi-Key	RHM560CCT-ND
F1	1	500mA poly fuse	Yes	Digi-Key	MF-R050-ND
U1	1	ACS702ELC-20 current sensor	Yes	Allegro Micro	
J1	1	3 pin high current connector	Yes	Digi-Key	277-1272-ND
U5	1	LM1117-3.3 voltage regulator	Yes	Mouser	511-LD1117DT33C
U3	1	LM4120 1.8 volt reference	No	Digi-Key	LM4120IM5-1.8CT-ND
U2	1	MCP6004 op amp	Yes	Digi-Key	MCP6004-I/SL-ND
J2, J3, U4	1	RJ-45 connector	Yes	Digi-Key	A31416-ND
	1	Circuit Board, 3" x 3"	Yes	Gold Phoenix	
	0.5	Hours of assembly labor	NA	APRS World	

A large bill of materials such as this one, in the equipment purchase request packet for an electrical substation, is a case study for stratified sampling. (Graphic courtesy of Anthony J. Nicolella)

Before getting started, let's answer some basic questions regarding stratified sampling: What do we mean by stratified sampling? Where can I find more information about it? What steps are involved?

According to the *Contract Pricing Reference Guides*, Volume 2, Chapter 3 (online at **https://acc.dau.mil/cprg**), stratified sampling is a method used for cost/price analysis. It allows you to concentrate your efforts on the items with the greatest potential for cost/price reductions, while using random sampling to identify any pattern of overpricing smaller-value items. Stratified sampling is not only a sampling method, but also a proposal analysis technique. *Defense Federal Acquisition Regulation Supplement* 215.404-1 (online at **http://www.acq.osd.mil/dpap/dars/dfars/html/current/215_4.htm**) and the related *Procedures, Guidance and Information* (at **http://www.acq.osd.mil/dpap/dars/dfarspgi/current/index.html**) list this technique in relation to spare parts and support equipment, to break down items into high-dollar value and low-dollar value strata.

A SEVEN-STEP PROCESS

There are seven major steps used in stratified sampling:

1. Identify a stratum of items requiring 100 percent analysis.
2. Group the remaining items into one or more strata to facilitate analysis.
3. Determine how many items will be sampled in each stratum.
4. Select items to be analyzed.
5. Analyze all items identified for analysis—specifically, summing prices for the 100 percent analysis stratum while developing a decrement factor for any stratum being randomly sampled.
6. Apply the decrement factor to the total proposed cost of items in the stratum.

Stratification Table

Figure 2

Item Description	Qty	Proposed Unit Cost	Total Proposed Cost	*Should Cost	Decrement Factor	Stratum	Random Number	100% Analysis
300 kVa, 3 Phase, Pad Mt. Xfrms	20	$7,500	$150,000	$148,000		1		Yes
500 kVa, 3 Phase, Pad Mt. Xfrms	15	$10,000	$150,000	$146,500		1		Yes
750 kVa, 3 Phase, Pad Mt. Xfrms	5	$15,000	$75,000	$73, 500		1		Yes
Subtotal			$375,000	$368,000				
Copper Wire	2 spools	$10,000	$20,000	$17,500	.125	2	.09654	No
Capacitors	1	$8,000	$8,000	$7,500	.063	2	.08632	No
Fuses	25	$10.00	$2,500	$2,250	.100	2	.07531	No
Resisters	12	$400	$4,800	$4,300	.104	2	.06420	No
Voltage Regulator	3	$1,200	$3,600	$3,450	.042	2	.05319	No
Subtotal			$38,900	$35,000				
Total			$413.900	$403,000				

Step 2 Step 1 Step 5 Steps 3 & 4

This table shows the various items to be purchased, with proposed costs and should-costs. Items are grouped into one or more strata to facilitate analysis. Should-cost amounts can be determined by using numerous proposal analysis (price or cost analysis) techniques such as parametric estimating with simple regression analysis, comparison of proposed prices to historical prices paid for like items, or comparison of proposed prices to independent government estimates. (SOURCE: Anthony J. Nicolella)

7. Sum the pre-negotiation positions for all strata.

Let's apply all seven steps in analyzing this BOM. For simplicity purposes, we will only use two strata in our analysis.

In Figure 2, transformers (Xfrms) make up $375,000 of the total proposed cost of $413,900. This stratum alone represents 90.6 percent of the total proposed cost, which is significant. Because of this, Stratum 1 will require 100 analysis, as indicated in Step 1. Our should-cost objective for the transformers in Stratum 1 would be $368,000.

For the randomly sampled items (copper wire, capacitors, etc.) in Stratum 2, application of a decrement factor would be required as indicated in Steps 5 and 6. This stratum makes up only 9.4 percent ($38,900) of the total proposed cost of $413,900, which is not significant. Thus we do not want to spend an inordinate amount of time analyzing this stratum.

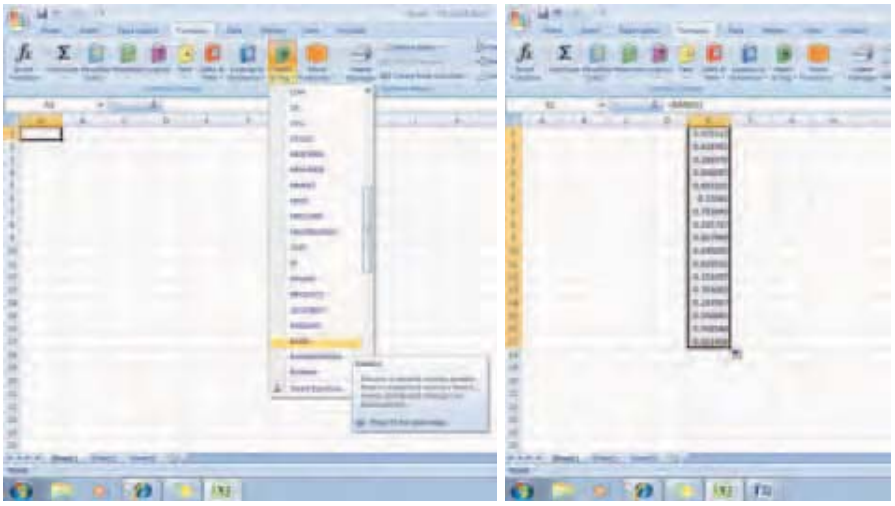
ANALYZING STRATUM 2

Our analysis of Stratum 2 will be totally different than for Stratum 1, in that it will include two key components: computing and assigning random numbers to our items, and applying a decrement factor to come up with a range and target objective. Let's see how this works.

Steps 3 and 4 in Figure 3 (determining how many items will be sampled in each stratum and selecting items to be analyzed) require us to generate and assign

Assigning Items for Analysis

Figure 3



Using the random numbers function in Microsoft Excel is the easiest way to generate random numbers for Steps 3 and 4 of the seven-step stratified sampling process. (SOURCE: Anthony J. Nicolella)

random numbers to the items in Stratum 2. The easiest way to generate random numbers is by using the random numbers function in Microsoft Excel. Just follow these five easy steps:

1. Go to Formulas.
2. Select Math & Trig icon.
3. Select RAND.
4. Generate random numbers.
5. Grab bottom right-hand corner of first random number cell and drag it down until each item has a random number assigned to it.

Now that we have assigned random numbers to Stratum 2, we can start our analysis. To determine which items to analyze in Stratum 2, we randomly selected items that ended in a number of "54" and "31." In our Stratum 2 example, only two items had these random numbers: copper wire and fuses, with total proposed costs of $20,000 and $2,500, and should-cost amounts of $17,500 and $2,250, respectively.

For Stratum 2, total the proposed prices for all sampled items. Total the dollar differences between should-pay and proposed prices ($2,500 + $250), and divide that total difference ($2,750) by the total of proposed prices ($22,500). This technique gives more weight to the higher-priced sampled items in establishing the decrement factor, which is computed as follows:

$2,750/$22,500 = 0.12

We can take this decrement factor of 0.12 and come up with a recommended objective price of $34,232, or approximately 88 percent of the proposed $38,900. However, the confidence interval would be from $34,232 (88 percent of $38,900) to $38,900 (100 percent). Based on this, a target objective of $36,566 (94 percent of $38,900) would be reasonable.

CONCLUSION

A 100 percent analysis was performed on Stratum 1 (the high-dollar items), and a random analysis was performed on Stratum 2 (the remaining items). Now that this has been completed, we can move on to our final step: to sum the pre-negotiation positions for all strata.

For Stratum 1, that pre-negotiation position would be $368,000, and for Stratum 2 it would be $36,566 (the 94 percent confidence interval), giving us a total pre-negotiation position of $404,566.

This article demonstrates how quick and easy it would be for a buyer to develop a government objective using stratified sampling. The next time your agency has a large buy, try using stratified sampling. It will provide high-quality results in a short period of time, and save the buyer and his or her organization valuable resources.

For more information, contact the author at ***anthony.nicolella@dau.mil****.*

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CULTURAL IMMERSION
Dr. Genevieve Bell, Director of the Interaction and Experience Research and Development laboratory at Intel Corp., visits with kindergartners at the Peterborough Primary School in South Australia. Bell's approach to technology starts with an in-depth look at the lives of the people who use it. (Photo by Katrina Jungnickel)

An ANTHROPOLOGICAL EYE ON THE SOLDIER

Intel's Genevieve Bell looks at technology from a different perspective

This Critical Thinking interview is with Dr. Genevieve Bell, Director of Interaction and Experience Research, Intel Labs at Intel Corp., which dominates the market for microprocessors that go into desktop and notebook computers. Born and raised in Australia, Bell was a researcher at Stanford University, where she received a Ph.D. in anthropology, when Intel hired her in 1998.

The company named her an Intel Fellow in November 2008, and in 2010, Dr. Bell was made Director of the User Experience Group within Intel's Digital Home Group. Gathering a team of anthropologists, interaction designers, and human factors engineers to transform consumer-centric product innovation, she has altered how Intel envisions, plans, and develops its platforms.

Bell's team is responsible for setting research directions, conducting global comparative qualitative and quantitative research, leading new product strategy and definition, and championing consumer-centric innovation and thinking in Intel's consumer electronics business and across all of the company's platforms.

In 2010, AlwaysOn, a leading Silicon Valley business media company, named Bell one of the top 25 women in technology to watch. In 2009, Fast Company magazine recognized her as one of the 100 most innovative people in business. Bell is also a Thinker in Residence for South Australia.

Bell is co-author of "Divining a Digital Future: Mess and Mythology in Ubiquitous Computing" (MIT Press, 2011), written in collaboration with Paul Dourish, a professor of Informatics in the Donald Bren School of Information and Computer Sciences at the University of California, Irvine. The book explores the social and cultural aspects of ubiquitous computing, a post-desktop model of human-computer interaction in which computing has been thoroughly integrated into everyday objects and activities.

THE HUMAN DIMENSION
Bell addresses the audience at the Seoul Digital Forum in May, the theme of which was "Coexistence: Technology, Humanity and Great Hope for the Future." (Photo courtesy of Intel Corp.)

Q. You come to the world of technology by way of anthropology. How does this inform the way you think about technology concepts?

A. I usually start by asking what is it that people care about. So I've spent a lot of time trying to make sense of … what are they passionate about, what frustrates them, what do they want for themselves, their kids, their communities, and I try to make that a starting point to developing technology. So rather than just going for solutions, I'm interested in the experience that you are trying to deliver and what is it that people care about.

Q. Is that indistinguishable in your mind, then, technology itself and people using the technology?

A. Well, I push it one step further: I don't ever start by thinking about the technology.

Literally, when we do research, I don't go into people's houses and say, "Tell me what you do with your cellphone, or what do you want from your cellphone." I literally start by saying, "Tell me what you did yesterday, and tell me about your hopes and your dreams. Tell me about your kids." And then we start thinking about technology.

The reason for that: How do you start with the right context? It's always bigger than just the cellphone and laptop, the piece of software.

Q. How does Intel's user-focused Research and Development [R&D] Lab differ from the traditional R&D lab?

A. I report directly to the CTO [Chief Technical Officer] of the company, and my lab sits inside the research and development laboratory. I have a very interdisciplinary lab. I have research social scientists, industrial designers, human factors engineers, as well as more traditional hardware and software engineers.

Q. From your experience, how vital is R&D funding to the process of creating new technology?

A. Well, one of the most amazing things about Intel is that they have always made a really strong commitment to research and development. And, in fact, they came to really double down their commitment when the economy was bad. One of our early CEOs has a philosophy that you should invest in a recession, because what you want to do is have a lot of ideas in the pot when the economy turns around again.

So at Intel, the commitment to R&D is a culture. It's one of those things where as far as Intel is concerned, if you are not investing in five to 10 years' worth of ideas, you are making the company vulnerable.

Q. Do you find that different cultures create, use, and accept new technology in different ways?

A. Absolutely. I think there are very different trajectories [of] technology development, function, and use. And some of those things are absolutely about culture. Some of them are about more complicated interplay of regulation, history, existing infrastructure, and culture. But you see it really strongly in an incredible uptake of robotics in Japan, for instance, in industry, in people's homes, in elderly care, [whereas] there are places where robots have been really strongly rejected in the United States. I think there are some religious and cultural forces at play there about what robots represent.

Q. So how do you see the United States in that light when you look at technology?

A. Wow. I think the last five years have been very instructive. Some of the biggest centers of innovation haven't actually been in the U.S., but Silicon Valley is still a really important hub. When the global revolution happened … computers kind of moved into the mobile space. The biggest phases of this weren't in the United States. It was clearly places like Scandinavia, Japan, Korea, and to a different extent, India, that made all the kind of mobile payment stuff; whether it's using a mobile phone as payment, or midfield communication, all of that market is happening outside of the U.S. before it happens here.

I mean, India went from having about 11 million mobile phones in 2001, and now they have 850 million. It's the fastest-growing mobile phone [market] in history right now. There are now more mobile phones on the planet than there are people. But the U.S. is a really slow adapter to mobile technology by comparison to the rest of the world.

Q. Do you see a pattern emerging when a relatively new technology is accepted into a culture and begins to spread to a mass audience?

A. I think the technologies are different, rather than dependent on what they did well. I mean it's quite clear that social networking services have been very popular globally, but the different services are popular in different places.

So China has RenRen and Qzone. In India and Brazil, it's a site called Orkut. Facebook has been popular globally, and people do very different things with it. Orkut … is very much music-oriented; it's more like Myspace in some ways. Facebook is usually popular in Indonesia, but they are not using it to exchange photos and their kids and their dinners.

Basic technology will bring a very different kind of impact. Things have turned up in different places. I don't think there has always been a clean line. It's quite clear that if you are in Africa, the first time you encounter the Internet, for many people it's going to be on a phone. And it may be through a payment structure as opposed to a desktop at your office.

Q. Are there any key things economically, culturally, or politically that sort of facilitate the way a culture accepts these things? Or is it culture-dependent?

A. No, I think it's just about culture. I think it's about government. And government is a part of culture. There has definitely been a push in Asia, in particular, to really strongly link technology development and use to citizenship. The future in Korea is tied up with it being a broadband, fast Internet nation. They call it the "U" society, the ubiquitous society. And the government certainly underwrote the rollout of the fastest broadband network in the world and chose … to make it a two-way network, so that it was as fast to upload and download, which meant there were really interesting consequences when broadband took off in Korea. It was content creation as well as consumption.

I USUALLY START BY ASKING WHAT IS IT THAT PEOPLE CARE ABOUT … WHAT ARE THEY PASSIONATE ABOUT, WHAT FRUSTRATES THEM, WHAT DO THEY WANT FOR THEMSELVES, THEIR KIDS, THEIR COMMUNITIES, AND I TRY TO MAKE THAT A STARTING POINT TO DEVELOPING TECHNOLOGY.

THINKER IN THE MAKING
Bell was born and raised in Australia and is now a Thinker in Residence for South Australia. This photo shows her as a young girl in the mid-'70s in an aboriginal community of Central Australia that was then called Warrabri and is now called Ali Curung, in the Northern Territory. (Photo by Dr. Diane Bell)

It's really quite common across Asia, whether you're in Singapore, India, Malaysia, even China, to have governments link technology to citizenship in kind of explicit ways: "The citizens use the Internet. The Internet is our future."

Even Australia has made a strong investment in a broadband network.

Q. R&D funding in the Army and the Armed Forces as a whole is dominated by engineers who design weapon systems and equipment for Soldiers to use. Much of the focus is on how best to counter current and emergent threats. How could the Army benefit from taking an anthropological approach and looking at the Soldier who uses technology?

A. Taking an anthropological approach here would involve looking at more than just the Soldiers. I think it would involve thinking about the whole ecosystem in which Soldiers operate, right?

Q. Certainly.

A. And then I imagine there is a piece that says Soldiers aren't just Soldiers when they are at war. How do we understand the life of Soldiers at home? I'm sure it extends to the communities they operate in, the bases they're on, their families, their extended families, those communities as well as the place that they find themselves.

I think an anthropological approach may also ask questions about what is the nature of defense? There are certainly multiple models for what defense looks like, both symbolically and actually. But there would probably be a number of frameworks of thinking about that one, where it wasn't just about any particular long-term perspective.

It's not, "Are we equipped in the battle we're in now?" but "What does it mean to think about war, defensive and offensive? What would it look like 10, 15, 20 years from now?" I know some of those conversations go on inside the military, about the Army and the future.

Some of the conversation [the Army] must be having is about, okay, now that we're sort of working out our relationships with Afghanistan and Iraq, the equipment that we have to get back from there, what does that look like?—you know, as opposed to the model that was certainly true when I was growing up in Australia; when the U.S. left Australia in '45 or '46, they left a lot of stuff behind.

Q. Given that humans acquire culture through socialization, people living in different places or different circumstances develop different cultures. How do you think that might apply to the Army and the way it organizes and equips units, specifically different organizational cultures like the military police, artillery, etc.?

A. Organizational culture is slightly different than the traditional way I think about cultures. It's also not just about the formal mechanism, it's about informal stuff, too, but it's the symbolic, tacit domain. The American military is shaped as much by the experiences of troops on the ground as the men and women who lead it, whose lives were shaped mostly in a post-Vietnam era, at West Point and other kinds of institutions and experiences.

I think you have to remember that as organizational cultures are shaped, it's not just about what people say, it's also about what they do, the alignment of what they say and what they do. And then it's about all the symbolic stuff. And the symbolic stuff runs the gamut from actual things we pick up as being symbols—uniforms, flags—and then all the passive stuff that people sometimes try to regulate away, the names people paint on their airplanes, … the kind of language that people use to talk about stories of the "enemy" in the fight.

I think the challenge in all organizations—it's true in Intel, as I'm sure it is in the military—is that organizational cultures need to grow and adapt, and that is sometimes difficult.

Q. That's true. What could Army acquisition learn from the way

Intel is incorporating anthropology into its business?

A. With Intel, there was this moment with the principal decision makers that Intel no longer looks like the market they needed to succeed in. When Intel first started, the people who bought technology looked remarkably like the people who made it in private companies. And five, 10, or 15 years ago, the market in technology really changed. It became global. It involved people who had very different lives, aspirations, and desires, and marketplaces than Intel was used to.

I think part of the function my team and I have performed in Intel has really been about this research: How do you help make sure that we're not imposing the way we wish the market was vs. the way it really is? My function is partly education and partly reality check, and partly having to say to senior leaders, "I know you want this piece of technology just like that, but you don't represent any percentage of the market; they are 20 years younger and living in a different country." So they get a piece of that.

For Intel, it was about what happens when the things that made you successful historically don't scale, when your instincts for what things are don't work out. What made us successful in World War II in Soldiers, what was going to make us successful in Vietnam and Korea—those were different wars fought against different notions of what was the battlefield, different ideas of what it meant to be there, different notions about what women looked like. How do you find the space to ask the hard questions about what you're doing and critically ask, "Those things, the way we've always done it, do those make sense anymore? Are there other things we should be considering? Do the instincts of our leaders reflect the reality of what we are intending to get done?"

We do some things here that, you know, have been about how to equip our leaders with different sensibilities. We have a program now where we take our senior leaders into the houses of everyday consumers outside of their own country, go sit with consumers and think about what does it mean to live in a house in China or India, or Brazil or Nigeria. They come back with a very different sensibility almost immediately. My colleagues are anthropologists for large airline companies, and the first time they put the senior executives of that airline into economy seats, they made them sit there for seven hours. It completely changed their perspective on what they were doing.

So it's how do you manage to refresh and reengage your senior leaders and decision makers with the reality of the world as it is now?

Q. You recently talked with Slate magazine's Katy Waldman about your team's examination of how people use cars. That was a pretty interesting article. Two points: One, that cars protected people not from just physical danger, but also from social danger. And another point, that cars were a powerful proxy for other digital devices. If you were to look for a new way to study how Soldiers use technology, where would you start?

A. That's such an interesting question. I know a little bit of work inside our factories at Intel, and one of the places we found most valuable was to start trying to tease apart the difference between what the rule book says and what was actually happening, because it turns out that's the place where either the rule book isn't clear or it's gotten outdated. So Intel has a very set mechanism for how you make new silicon. And you know there is a rule book and a binder with all the information, but we started to talk and wanted to know, what are people actually doing? Does it look like it's supposed to?

I suspect if it were me, I'd be doing a number of things that started with, "What is the kit people are issued? And by the time they get wherever they are going, will they come back with the kit they actually have? What do they have to supplement? What have they stopped using? What have they added? What have they hacked together to make something new?" Because I bet all of that exists: Whatever kind of modifications people are making, whether it's sticking photos in their helmets, whether it's stitching things together to make different kinds of safety provisions, I guarantee you that there are people doing it, but it is completely off-book.

And I also bet you that everyone knows about it. And sometimes there is a process for taking the hacks and modifications and re-implementing them. But I bet it's not fast enough. So one of the first things I would do is look at what are people being issued within the various branches and what do they have when they deploy and when they come back? Also, what have they used, and what haven't they?

The thing we found with the car, which was useful, was [the researchers] actually made people empty the entire contents of their car, and then they inventoried all of it. And they asked them why the stuff that was there was there. And it was a really instructive conversation about how things end up in your glove compartment and in the trunk of your car. I suspect there is something similar about how something ends up in your duffel, or why that is the thing that you have. I think that would be wonderful, just because I always think

TAKING NOTE
During a field visit in March, Bell takes an opportunity to note her impressions at a museum in Surabaya, Indonesia.

it's really instructive of the difference between what people say they are doing and what they are actually doing.

Q. The ubiquitousness of smartphones, tablets, and video games has shaped the modern Army. For Soldiers who are in their twenties and thirties, certainly, these technologies are as necessary as shoes and socks. The Army and other military services are struggling to keep pace with the constant change in these technologies, given the time it takes to work a product designed to serve the entire Army through the regulations, approval, and purchasing to fielding it. How can the Army be sure it has a nimble finger on the pulse of rapid change in consumer technology, so that it maximizes the potential for new uses on the battlefield?

A. Wow, that's a good question. I spent a bunch of time working with the Australian government over the last couple of years, and one of the things I noticed to be a challenge for them is that they need technology to be really kind of stable before they can deploy it. So I'm sure one of the challenges you will face is that it's robust and reliable.

My brother is in the Special Forces back in Australia, and he calls me at one point, right before the war in Afghanistan, to ask me what kinds of laptops are good for jumping out of airplanes. Well, all kinds are terrible; basically, just find the smallest one, wrap it in bubble wrap, and duct-tape it to survive the drop and roll. I don't think technology is really equipped for that.

I think one of the harder things to work out is what technology is here to stay versus a phase people are going through. If this is technology that's going to be popular for a year or two, then do people evolve to the next thing, or is it something that is really a game-changer? And then you get into all the challenges we see everywhere else that have to do with standardization … you can also see challenges about security, authentication. Frankly, everyone is getting smart very quickly in this space, and it's totally one of the ones where the instincts of our senior leaders may not match the experience of the brainchild.

The military has been a big source of interesting innovation, whether it is all the work that's being done in the Army around biodiesel, energy efficiency, about what it means to air-condition things in the middle of the desert … a lot of innovation is possible when you have different kinds of problems to solve. I think it's also how does one think through what is good enough, and where is "good enough" good enough, because we know it's going to look different in different technologies. All sorts of new technologies aren't as reliable as they should be, and they haven't stopped people from taking them up wholesale.

And I suspect it's something different in a piece of equipment that's supposed to keep you safe, physically safe, and a piece of equipment that's going to let you talk to your kids. You know, you may be perfectly happy to have a low-bandwidth, two-way video for your kids two-thirds of the time because you still get to see their faces. ?

PEO Ground Combat Systems

Shaping the Future Through Affordable Modernization of Ground Combat Systems

In alignment with the Army's Combat Vehicle Modernization Strategy PEO GCS is working to:

1. **Transform** capabilities by acquiring the Ground Combat Vehicle, robotics and unmanned ground systems
2. **Replace** the M113 FoV to increase force protection, mobility and network capabilities
3. **Improve** the Abrams tank, Stryker FoV, and Bradley FoV to increase space, weight and power, and enable integration of the emerging network

QUALITY CONTROL, *Close Up*

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EFFICIENCIES

PEO Ammunition independent audits focus on quality management systems to ensure compliance with materials and requirements

by Samuel H. Figueroa and Johnny R. Hartman

In the world of Army Acquisition, we are on a seemingly unending quest to improve our processes. One process that has seen a great deal of change is the way we ensure that we buy only high-quality products for our warfighters, for whom they literally are a matter of life and death.

Not long ago, the acquisition community often demanded numerous inspections of the products we were buying to ensure strict adherence to the detailed specifications we had imposed on our suppliers. Over time, we found that ensuring quality in this fashion was overly expensive because of the man-hours involved in multiple inspections of every piece. In addition, we came to realize that we often rejected parts that were perfectly usable, because of overly tight tolerances.

In response, we began to find ways to reduce expenses caused by multiple inspections and the resulting scrap rates. We began to understand that well-controlled manufacturing processes automatically reduced the risk of defects. This ushered in proven quality systems such as Total Quality Management, Statistical Process Control, and most recently, Lean Six Sigma (LSS). These systems all recognized that the best way to improve product quality was to improve production processes. This prevented opportunities for error and reduced variability in results that could grow over time.

Even with these quality systems in place, however, the Project Manager Combat Ammunition Systems (PM CAS) of Program Executive Office Ammunition (PEO Ammo) noted that nonconforming products were still being produced occasionally. These nonconforming munitions would often be discovered during Lot Acceptance Testing, which resulted in the outright rejection of thousands of rounds at a time and an expensive, time-consuming rework for the entire lot.

The present fiscal situation reinforces the need to cost-effectively eliminate concerns that ammunition received in the battlefield may undergo suspensions or other condition-code downgrades. Clearly, the mere existence of quality management systems (QMS) was not enough to ensure product quality.

As a result, PM CAS identified a need to establish methods to ensure implementation of QMS requirements, with special attention to safety-critical characteristics (SCC). To achieve this goal, PM CAS sponsored LSS Black Belt and Green Belt projects that implemented independent verification of materials and requirements for post-award conferences, and established a supplier QMS and SCC audit program. The independent audit program is a consistent, comprehensive verification of the QMS of suppliers and sub-vendors alike, using International Organization for Standardization (ISO) 9000 as its frame of reference.

NO TIME TO DOUBT

Every Soldier assumes that each and every round will work as advertised, and it is the acquisition community's responsibility to provide that guarantee. Program Executive Office Ammunition's (PEO Ammo's) independent audit program is a means to fulfill that commitment. Here, members of the 3rd Brigade Combat Team, 101st Airborne Division (Air Assault) (3/101) place complete trust in their 120mm mortar ammunition as it starts its journey to the target area at Camp Buehring, Kuwait. (U.S. Army photo by PVT Mary Gurnee, 3/101 Public Affairs)

FOCUS ON IMPLEMENTATION

To be very clear, the implementation of these quality audits is *not* a rejection of modern quality systems and a return to the old approach of trying to "inspect-in" quality to ammunition products. To the contrary, the audit process can be likened to inspection of the quality systems themselves, to ensure that they are properly embraced and implemented. If the system doesn't work right, chances are its product won't work right, either.

PM CAS, the U.S. Army Armament Research, Development, and Engineering Center (ARDEC) of the U.S. Army Research, Development, and Engineering Command, and the Joint Munitions Command (JMC) all understand that the ammunition industrial base consists of a variety of suppliers, and that therefore no universal QMS exists. Our guiding principle, therefore, is that each supplier will have sound procedures and processes for ensuring ammunition quality. The audit process is designed to ensure that these procedures are in place, understood by the supplier's workforce, and used consistently.

PM CAS needed a quality paradigm shift to establish a proactive, not reactive, method of ensuring compliance with SCC requirements. The LSS projects needed to address all requirements to be fulfilled in document submittals, as well as on the production floor. Before any audits could take place, contract language had to be added or modified to require that audits would be performed and access granted to all quality records. In many cases, this also required that contract language be flowed down to ensure access to subcontractor facilities and records.

These projects created a process that has proven itself over time. It employs a PM CAS audit manager, who interfaces with ARDEC and JMC audit coordinators, audit team leaders, and team members. The teams consist of product quality managers from JMC and ARDEC sites, various integrated product team (IPT) members, subject-matter experts, representatives of other services such as the Marine Corps, and in-plant quality assurance representatives. These audits now also include participation from other PEO Ammo PMs, most notably PM Maneuver Ammunition Systems and PM Close Combat Systems.

BOTTOM LINE: PRODUCT QUALITY

Ultimately, the independent audit program established by PEO Ammo aims to ensure the quality of products such as these 155mm High Explosive shell bodies, shown undergoing heat treating at Scranton Army Ammunition Plant, PA. (Photo courtesy of Metro Communications Inc., Hampton, VA)

HOW THE AUDIT WORKS

Audit schedules are coordinated with and reviewed by the PM. The goal of PM CAS is to audit every ammunition supplier at least once every year, with priority placed on suppliers with SCC. The lead auditor prepares the audit plan, obtaining input from various IPT members from each functional area.

The key to achieving this ambitious goal was the collaboration of the Product Quality Management Offices at ARDEC and JMC. A joint standard operating procedure (SOP) was created that calls out common definitions, audit procedures, contract language, audit plans, and reporting formats. This SOP has been improved over time to ensure consistent and comprehensive verification of all QMS requirements.

PM CAS also facilitated close collaboration of the offices. As a result, both

THE SUM OF ITS PARTS

For every round of ammunition, each and every component must work in top shape for it to deliver its effects on target. The same applies to a supplier's quality management systems (QMS). Here, a Marine from 1st Battalion, 2nd Marine Regiment removes the increments from a 60mm High Explosive mortar round in preparation for a firing mission at Marine Corps Base Camp Lejeune, NC, Aug. 18, 2011. (Photo by LCpl Michael Petersheim, 24th Marine Expeditionary Unit)

organizations employ the same process and leverage each other's personnel to conduct the audits. This approach has reduced cost and enabled cross-pollination of the auditors' expertise. In addition, it has helped newer auditors to rapidly learn and apply the auditing processes and documentation, and allowed supervisors to rapidly substitute leads to audits without affecting the customer's deliverables, scheduling, and audit quality.

Other key players are the audit coordinators at JMC and ARDEC. Their responsibilities include audit schedule recommendations, identifying audit team leaders and members, and review and approval of audit plans and reports. In addition, the coordinators are often participating members of the audit teams themselves.

Every audit has a single designated team leader who is responsible for coordinating and conducting the audit. The team leader makes recommendations as to team membership, coordinates dates with the supplier to be audited, reviews all pertinent contracts, assigns resources, develops audit plans, conducts entrance and exit meetings, classifies findings, and develops audit reports.

CATEGORIES OF FINDINGS

Audit findings are categorized as major, minor, or observations. A major finding is evidence of a QMS breakdown and thus a greater risk of creating or even shipping nonconforming product. A minor finding reflects isolated errors in equipment handling (for instance, overdue calibration) or documentation trails. An observation, or opportunity for improvement, is a lesser issue that nonetheless merits management attention.

With any major finding, a follow-up visit is conducted three months later to ensure that corrective action has been properly implemented.

Results of these independent auditing efforts have exceeded all of PM CAS' management expectations at every review. Most audits of contractors and government-owned, government/contractor-operated organizations resulted in major and/or minor findings on the first visit. The contractors' and government facilities promptly worked on solving these deficiencies, leading to far better compliance with their QMS. In the program's first fiscal year, half of the audited suppliers received satisfactory ratings.

Currently, 83 percent of all audited suppliers have that passing grade.

CONCLUSION

Quality audits are a proven method to ensure that contractors maintain SCC as well as QMS requirements for all Army,

PRODUCTION EFFICIENCIES

By reinforcing strict adherence to Quality Management best practices, PEO Ammo's independent audit program ensures that every activity in and around the production floor prevents defects and improves quality. This translates into high production yields and the utmost quality of ammunition used, such as these 105mm rounds for certification of a section of 2nd Battalion, 319th Airborne Field Artillery Regiment, 2nd Brigade Combat Team, 82nd Airborne Division (2/82). The section fired live rounds after being certified April 20 at Fort Bragg, NC. (U.S. Army photo by SGT Matthew Ryan, 2/82 Public Affairs)

CONFIDENCE IN BATTLE

PEO Ammo's independent audit program performs a comprehensive health assessment of each supplier's QMS. As auditors validate the supplier's every quality activity and ensure that its QMS meets or exceeds contractual requirements, they provide evidence to Soldiers that confidence in their munitions is well-based. Here, PFC Marquis Durham of 2nd Battalion, 319th Airborne Field Artillery Regiment, 2nd Brigade Combat Team, 82nd Airborne Division removes a spent casing from a 105mm howitzer during his battery's certification in April at Fort Bragg, NC. (U.S. Army photo by SGT Matthew Ryan, 2/82 Public Affairs)

Air Force, and Marine Corps munition procurements. The audits have enabled contractors to achieve compliance that is equal to or better than that specified on their contracts.

This is a win-win situation for all. PM CAS has gained greater confidence in the quality of the procured components and ammunitions. Our suppliers' preparations for ISO 9001 recertification are far better, as the independent audit uncovered "surprises" that the ISO 9001 registrar's audit would otherwise find.

ISO 9001 registrars certify companies after a rigorous assessment. They also reassess every 1-2 years to ensure that the system is not obsolete. The independent audits' findings allow for resolution before the registrar's appearance; thus, the company averts the corrective action it would otherwise have to address with the registrar.

Most important, the warfighter gains unequaled assurance that the processes of making the ammunition on which their lives depend are the best possible, and second to none in the world.

For more information, go to ***https://picac2cs9.pica.army.mil/pmcas/.***

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The Power *of* LSS

PM ITS leverages Lean Six Sigma to implement alternate energy options for sensors

by LTC John (Cliff) Calhoun and Dr. Christina Bates

For the past few years, Army leadership has emphasized the importance of identifying and leveraging alternate energy sources for systems in theater, to better manage sustainment costs while also being mindful of a system's environmental impact. While this "green" initiative has made some progress, more work remains to be done to truly harness the power of alternate energy sources in a way that is both feasible and does not hinder overall system performance or reliability.

Upon completion of a recent Lean Six Sigma (LSS) project using the Define, Measure, Analyze, Design, and Verify (DMADV) approach, the Product Manager Integrated Tactical Systems (PM ITS) paved the way for establishing a methodical and proven approach to identifying, testing, and implementing a viable alternate energy source for its tower-based sensors. PM ITS is assigned to Project Manager Night Vision/Reconnaissance, Surveillance, and Target Acquisition (PM NV/RSTA) within Program Executive Office Intelligence, Electronic Warfare, and Sensors.

In a recent demonstration of a hybrid solution to power these critical sensors in theater, PM ITS successfully powered a day/night, state-of-the-art sensor using various energy sources, including batteries and solar panels.

"We kicked off this project in the spring of 2011 to identify opportunities to reduce system downtime and provide a redundant power source for the Rapid Aerostat Initial Deployment [RAID] sensors," said Bill Read, Deputy PM ITS. "The sensors are mounted to towers and provide surveillance capability during day and night conditions in theater.

GENERATING A SOLUTION

Product Manager Integrated Tactical Systems (PM ITS) successfully demonstrated a hybrid solution to power critical sensors in theater, using the 5-kilowatt Tactical Quiet Generator to decrease system downtime and improve readiness rates. Here, Billy Smith, internal Black Belt on PM ITS' Lean Six Sigma (LSS) team, describes features of the generator May 22 during the demonstration at Redstone Arsenal, AL. (U.S. Army photos courtesy of PM ITS)

"For some time, we have been interested in improving system operational readiness [OR] and decreasing our generators' fuel consumption," Read explained.

"We decided to partner with our contractor, Raytheon [Co.], to kick off an LSS project to improve system readiness and to identify possibilities to implement alternate energy sources for the sensors."

PROJECT METHODOLOGY

Lean Six Sigma is the Army's preferred methodology for process improvement and business transformation. As part of its LSS project, PM ITS assembled a cross-functional team of subject-matter experts, including an internal LSS Black Belt, to analyze the problems with the sensor generators and to develop tailored, feasible solutions.

The cross-functional nature of the team ensured that all stakeholders had a voice at the table and that all issues were raised and considered. In addition, "We were also adamant that any solution(s) developed would be managed and ultimately owned by the government, to ensure continued benefits at the best value to the taxpayer," Read said.

With these parameters in mind, the team set out to define the problem clearly in the Define phase of the DMADV methodology. After several team meetings and focused discussions, the team narrowed down the problem statement:

The RAID sensors would benefit from a more consistent and reliable power source, a 5-kilowatt Tactical Quiet Generator, to decrease system downtime and improve readiness rates. Moreover, the team noted that improving the current generators' efficiency would lower fuel consumption and fuel costs.

"With this problem statement in mind, we outlined clear, specific goals for the project, including increasing OR rates by at least 1 percent and reducing overall generator usage and, in turn, fuel consumption and cost," said Billy Smith, the LSS team's internal Black Belt.

To gain a better understanding of the root causes of the problems identified, the team entered the second phase, Measure, during which they gathered data for and analyzed various key metrics, including fuel consumption patterns and amounts, percentage of failures attributable to the generators, operational availability and readiness, and overall generator power draw.

"We needed to ensure that we were measuring the right things. In this way, we could be sure that we were finding the true causes of the problem. Once we found the causes, we were then able to pointedly design solutions to address them," Smith said.

Using these data, the team entered the Analyze phase, conducting various statistical analyses to develop findings and identify the overall root causes of the generator problems.

"The team found that inefficient and excessive use of generators was the primary cause of the generator failures we were experiencing, while high system power draw and inefficiencies were directly contributing to the excessively high fuel consumption we measured on the generators," said Read. "Clearly, this project presented us with a prime opportunity to identify and design a more robust, cost-effective, and environmentally sound alternative or complement to the existing generators," he added.

With these findings in hand, the team set out to directly address the root causes identified during the Analyze phase.

"Once we felt confident in the root causes identified, we engaged in a number of related activities directed toward the development of an optimal alternate energy design," Smith said.

These activities included developing a system concept of operations and design parameters; conducting a power analysis to determine consumption rates and patterns; articulating specific design assumptions; determining required battery run times; and comparing a pure versus a hybrid power solution. Overall, the team determined that a hybrid power solution would best address the problems identified, and would satisfy customer needs and system performance requirements.

The team then conducted trade analyses to determine the best commercial-off-the-shelf (COTS) solution available to meet the system's hybrid power needs. A COTS solution would address the problems identified while reaping savings by implementing an existing solution, as opposed to developing a new, custom solution. At the conclusion of the trade analyses, several COTS modifications to the system's design were recommended, including adding a battery bank, adding solar panels and batteries, and reducing the overall system load with more efficient electronics.

SUCCESSFUL DEMONSTRATION

"Once we determined the best solution—that is, the hybrid power solution—we then arranged for a demonstration to view the system in operation and to determine any remaining modifications and other items necessary to move from a prototype to full implementation," Read said. The demonstration, which took place May 17-21, "was a success in every way," he said.

TEAM EFFORT

The government teamed with Raytheon Co. to develop the Rapid Aerostat Initial Deployment (RAID) solar/ hybrid tower.

"WE NEEDED TO ENSURE THAT WE WERE MEASURING THE RIGHT THINGS. IN THIS WAY, WE COULD BE SURE THAT WE WERE FINDING THE TRUE CAUSES OF THE PROBLEM. ONCE WE FOUND THE CAUSES, WE WERE THEN ABLE TO POINTEDLY DESIGN SOLUTIONS TO ADDRESS THEM."

The system achieved a 93.8 percent reduction in run time, far exceeding the team's goal of a 50 percent reduction. Moreover, the system achieved fuel savings of 4.25 gallons per day (or 128 gallons per month), which translates to $191.30 saved per day, per system (about $69,800 per year, per system). The team also met the requirement for electronics-off-the-tower by reducing weight at the top of the tower by 65 pounds and volume by 5.8 cubic feet. This weight reduction reduced the system's overall power consumption.

Furthermore, all existing interface requirements were met, enabling the placement of the new hybrid power systems on existing RAID towers with minimal modifications to the mechanical hardware and no modifications to the interface connections. Finally, because most of the critical components were moved to the base of the tower as part of the new, hybrid power design, the towers no longer needed to be lowered to allow for maintenance.

Dr. Jim Sommer, Army Science Advisor to U.S. Central Command (CENTCOM), attended the demonstration and came away "very impressed with this project," he said. "I think this is a great endeavor; it has the potential to save energy and possibly lives. I will be interested in seeing the final results of this project and considering applicability across CENTCOM," Sommer said.

CONCLUSION

"We were very pleased with the hybrid power system demonstration," Read said. "We achieved all of the project goals by using the rigorous LSS methodology, coupled with a mind toward green solutions. At the end of day, we now have a far more efficient system that is easier to maintain and consistently demonstrates higher operational readiness rates that contribute to saving lives on the battlefield—all at less cost to the taxpayer.

"This was a win all the way around, and we are now working to obtain funding to upgrade the RAID systems in Afghanistan. We anticipate fielding this capability as early as March 2013," he said.

For more information on PM NV/RSTA and PM ITS, go to ***http://peoiews.apg.army.mil/nvrsta/index.html.***

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DR. CHRISTINA BATES is a Strategy and Strategic Communications Specialist for Project Manager Night Vision/ Reconnaissance, Surveillance, and Target Acquisition. Bates holds a B.A. in communication and sociology from Boston College, an M.S. in mass communication and a J.D. from Boston University, and a Ph.D. in communication from Arizona State University. She is an LSS Master Black Belt.

STANDING TALL

Using LSS methods, PM ITS set out to identify opportunities to reduce system downtime and provide a redundant power source for the RAID sensors. The result was a successful hybrid of various energy sources, including batteries and solar panels, for day/night, state-of-the-art sensor operation. Pictured is a RAID solar hybrid tower.

MYTH BUSTED

PEO STRI dispels doubts about industry days to achieve closer communication, more responsive acquisition

by Jeffrey D. Claar

The Discovery Channel's Emmy-nominated series "MythBusters" aims to uncover the truth behind popular myths and legends by mixing scientific methods with gleeful curiosity and plain, old-fashioned ingenuity. A misconception or myth in acquisition has been that industry days and similar events attended by multiple vendors are of low value because the government does not provide useful information and vendors are reluctant to engage with government representatives in the presence of competitors.

To dispel this belief, the Acquisition Center of the Program Executive Office Simulation, Training, and Instrumentation (PEO STRI) has taken on the role of "myth buster" with the creation of PEO STRI Acquisition Center Procurement Administrative Lead Time (PALT) Industry Days.

On Feb. 2, 2011, the Office of Management and Budget (OMB) issued a "myth-busting" memorandum in an educational campaign addressing misconceptions and facts surrounding communication with industry during the acquisition process. The memorandum (online at **http://www.whitehouse.gov/sites/default/files/omb/procurement/memo/Myth-Busting.pdf**), identified common "myths" that were hindering agencies and directed the removal of unnecessary barriers to reasonable communication, promoting responsible and constructive exchanges with industry.

In August 2011, PEO STRI hosted its inaugural PALT Industry Day. The Acquisition Center's Principal Assistant Responsible for Contracting (PARC), Joseph A. Giunta Jr., noted that it was "a means of providing ground truth and situational awareness of PEO STRI's Acquisition Center procurement process and ongoing procurements."

MONTHLY INDUSTRY DAYS

Since then, PEO STRI PALT Industry Days have grown exponentially, serving the contracting community, requiring activities, and industry partners alike. The now-monthly PALT Industry Day provides more than 200 industry representatives with the status of PEO STRI programs and ongoing procurements, and the opportunity to request updates on specific procurements of interest in a question-and-answer forum.

These types of venues enhance communication and enable PEO STRI to respond faster to critical, emerging requirements with innovative acquisition and technology solutions, thereby putting the power of simulation into the hands of America's warfighters.

One clear example centers on the Assistant Project Manager for Medical Simulation (APM MedSim) office, chartered to deliver medical training technology to Soldiers, Sailors, Airmen, and Marines for the application of medical interventions under combat conditions. APM MedSim, assigned to Project Manager Combined Arms Tactical Trainers (PM CATT), is the Army's primary acquisition program management office for medical simulation and training products, specifically the Medical Simulation Training Center (MSTC) Program. These Army training assets deliver effective medical training using a standardized platform for both classroom and simulated battlefield conditions.

The MSTC Program supports training for medical and nonmedical personnel including active-duty, Reserve, and National Guard Soldiers, with priority given to deploying units. MSTC systems are operating in both CONUS and OCONUS locations.

The APM MedSim has used the PALT Industry Days extensively, specifically with regard to the MSTC Program, for active dialogue with potential contractors, creating a much clearer understanding of the government's material requirements and schedule. At the same time, our acquisition teams have gained a better appreciation of what products industry has to offer and any associated programmatic or technological constraints.

FREE TO ASK QUESTIONS

The PEO STRI PALT Industry Day sessions are driven by industry's questions, not a fixed government agenda. Industry attendees routinely ask questions about contract types and PALT milestones associated with a specific procurement, enabling them to better allocate resources and make investment decisions.

MATCHING REQUIREMENTS WITH SOLUTIONS

The monthly Procurement Administrative Lead Time Industry Days sponsored by Program Executive Office Simulation, Training, and Instrumentation (PEO STRI) help match critical, emerging requirements with innovative acquisition and technology solutions, such as for medical simulation. Here, SGT Nicholas Kleem of the 215th Medical Company applies an occlusive dressing to treat a simulated casualty's chest injury during medical sustainment training Jan. 15 at Camp Atterbury Joint Maneuver Training Center, IN. (Photo by SSG David Bruce, Camp Atterbury Public Affairs)

KEEPING SKILLS SHARP

The Medical Simulation Training Center (MSTC) Program supported by PEO STRI delivers effective medical training using a standardized training platform for both classroom and simulated battlefield conditions. Here, SSG Teresa Greening and SGT Joshua Long, MSTC instructors, prepare to lift a stretcher with a simulated casualty March 8 at Joint Base Lewis-McChord, WA. (U.S. Army photo by SPC Loren Cook, 20th Public Affairs Detachment)

Small business strategy is also a topic of discussion, leading to better teaming opportunities. PEO STRI's PARC, Deputy PARC, Division Chiefs, Program Managers, Legal and Small Business offices, and a host of contracting officers attend so that they can respond readily to industry's requests. In this unscripted setting, our industry partners have been more open and comfortable with sharing information. In turn, "We obtain better information for the acquisition community," Giunta said.

That said, "We do have the ability to push specific information to industry at these venues, leading to an educated partner on our own internal processes and policies," Giunta noted.

For example, the PEO STRI Acquisition Center recently implemented an Acquisition Instruction (AI) outlining internal policies and procedures on fostering productive exchanges of ideas with industry. True to the intent of vanquishing old myths, industry partners received access to the Acquisition Center's "Communication with Industry" instruction, AI 016, immediately after its full implementation across PEO STRI.

Through the use of PALT Industry Days, the consensus is that PEO STRI has been better able to address the industry perceptions alluded to in OMB's myth-busting memorandum.

BUILDING TRUST, KNOWLEDGE

Industry seems to agree. As David Manning, Founder of StrategyONE Services LLC, said, "Communication has improved to the point where we now are beginning to build a more trusting relationship between the government and industry." He added, "It validates that PEO STRI senior leaders

are committed to addressing industry's concerns and issues."

Senior leadership at PEO STRI hears industry loud and clear. Fran Fierko, Deputy PM CATT, acknowledged, "Indeed, an element of trust is now building between the government and industry. We understand their concerns, and they better understand our constraints."

Giunta also noted an unexpected benefit from the PALT Industry Day sessions. "At the end of the sessions, the gatherings have evolved into a sort of extended market research venue for our requiring activities," leading to potential teaming opportunities for industry partners.

Market research is used to determine whether industry can support the acquisition "needs" of the government. It is a continuous process for gathering, analyzing, and documenting information about products and services available in the marketplace, and includes determining product characteristics, suppliers' capabilities, and business practices.

The PALT Industry Day venue brings together program managers and industry monthly to share new technologies and business approaches. This not only helps the program manager better define requirements, but ultimately also lends itself to better framing the requirements for our industry partners.

Matt Fair, Vice President of Orlando-based operations at Tactical Micro Inc., agreed. "Not only have the PALT Industry Day sessions led to improved communication with the government, but the secondary effects have also been significant," specifically industry-to-industry communication.

INVITING DISCUSSION
The PEO STRI Acquisition Center's monthly Industry Day, called the Procurement Administrative Lead Time, facilitates discussions between the government and industry on business opportunities, program status, requirements, and contracting actions. (U.S. Army photo courtesy of PEO STRI)

CONCLUSION

Facilitating better communication with industry partners through forums such as the PEO STRI PALT Industry Days can and does shape how we get technology to the warfighter.

"Training is a team sport," noted Dr. James T. Blake, Program Executive Officer STRI. "The tremendous technological advances we are making in simulation, training, and testing reach far beyond just benefiting our Nation's warfighters.

Through the affiliations that we form in the military, government services, industry, and academia, we are able to have a significant impact on the training of not only our own military forces but also that of our coalition partners."

So while we may not be solving age-old myths by answering questions such as, "Would a bull really cause destruction in a china shop?" we are, with forums like PEO STRI's PALT Industry Days, diffusing old communication myths by changing a culture within our acquisition community and restoring credibility and transparency to the procurement process in the eyes of our industry partners.

For more information, go to ***http://www.peostri.army.mil.***

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PANNING FOR DATA

The Program Assessment and Root Cause Analysis (PARCA) Directorate identifies what is useful from myriad reporting requirements. The first areas PARCA is tackling are cost, schedule, performance program management, and reporting of Acquisition Category I programs. (Photo by Jupiterimages/Photos.com)

GETTING GOOD DATA

PARCA makes strides in identifying what's useful from myriad reporting requirements

by Augusta Zoe Hemann

How are my programs doing against baseline? Which programs are likely to breach? Which programs are successful, and why? In what areas and acquisition phases do we have the most risk? What impacts do a continuing resolution, congressional marks, and other fact-of-life changes have on programs?

These are just a small sampling of the myriad questions that acquisition leaders face every day. Over the past 10 years, the way the acquisition community does business has been affected by many influences, including going to war, Army Force Generation, economic crisis, continuing resolutions, and the drawdown of the war effort. These constant changes, coupled with the breakneck speed of technological advances, have provided us with plenty of data but a limited capability to relate the data to meaningful context, identify our challenges, and assist our understanding of their root causes.

To support efficient delivery of complex systems and to effectively evaluate lessons learned about successful and unsuccessful strategies, we must be able to convert the data into knowledge and provide analysis to understand the root causes. Methods that navigate these many challenges, delivered in an affordable and timely manner, can provide a good product that meets the needs of the Army.

Relatively inexpensive technology has made possible a large increase in data and ad hoc reporting, and we have created an environment that isolates data into narrowly focused groups. We have not become more efficient—we have become less so.

The Program Assessment and Root Cause Analysis (PARCA) Directorate, under the Assistant Secretary of the Army for Acquisition, Logistics, and Technology (ASA(ALT)), is charged with helping to make programs more efficient and to determine the source of both positive

OVER THE PAST 10 YEARS, THE WAY THE ACQUISITION COMMUNITY DOES BUSINESS HAS BEEN AFFECTED BY MANY INFLUENCES, INCLUDING GOING TO WAR, ARMY FORCE GENERATION, ECONOMIC CRISIS, CONTINUING RESOLUTIONS, AND THE DRAWDOWN OF THE WAR EFFORT.

and negative root causes, enabling us to share lessons learned. We must evaluate how we can apply these in a stringent economic environment with more threats and more information than ever.

What information do we really need? How do we ensure that the owners of this information can share it easily? How can we use this information in more dynamic ways to capture trends and anticipate problems before they occur?

WORKING WITH PEOS

Along with managing and analyzing data and reporting that go to the Office of the Secretary of Defense (OSD), PARCA looks at simplifying internal acquisition program management by working with the program executive offices (PEOs) and understanding their management concerns. Even with the multiple ways we can communicate using technology, face-to-face communication is important.

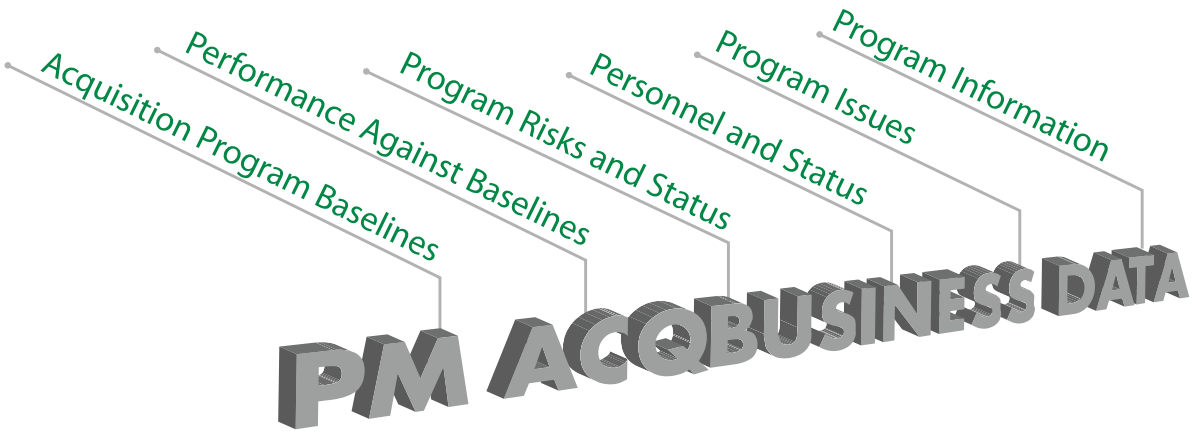
PARCA has begun workshops in which action officer representatives from the PEOs and deputy assistant secretaries of the Army are invited to discuss specific reporting requirements and business rules, and to provide feedback to wire-frames and demonstrations of the revised data and automated reports.

These conversations are invaluable, because a cornerstone of data quality is consistent stakeholder engagement, with open discussion of what data are really important, the best way to capture the data, and how they are used.

A SIMPLER APPROACH

One of PARCA's roles is combat developer for Product Manager (PM) AcqBusiness, a program designed to manage acquisition program reporting. Data from the PEOs, such as acquisition program baselines, performance against baselines, program risks and status, personnel and status, program issues, and general program information go into systems at PM AcqBusiness. Depending on the level of access, the data are for PEO use only, or shared with ASA(ALT), OSD, and/or Congress.

Previously, data were in stovepipes. There was too much data, with an absence of business rules, meaningful sense, and predictive analysis. PARCA has begun to engage the community with governance boards and workshops aimed at tackling specific problems deliberately and methodically. These problems can be daunting, but by breaking them down and working to simplify



FRAMEWORK FOR IMPROVEMENT

PARCA aims to bring a stronger focus and greater efficiency to an environment where data on Army acquisition programs were isolated into narrowly focused groups.

and accurately report one area at a time, the visibility of our issues increases, and so does our efficiency.

The first areas PARCA is tackling are cost, schedule, performance program management, and reporting of Acquisition Category I programs. This gives us enough initial data to see what is meaningful to report; our challenges with cost, schedule, and performance; and what data are missing.

PARCA has conducted several workshops so far, revealing different business rules in our community on the way we evaluate and rate programs. This has helped to identify some data discrepancies, and we have begun the process of presenting recommendations to our leadership for unification of business rules.

CONCLUSION

This is a step forward in getting clear metrics on our programs and understanding which are doing well and which may have challenges that may or may not be apparent.

"Less is more" is an adage that works for the task of more efficient analysis and reporting of our programs. PARCA has made initial steps toward simplification with consolidation of the Probability of Success reporting required for senior leadership into the Universal Acquisition Data Display and Entry system as a single point of entry, and by getting rid of requirements for reports that no one really looks at.

PARCA continues to work the grind, getting into the dynamics of every report and understanding what information is truly required and what can be done to make it more meaningful and dynamic.

*For more information, contact Joe Brito at **joseph.m.brito.civ@mail.mil**. Also, go to the website for the Next Generation Business Environment, at **https://acqdomain.army.mil/AcqBusiness.***

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UNDERSTAND the Battlefield

Enable Decisive Action.








Provide affordable, world class Sensor and Electronic Warfare capabilities enabling rapid situational understanding and decisive action.

Mission

A team of dedicated professionals driving innovation and exceptional value in understanding and shaping the Battlespace.

Vision

Intelligence - Electronic Warfare - Sensors - Situational Understanding

Program Executive Office
Intelligence, Electronic Warfare & Sensors

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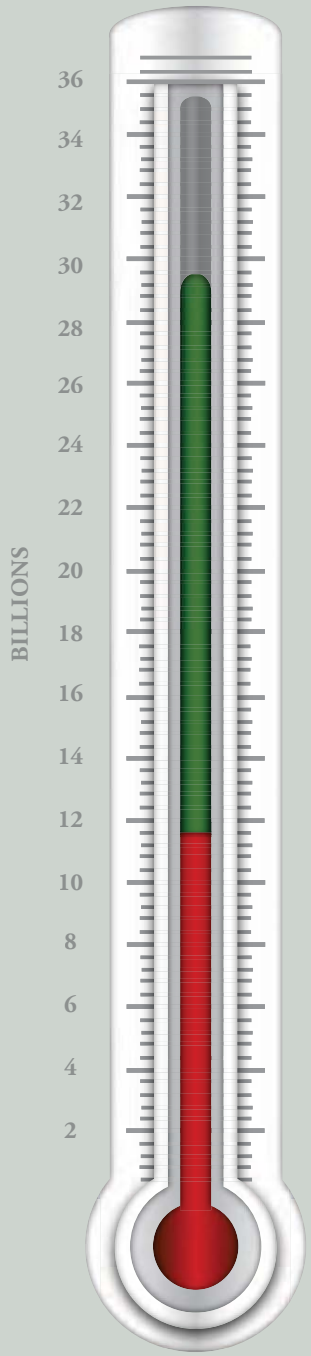
Find us on

COST SAVINGS
$18.0 BILLION

COST AVOIDANCE
$11.6 BILLION

CURRENT TOTAL
$29.6 BILLION



DOLLARS & SENSE

The Assistant Secretary of the Army for Acquisition, Logistics, and Technology (ASA(ALT)) community has continued to meet warfighter needs by identifying cost savings and avoidance in all areas of Army acquisition, while facing the challenges of reduced manpower, funding, and contractor support. Army AL&T *Magazine has tracked this effort.*

As of June 30, ASA(ALT) organizations had completed 896 Continuous Performance Improvement projects and achieved cumulative benefits of $29.6 billion in efficiencies ($18 billion in cost savings and $11.6 billion in cost avoidance), realized in the period from FY07 to FY18. Some examples of successful Lean Six Sigma (LSS) projects follow.

- ***Soldier Protection and Individual Equipment (SPIE) Logistic Mission Analysis (Project Manager (PM) SPIE, Program Executive Office (PEO) Soldier)***—The team applied LSS principles to improve the Army's Rapid Fielding Initiative (RFI), which provides state-of-the-art modernization items to deploying forces to enhance individual and small unit mobility, lethality, survivability, and the ability to operate in any environment. The project, which identified redundancies across PM SPIE's RFI portfolio to make staging, fielding, and new equipment training more efficient and cost-effective, achieved $82 million in validated cost savings for FY12-18.

- ***Retaining High-Powered Serviceable T700-GE-700 & T700-GE-701C/D Aircraft Engines (PM Utility Helicopter, PEO Aviation)***—This project identified ways to increase use of helicopter engines by swapping out, transferring, and reusing serviceable engines, resulting in a validated cost avoidance of $206 million for FY11-15.

- ***Field Level Maintenance (FLM) Special Tool Relevancy (PM Joint Combat Support Systems, PEO Combat Support and Combat Service Support)***—This multigenerational project developed a process to ensure that the minimum essential special tools were identified in the Tactical Wheeled Vehicle family. This process has the potential to reduce by 75 percent the number of special tools required to execute FLM while increasing Soldier-maintainer effectiveness and efficiency, significantly decreasing the logistics burden, and reducing total life-cycle costs. The team realized a validated cost avoidance of $39.3 million for FY13-18.

For more information on ASA(ALT) efficiencies initiatives, contact Colleen Prasil in the Strategy and Improvement Directorate at ***colleen.f.prasil.civ@mail.mil.***

COMMENTARY

FROM THE DIRECTOR,
ACQUISITION CAREER MANAGEMENT
LTG WILLIAM N. PHILLIPS

PROFESSIONAL *to the* CORE

Growing the Army Acquisition Workforce, in numbers and skills

SUPPORTING SOLDIERS
As part of the Profession of Arms, the Army Acquisition Workforce has the vital responsibility of helping Soldiers prevail in battle, by identifying, developing, and delivering critical technologies, solutions, and next-generation capabilities. Here, Soldiers load a CH-47 Chinook helicopter Sept. 9 on Camp Marmal, Afghanistan. (U.S. Army photo by CPT Andrew B. Adcock)

Those of us in the acquisition career field have the great honor of identifying, developing, and delivering critical technologies, solutions, and next-generation capabilities to our Soldiers with a mind to greatly helping their mission in battle. Acquisition is an integral part of the military Profession of Arms, a mission to serve Soldiers. You are a member of the most respected institution in America—our military!

I take great pride in ensuring that senior Army leaders and commanders are kept abreast of the key issues of importance to our field of endeavor. As part of this, we aim to continue educating, training, and providing the right experiences and opportunities for our men and women in the Army Acquisition Workforce, in order to recruit and retain the best and brightest talent for our ranks.

Over the past two years, I have engaged commanders and directors personally to make it clear that managing

the professionalism of our workforce is "commander's business." They are, in turn, engaged in personally ensuring that the acquisition workforce is trained and certified to handle the challenges of the mission.

BUILDING THE WORKFORCE

We continue to make substantial progress in implementing the Secretary of Defense's "acquisition workforce growth" initiative, which calls upon us to add 1,885 new acquisition positions to our ranks by 2015. To date, we have hired 1,677 and have a plan in place to add the remaining personnel over the next few years to complete this important requirement. In total, there are currently approximately 42,000 dedicated acquisition professionals in our ranks.

Concurrent with our efforts to add to our capacity, we are focused on ensuring that the acquisition workforce has the requisite skills needed to excel. Along these lines, we are expanding training, certification, and opportunities for those entering the acquisition field.

There are 14 different acquisition career fields, including business professionals, all aspects of contracting, program management, and a variety of technical disciplines such as systems engineering and information technology. The dedicated individuals in these fields serve at every level, from interns and journeymen through the highest ranks of acquisition supervisors. All are important contributors in our acquisition business.

PROFESSION OF ARMS

While those responsible for developing, purchasing, and fielding battlefield gear for Soldiers may work behind the scenes, acquisition is an integral part of the military Profession of Arms, supporting Soldiers on the front lines. Here, SGT Jacob Bauer (center), an infantry team leader with 2nd Battalion, 505th Parachute Infantry Regiment, 82nd Infantry Division, prepares to lead his paratroopers on a patrol in Mulakala, Afghanistan, Aug. 30. The paratroopers were searching for an improvised explosive device factory in the village. (Photo by SPC Alex Amen, 115th Mobile Public Affairs Detachment)

SKILLS TO MEET THE MISSION

All of our efforts to grow the workforce must be relevant to the often fast-changing nuances woven into our mission. Therefore, our plan cannot be stagnant but must remain cognizant of new developments related to emerging technology, contract pricing, cost estimating, and a variety of other dynamics central to our efforts and the current fiscal and developmental environment.

We will continue to leverage, build upon, and institutionalize the significant progress we have made in improving efficiency within the acquisition process, strengthening contracting and contracting oversight, and sustaining the professionalism and expertise of

OVERALL, 91 PERCENT OF OUR ENTIRE ACQUISITION WORKFORCE IS CERTIFIED OR WITHIN THEIR GRACE PERIOD (A GLIDE PATH TOWARD ACHIEVING CERTIFICATION). … THIS 91 PERCENT IS THE HIGHEST THAT OUR WORKFORCE HAS ACHIEVED, BUT IT IS NOT ENOUGH.

LIFESAVING CAPABILITIES
LTG William N. Phillips, Principal Military Deputy to the Assistant Secretary of the Army for Acquisition, Logistics, and Technology and Director, Acquisition Career Management, inspects the underside of a Mine Resistant Ambush Protected (MRAP) vehicle Feb. 22 during a tour of the MRAP Sustainment Facility at Mina Abdullah, Kuwait, with Dr. Scott Fish, Army Chief Scientist. MRAPs provide Soldiers with vital protection against underbody mines and small arms threats. (Photo by CPL Jordan Johnson, 13th Public Affairs Detachment)

our workforce. As acquisition professionals, we consistently seek to deliver critical next-generation capabilities while simultaneously working to lower costs wherever possible, streamline requirements, and remain conscious of our fiscally constrained environment.

Some key requirements for our workforce involve metrics that relate directly to our profession as acquisition professionals and leaders. First, Army Acquisition Workforce personnel are required to accumulate Continuous Learning Points (CLP) within a two-year recurring window, for example from September 2010 to 2012.

Our workforce is maintaining and furthering its professional currency and expertise by obtaining 80 CLPs through important training opportunities, courses, online programs, and even developmental assignments like serving on integrated product teams.

Failure to achieve the 80 CLPs within each two-year window is not an option!

With these training goals in mind, members of our acquisition workforce continue to make great progress in earning acquisition certifications to preserve and build upon their expertise.

Overall, 91 percent of our entire acquisition workforce is certified or within their grace period (a glide path toward achieving certification). For those serving in Critical Acquisition Positions, that figure is at 96 percent; and for those in our Key Leadership Positions, 99 percent.

This 91 percent is the highest that our workforce has achieved, but it is

WE AIM TO CONTINUE EDUCATING, TRAINING, AND PROVIDING THE RIGHT EXPERIENCES AND OPPORTUNITIES FOR OUR MEN AND WOMEN IN THE ARMY ACQUISITION WORKFORCE, IN ORDER TO RECRUIT AND RETAIN THE BEST AND BRIGHTEST TALENT FOR OUR RANKS.

not enough. While we applaud this progress as we continue to meet our benchmarks and standards, we plan to continue our great work and increase our certification rates.

My goal for the Army Acquisition Workforce in total is to achieve even greater progress toward 100 percent.

You are an acquisition professional and part of a team dedicated to providing capability for our warfighters. Being certified in your profession is a requirement, not an option.

The expectation remains that all our teammates will become certified for the positions they occupy—with no exceptions.

CONCLUSION

In closing, our job is to support our Soldiers and deliver capability that accomplishes the mission with greater efficiency and effectiveness.

Those of us in the acquisition community are members of the Army's Profession of Arms; you are acquisition professionals in America's most respected institution! I remain very proud of your incredible work in supporting our Soldiers. Thanks for your service and your many sacrifices.

ACQUISITION IN ACTION

During a visit to Fort Bliss, TX, in May, Phillips received briefings and updates on Network Integration Evaluation (NIE) 12.2, the centerpiece of the Army's evolving Agile Acquisition strategy, from Soldiers of the 2nd Heavy Brigade Combat Team, 1st Armored Division (2/1 AD). The 2/1 AD plays a central role in the NIE series, conducted at Fort Bliss and White Sands Missile Range, NM, to assess potential network capabilities in a robust operational environment. Here, 2/1 AD Commander COL Daniel Pinnell prepares to climb into his Mine Resistant Ambush Protected All-Terrain Vehicle May 10 after hosting Phillips' visit. (Photo by SGT Sean Harriman, 2/1 AD)


Checkpoint
Danger

LANDWARNET SYNERGY

From installation to tactical edge

by LTG Susan S. Lawrence

Over the past 10 years, the Army has significantly improved communication capabilities to support Soldiers in the fight. Mission command and success have depended increasingly on the network to reach back for support and to reach forward to coalition networks from stateside locations for left-seat riding/learning before Soldiers ever get into theater.

On Sept. 9, 2011, Secretary of the Army John McHugh signed a memorandum on Information Technology Management Reforms challenging us to apply the "same innovation and adaptability … in our Operating Force" to the institutional Army, which we are doing.

As we focus on the end-to-end network, we are upgrading the largest portion of the Army network—the infrastructure on posts, camps, and stations—to support a smaller, more capable, CONUS-based, expeditionary Army. Reliance on the network has also increased among our functional areas; for example, modernized finance and personnel activities cannot be executed without the network.

This places the Army at a watershed point: To operate as an Army and to maintain and modernize critical mission areas, we must fundamentally modernize our network. (See Figure 1, Page 172.) Our challenges are to improve cyber security and Network Operations (NetOps), meet operational needs in a dynamic threat environment, and become more efficient under tightening fiscal constraints.

SECURITY AND STANDARDS

First and foremost, improving cyber security and NetOps are fundamental to operating in a single, secure, standards-based network environment. Nonstandard network management tools, multiple access

EXTENDING THE NETWORK

As part of the Army's significantly improved communication capabilities to support Soldiers in the fight, SIPRNet/NIPRNet Access Point (SNAP) terminals provide beyond line-of-sight voice, video, and data communications to small units at forward operating bases. SNAP terminals, a component of the Warfighter Information Network – Tactical, thereby extend the Army network down to the team, platoon, and company levels. (Photo by Claire Schwerin, Program Executive Office Command, Control, and Communications – Tactical)

points, vulnerable perimeter defenses, and stovepiped architectures (many of which were deployed quickly to support war efforts) make it difficult to prevent, identify, isolate, and eliminate security risks. As cyber threats increase exponentially, the ability to secure LandWarNet is not only the Army's top concern, but also a continued priority for DOD and the President.

Standardizing NetOps tools, coupled with upgrading legacy software, will allow the Army to monitor and respond to attacks without fear of incompatibility. Introducing thin/zero clients—systems that export part or all of computer operations to a central server—will allow us to use more cloud and consolidated services, reducing the substantial risk of compromise associated with a user device; in the current LandWarNet architecture, 80 percent of network vulnerabilities are introduced at the end node.

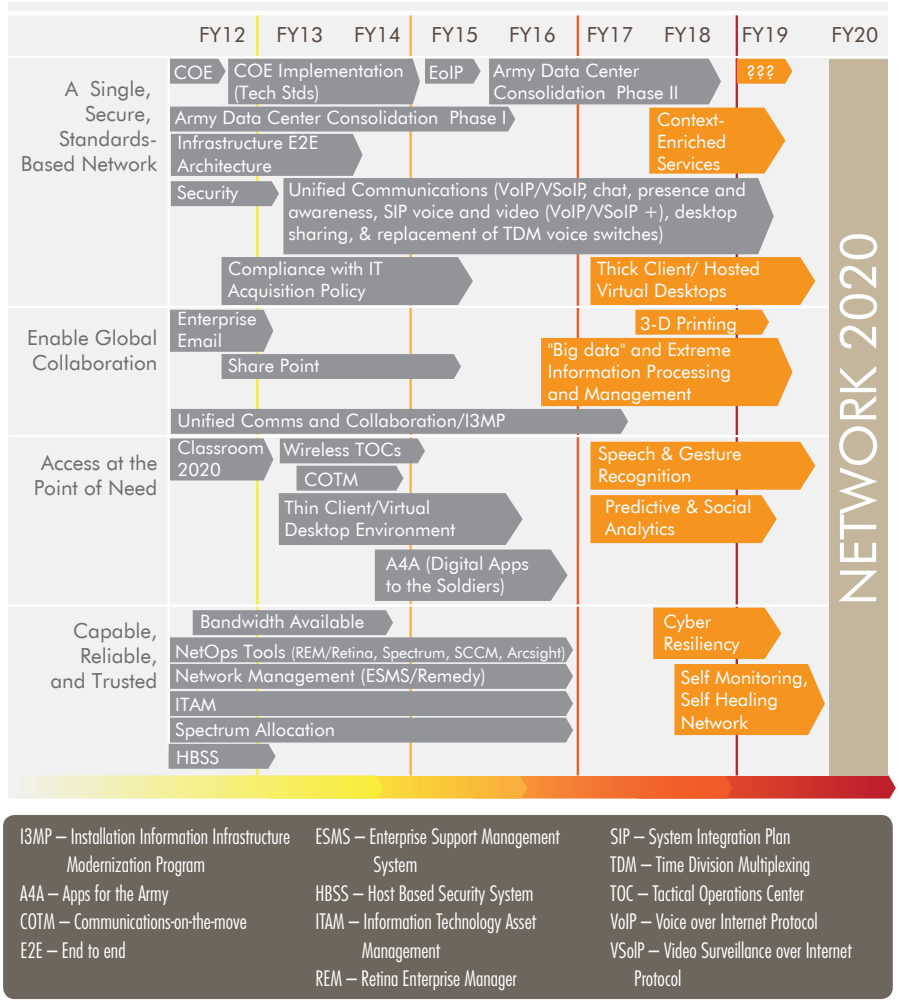
Centrally managed and cloud-based services, such as enterprise directory and enterprise email, also will ease network identity management, streamline user access, improve collaboration, and save resources through infrastructure consolidation.

Second, meeting the Army's operational needs is a continuing challenge, both at the tactical edge and on posts, camps, and stations. To be effective, LandWarNet must provide trusted access, assured connectivity, interoperability, and collaboration with all mission partners. It must be available at the point of need regardless of the geographical location—wherever Soldiers (Active, Army National Guard, and Reserve), leaders, and civilians are conducting the daily business of the Army, training, preparing for deployment, en route, or deployed. (See Figure 2.)

OUR CHALLENGES ARE TO IMPROVE CYBER SECURITY AND NETWORK OPERATION MEET OPERATIONAL NEEDS IN A DYNAMIC THREAT ENVIRONMENT, AND BECOME MORE EFFICIENT UNDER TIGHTENING FISCAL CONSTRAINTS.

BUILDING THE NETWORK

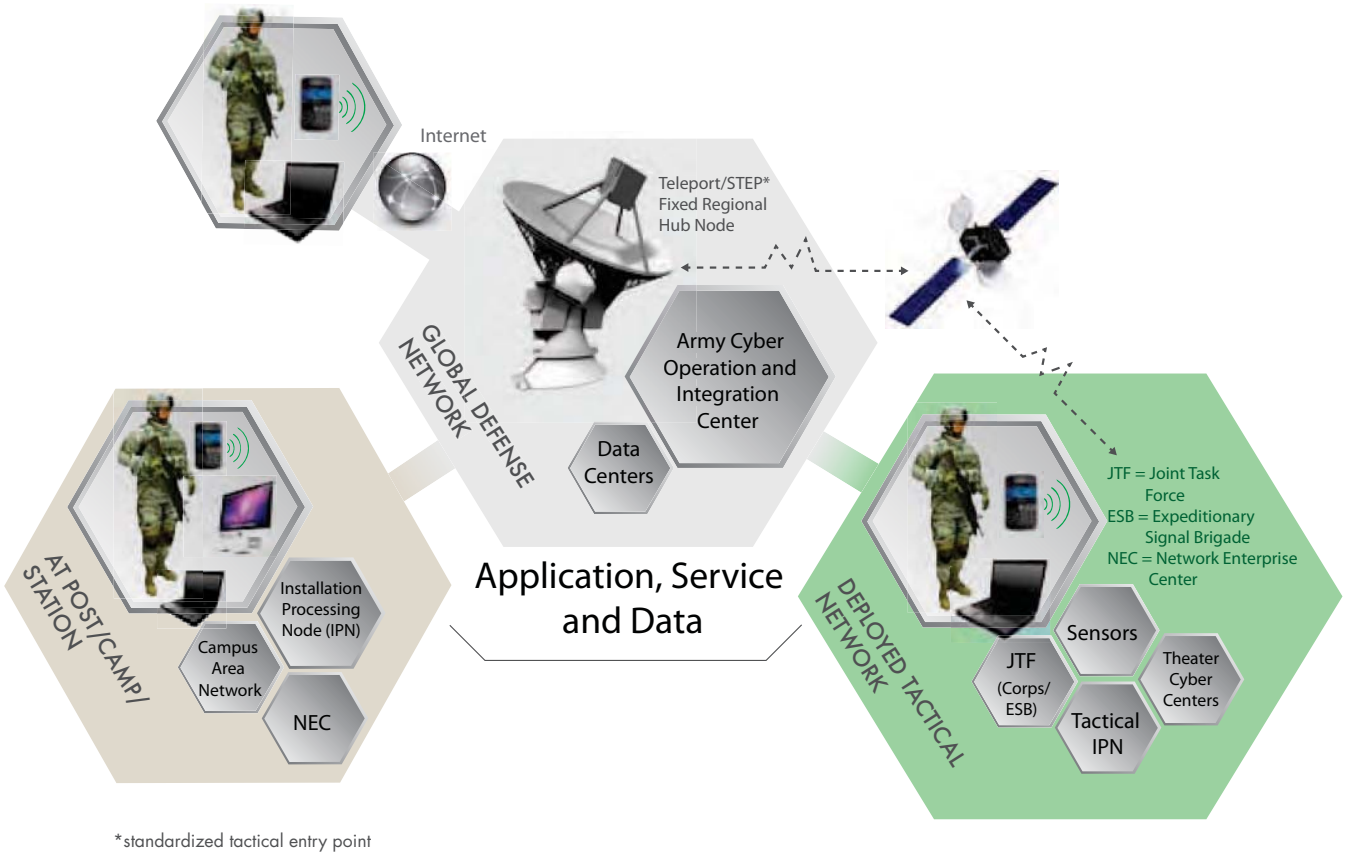
Figure 1



The Army's fundamental modernization of its network involves multiple simultaneous challenges, each of them on a trajectory toward achievement by 2020. (SOURCE: Army Chief Information Office (CIO)/G-6)

TRUSTED ACCESS EVERYWHERE

Figure 2



A central tenet of LandWarNet is that it must provide trusted access, connectivity, interoperability, and collaboration with all mission partners and be available at the point of need wherever Soldiers, leaders, and civilians are—training, preparing for deployment, en route, or deployed. (SOURCE: Army CIO/G-6)

The installation focus is aimed at giving units the ability to use their mission command (MC) systems on home-station networks and to connect to combat theater tactical networks. Previously, tactical networks and MC systems could be set up only during exercises in the field and were packed away when units returned to their motor pools. Now, a program called Installation as a Docking Station provides persistent MC connectivity. Units will have the most current mission data and system updates before deploying—the essence of a single, end-to-end network that enables a train-as-you-fight strategy.

Increased efficiency through advanced technology and improved IT governance is key to maximizing the bang of the federal budget's diminishing bucks. The President has directed that all U.S. government agencies achieve efficiencies and optimize their return on investments. For our networked Army, this mandate means enterprise systems and solutions that enable continuous, protected data access; a robust, secure network infrastructure to support every facet of Army, Joint and multinational operations; and a smaller physical footprint.

A FOUR-PRONGED APPROACH

Four major efforts are underway:

MOBILE COMMUNICATION
Tactical networks and mission command (MC) systems traditionally have been set up during exercises in the field, then packed away when units returned to their motor pools. The Army is transitioning to a program called Installation as a Docking Station, providing persistent MC connectivity and giving units the most current mission data and system updates before deploying Here, satellite transportable terminals and joint network nodes are set up July 11 during *Exercise Grecian Firebolt 2012* at Fort Hunter Liggett, CA. *Grecian Firebolt* is the U.S. Army Reserve's largest communications exercise, supporting real-world missions and training exercises for thousands of active-duty and Reserve Soldiers. (Photo by 1LT Eric Connor, 335th Signal Command (Theater))

- The Joint Information Environment, through which the Army is aligning with our DOD counterparts to develop a single, secure, standards-based end-state architecture.
- IT Management Reform, a comprehensive plan to modernize the network and realize efficiencies, with the goal of achieving $1.5 billion in annual savings beginning in FY15 without compromising effectiveness or security.
- Network Capability Portfolio Review, which will institutionalize an end-to-end management approach for network capabilities and IT services to avoid redundancy, stovepiped acquisitions, etc.
- IT workforce rebalancing and redesign, developing effectively organized and better-trained and -certified personnel to operate and defend LandWarNet.

Streamlining and accelerating acquisition are also essential to improving operational effectiveness and saving money. By building a uniform underlying architecture and not focusing on individual pieces of hardware, the Army will create a flexible, nearly plug-and-play network that can easily use the latest technology as it becomes available.

The foundation of that architecture consists of the Common Operating Environment (COE) and Everything over Internet Protocol (EoIP). The COE is the set of standards to which the network and all systems and applications riding the network must adhere; based on an open architecture, it promotes the use of commercial-off-the-shelf technologies wherever possible. The Army also has standardized to a single mode of information transmission, regardless of format or delivery means. Whether simple text, voice, video, signal, or other type of data, the network will move it via a nonproprietary Internet protocol, dubbed EoIP.

CONCLUSION

In an era of network dependency, escalating cyber threats, and tighter budgets, secure, efficient, and expeditionary Army network operations are critical. The network therefore must be managed with the same operational rigor and discipline as a weapon system, but with a mind open to aggressive change, particularly in finding innovations in the resourcing and acquisition spheres that will allow much more rapid integration of ever-advancing information technology.

The Army simply can no longer afford to be two to three generations behind the commercial standard for IT. The network is the key to achieving the smaller yet more capable force the Nation needs—not as a capability in and of itself but as the end-to-end force multiplier empowering every Soldier and civilian, from the desks at the Army's Pentagon headquarters to the farthest reaches of the tactical edge.

LTG SUSAN S. LAWRENCE is the U.S. Army Chief Information Officer (CIO)/G-6. As the CIO, Lawrence reports directly to the Secretary of the Army for setting strategic direction and objectives, and supervises all Army C4 (command, control, communications, and computers) and information technology functions. As the G-6, she supports the Chief of Staff of the Army by advising on network, communication, and signal operations. Lawrence has served in operational assignments in Europe, Korea, Southwest Asia, and the United States, commanding at every level from platoon to Army Signal Command. Lawrence has a B.S in psychology from Campbell University, where she received her commission, and an M.S. in information systems management from the University of Georgia.

SPOTLIGHT

RACHELLE L. LAPPERRE

by Robert E. Coultas

When it comes to organizational process improvement, Rachel L. Lapperre lives and breathes efficiency.

"I fundamentally believe that anything can be improved," she said. "Circumstances, technology, and requirements are always changing; there's always an opportunity for improvement."

Lapperre, a DA civilian, is a Joint Attack Munition Systems (JAMS) Project Office Improvement Specialist within the Program Executive Office Missiles and Space (PEO MS), and the only Army Certified Lean Six Sigma (LSS) Master Black Belt in PEO MS. Under her leadership of more than 50 JAMS LSS projects, Lapperre has been credited with $202.2 million in cost saving and avoidance—half of PEO MS' total savings achievement.

Lapperre believes that continuous process improvement fits hand in glove with any organization's strategic plan. "With today's budget constraints, all organizations need to focus on getting the most out of each dollar they receive. There are Soldiers in the field who are depending on us to do all we can to support them. For JAMS, strategically assessing our products and processes for opportunities for improvement and cost savings is key to identifying ways to continue providing the level of support our customers have come to expect from us."

DRAWN TO LSS

Lapperre, who calls herself an Air Force brat with ties to Texas, started her federal career as a U.S. Army Materiel Command Fellow. After completing the coursework for her Master of Science in business administration, she was a Logistics Item Manager for the Apache Avionics and Radar Division in the Integrated Materiel Management Center of the U.S. Army Aviation and Missile Life Cycle Management Command. She later rotated to a Program Analyst position in the JAMS Logistics Directorate.

"That was where I first received formal LSS training and went on to become the first certified Black Belt in PEO Missiles and Space," she said.

Lapperre became interested in LSS while doing her master's coursework. "It captured my attention and just made perfect sense to me. I began researching LSS and applying what I had learned, with some very good results. When formal LSS classes were offered at PEO MS, I jumped at the chance to learn more and become an official LSS practitioner."

After earning her degree, Lapperre rotated to the JAMS Program Integration Directorate. As the only Black Belt in PEO MS, she teaches LSS courses and mentors those who are pursuing their LSS Black and Green Belts. She encourages in them "a willingness to keep an open mind, listen to people, and follow the data." Lapperre also coordinates the JAMS Strategic Plan with the JAMS Better Buying Initiatives, Value Engineering, and LSS projects.

BAPTISM BY HELLFIRE

Her toughest LSS project, Lapperre said, was her very first: improving the reset process for the M299 and M272 HELLFIRE Missile Launcher in 2008. She traveled with the reset team to depot-level repair locations at Tennessee National Guard facilities; Boise, ID; and Fort Bragg, NC, working 12-hour days on average, six days a week, on the flight line.

"The project was difficult for me because it involved maintenance work, of which I had no previous experience," Lapperre explained. Ultimately, however, the long hours and steep learning curve brought success. With the reset team's help, she designed special tools to improve the cleaning and coating of launcher parts and a test bench that made testing launcher components easier and safer.

LAPPERRE BELIEVES THAT CONTINUOUS PROCESS IMPROVEMENT FITS HAND IN GLOVE WITH ANY ORGANIZATION'S STRATEGIC PLAN.

"I learned a lot about the reset program requirements and just how much the JAMS reset team must coordinate multiple variables to meet these requirements," Lapperre said. "The reset project was where I first applied the LSS tools I learned about in the classroom to real-life situations."

Her efforts also produced a greater-than-anticipated savings. "Rachelle had a 20 percent cycle time [target] reduction at the outset," said Frank DeLuca, PEO MS' Assistant Program Executive Officer for Strategic Planning and Operations. "She actually came up with a 25 percent reduction and an annual cost avoidance of $94,000. She changed the flow of the operation to optimize the solution set. Basically, she sat down with the workers and asked them, 'Why are you doing that?' "

Thanks to Lapperre's achievements with the HELLFIRE Launcher reset project, the JAMS LSS Program received the award for Outstanding Performance of a Continuous Process Improvement Team from the Assistant Secretary of the Army for Acquisition, Logistics, and Technology in 2008. The JAMS Project Office, which has been nominated every year since the award's inception, also won in 2009 for its HELLFIRE Captive Carry LSS Project.

Other JAMS Project Office honors include Level I and II awards from the Alabama Quality Award program in 2010 and 2011, respectively, and an iSixSigma Largest-Breakthrough Improvement Project award for customer service in 2010.

EFFICIENCIES EVERYWHERE

Even off the job, Lapperre's instincts for doing things better are at work. Deeply dedicated to the JAMS family and the community of Redstone Arsenal, AL, Lapperre is involved with the JAMS Family Readiness Group and is a productive member of the JAMS fundraising teams. For the 2011 Combined Federal Campaign (CFC) and 2012 Army Emergency Relief (AER) programs, she helped JAMS exceed its fundraising goals by 40 and 71 percent, respectively.

"I'm always looking at ways to improve things, including fundraising efficiency and effectiveness. The ladies and gentlemen who work with me on the JAMS CFC and AER fundraising teams feel the same. I think that's why JAMS has been able to far exceed its fundraising goals each year," she said.

ROBERT E. COULTAS is the Army AL&T *Magazine Departments Editor and an* Access AL&T *News Service Editor. He is a retired Army broadcaster with more than 40 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.*

USAASC PERSPECTIVE

FROM THE DIRECTOR,
U.S. ARMY ACQUISITION SUPPORT CENTER

ACQDEMO: RECOGNIZING EXCELLENCE IN THE WORKFORCE

We have now completed our first full rating year under the Civilian Acquisition Workforce Personnel Demonstration Project (AcqDemo) since the transition from the National Security Personnel System was completed in May 2011. I'm happy to report that AcqDemo provides a great process for recognizing, rewarding, and retaining the Acquisition, Logistics, and Technology (AL&T) Workforce.

Like other, traditional personnel systems, AcqDemo has the processes to evaluate and compensate the workforce, but it goes beyond that. What makes AcqDemo different is that it not only recognizes employees' accomplishments, but also instills an atmosphere of making a difference in Soldiers' lives. In this organization, AcqDemo has consistently recognized our employees' dedication to making that distinction.

AcqDemo's Contribution-based Compensation and Appraisal System (CCAS) is a very important performance management evaluation tool. It links AL&T Workforce employees' objectives and performance contributions to the organization's mission. The connection between the employee's job and the value it brings to the unit can't be overemphasized; it is important to acknowledge the AL&T Workforce for their determined efforts on behalf of Soldiers.

Craig A. Spisak
Director, U.S. Army Acquisition Support Center

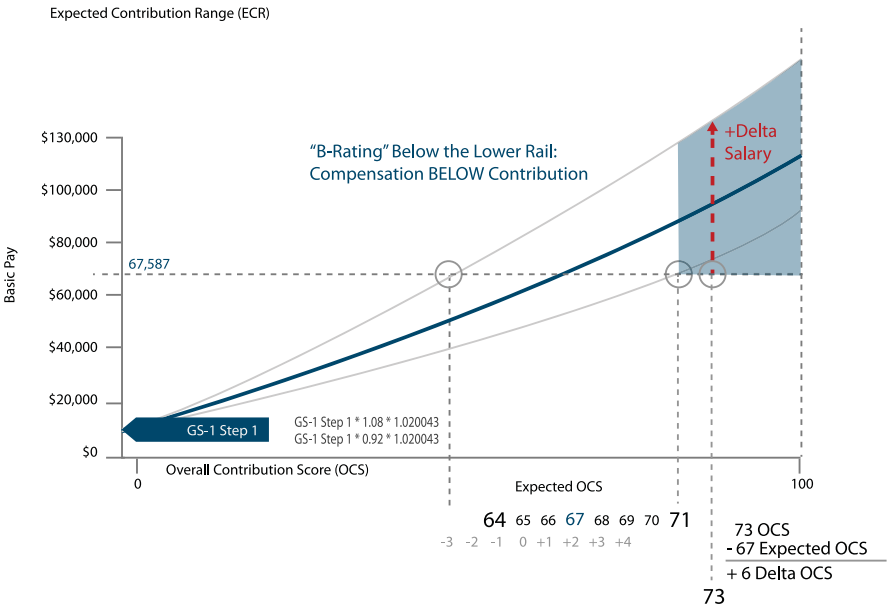
Unlike other performance management systems that base the employee's appraisal on daily activities, CCAS measures the contributions that an employee's activities make to the organization's mission and goals. CCAS provides flexibility for employees by using six factors to develop their contribution planning and their midpoint and annual self-assessments. The organization has the flexibility, through supervisors' assessments, to accurately recognize the contributions of the workforce, and to reward and compensate employees accordingly.

COMMUNICATING OBJECTIVES

When it comes to recognizing employee contribution, good communication is key throughout the AcqDemo CCAS process. The responsibility lies with everyone involved, but it begins with the individual.

As the Director, U.S. Army Acquisition Support Center (USAASC), it is my responsibility to communicate our organization's mission, goals, and priorities to my senior leaders, who in turn communicate them to their employees. It is the responsibility of the individual employee, when writing the objectives, to work with his or her supervisor to clearly translate organizational goals into specific objectives with expected results and impact for each rating period.

If that link is broken because of poor communication, then I can assure you that the pay pool panel will ask "So what?" when they see assessments that do not provide results and impact contributing to the organization's goals. At the beginning of



MEASURING CONTRIBUTION

Employees can determine their Expected Contribution Range (ECR) by intersecting their basic pay (found on Standard Form 50, *Notification of Personnel Action*) with the rails of the normal pay range, which are based on career paths and broadband level. Here, an employee is scored higher than the ECR. (SOURCE: U.S. Army Acquisition Support Center AcqDemo Program Office)

the rating period, we must develop and communicate objectives that contribute to the mission on the front end, and to articulate at the end of the rating period the results of what the employee has achieved. It's not about output, it's about outcomes. It's not just about activities, but also about the results and impact of those activities … contribution!

TRAINING IS CRUCIAL

If this personnel system is going to succeed, the workforce must be trained from initial entry into AcqDemo and throughout their time under CCAS. Over my career, I have served at every level of the CCAS process, from employee to supervisor to pay pool panel member to pay pool manager, and now as the next higher official above the pay pool manager. In every single capacity, I've seen the process work well here in USAASC, but not so well in other organizations where I've been assigned.

This is why training is critical to the success of AcqDemo and CCAS. Supervisors and employees must know how the system works, understand its underpinning philosophies, and be proficient in it. That proficiency is developed and maintained through comprehensive training. USAASC, the Army Lead for AcqDemo, has an outstanding training program that features a holistic approach to the mechanics of the system and how to link contribution objectives to an organization's mission and goals.

Our training program is a major factor in our success. Although our Army AcqDemo Program Office has traveled worldwide to provide their expertise and assistance, our AcqDemo organizations would be better served if they had resident subject-matter experts and trainers. That way, they would have in-house expertise to provide training on how to use and execute the system. I have tasked our Army AcqDemo Program Director to initiate a train-the-trainer concept for our current AcqDemo activities in 2013.

EXPANDING ACQDEMO

In my last commentary, we discussed one of the Under Secretary of Defense for Acquisition, Technology, and Logistics (AT&L) initiatives to improve the capability of the Defense Acquisition Workforce. Project 3, led by USAASC, is designed to elevate the status, prestige, and professional standards of acquisition personnel, focusing on key leaders.

One of the subsets of that project is to assess AcqDemo for broader application as a common performance management system for the AT&L civilian workforce—in other words, to study the feasibility of expanding AcqDemo to all DOD organizations that have a predominantly acquisition workforce. I highly recommend that all Army and DOD acquisition organizations adopt AcqDemo as their personnel system.

I believe AcqDemo and its performance management system, CCAS, have successfully measured our contribution to resource, train, develop, communicate, and manage our workforce. We take great pride in the fact that we are part of the acquisition profession that supports the Profession of Arms—the U.S. military. If your organization is interested in AcqDemo, please contact our Army AcqDemo Program Director, Jerry Lee, at 703-805-5498 or ***jerold.a.lee.civ@mail.mil***.

IMPARTING ACQUISITION KNOWLEDGE

Army Acquisition Center of Excellence evolves with the workforce

by Michael P. Truman

"WE HAVE TO MAKE SURE THAT WE HAVE THE RIGHT STAFF, THE RIGHT PEOPLE WHO HAVE THE REQUISITE EXPERIENCE IN THEIR CAREER FIELD BUT ALSO HAVE A PASSION FOR MAKING SURE THAT THE NEXT GENERATION IS PREPARED FOR WHAT THEIR UPCOMING MISSIONS ARE GOING TO BE IN ARMY ACQUSITION."

In FY11, the Army Acquisition Center of Excellence (AACoE) taught 210 students. In FY12, enrollment was 350 students. In FY13, 525 students are projected to pass through the center's doors.

Kevin Zurmuehlen has had a front-row seat for this tremendous growth, on the third floor of Madison Hall at the University of Alabama in Huntsville (UAHuntsville). Zurmuehlen has been at the AACoE since it stood up in January 2011, first as Deputy Director and, since July 30, as Director.

The AACoE provides training, education, and career development to Army officers, NCOs, and civilians in the Acquisition, Logistics, and Technology (AL&T) Workforce. The primary mission of the AACoE is to provide the educational courses required for Defense Acquisition Workforce Improvement Act certification, but the center's unique position provides opportunities beyond certification.

"We have a partnership with the Redstone community," Zurmuehlen said. Redstone Arsenal is a hub of Army acquisition—home to Headquarters, U.S. Army Materiel Command and U.S. Army Contracting Command, in addition to Program Executive Office (PEO) Aviation and PEO Missiles and Space, not to mention a large contracting base in Huntsville. The location of the AACoE campus offers access not only to government acquisition leadership, but to industry and academic leadership as well. These are all important connections for students to make.

"Think about an officer who's newly accessed to the acquisition workforce. The AACoE courses are his first look at his new career field. We're the first ones to influence [students] when they come into acquisition, setting the foundation for the impact they will have on Army Acquisition. And we are able to bring into the classroom senior leaders, O-6-level project managers, and commanders of DCMA [Defense Contract Management Agency] activities," Zurmuehlen said. Their varying perspectives reinforce classroom learning, showing real-life applications of what is being taught. "That's more beneficial than just learning the book basics," Zurmuehlen said.

CAMPUS ENVIRONMENT

The courses taught at the AACoE include the Army Acquisition Foundation Course, Intermediate Program Management Course, Intermediate Contracting Course, Basic Contracting Course, MOS 51C Senior Leaders Course, and the Functional Area 51 Intermediate Qualification Course. The center's facilities are maintained and equipped by UAHuntsville, from computer and phone lines, down to the lightbulbs.

Being in the middle of the UAHuntsville campus also helps foster an academic atmosphere at the AACoE. Students can be in classes for up to seven weeks, and some live in the UAHuntsville dormitories during that time.

Zurmuehlen said that UAHuntsville has been a great partner. "It's a very symbiotic relationship. They help us immeasurably to meet our mission, and I think we're helping them to prove their academic capabilities within the

CONTRACTING FUNDAMENTALS

Students work on an assignment from instructor Adina Peyton in her Cost and Pricing class. Peyton, who teaches Basic Contracting, says that students often come to her class right after returning from a war zone like Afghanistan, and that being in a classroom environment with a civilian teacher can be a dramatic transition. (Photos by Michele Custer, Army Acquisition Center of Excellence (AACoE))

NOT JUST BOOK LEARNING
SGT Virginia Kleinsorge (left), CPT Brent Warren, SSG Joshua Ruffner, SFC Andre Bannister Jr., MAJ Chanda Valentine, and MAJ Milton A. Montenegro study contracting with instructor Jeff Hardin at the AACoE, on the campus of the University of Alabama in Huntsville. In addition to classwork and reading assignments, the AACoE strives to provide students with a good look at what it is like to work in acquisition.

Redstone community and within Army acquisition."

The AACoE is examining further strategic partnerships with UAHuntsville, Zurmuehlen said, possibly letting AACoE instructors teach in the UAHuntsville Master of Business Administration program and having UAHuntsville faculty members come to the center to offer instruction on DOD business from their civilian and academic perspectives.

FOSTERING RELATIONSHIPS

MAJ James Burkes, currently stationed at Fort Bragg, NC, with the 905th Contingency Contracting Battalion, attended multiple contracting classes at the AACoE. He called it "unlike any other military school I have attended. The AACoE is not based on regurgitation; it focuses on critical thinking and applied knowledge."

MAJ Voyed Couey, an Assistant Product Manager in the Ground Maneuver Product Office of PEO Aviation's Unmanned Aircraft Systems Project Office, echoed Burkes' opinion. "I was coming into this thinking it was all about classwork and reading, with little interaction from the instructor. What really happened was there was a lot of classwork and reading, but in addition to that was a great amount of realism and interaction between the instructor and students to prepare you for the acquisition community."

Zurmuehlen believes the most important work the AACoE does is illustrating how the knowledge that students are gaining for certification will help their acquisition careers. He said that this work often results in close relationships with former students, who freely ask questions and give feedback. He told *Army AL&T* Magazine the story of a recent graduate who was on temporary duty in Huntsville and wanted to address one of the classes.

The former student told Zurmuehlen that he'd learned some things as a user representative and systems manager and wanted the opportunity to let AACoE students know how work was going for him, the new guy fresh out of the AACoE. Zurmuehlen said that putting him in front of a class to speak and answer questions was a great exercise. The former student was professional and enthusiastic about what he had been doing in his new job and how it connected to what the students were currently studying. The class benefited from listening to a peer who had been a student like them just six months earlier.

Adina Peyton, the course manager for the Army Basic Contracting Course, underscored many of Zurmuehlen's points. Her students often come to her class right after returning from a deployment, and being in a classroom environment can be a dramatic transition for some students. "They don't know an RFP [Request for Proposal] from EMAS [Engineering, Management, and Analytical Services] when they get here," she said. But in the six to seven weeks that they attend classes, they learn from the AACoE staff and, more importantly, they learn from their fellow classmates. Personal bonds develop at AACoE courses.

Asked about the faculty at the AACoE, Burkes said, "Our instructors answered our questions and provided helpful guidance throughout our course. They go the extra mile for students; they make themselves available early morning, late

evenings, and even on weekends to ensure students are successful. Upon graduation, they provided contact information for future use and inquiries."

MOVING FORWARD

In discussing where he saw the AACoE going during his tenure, Zurmuehlen noted that DA Pamphlet (DAPam) 600-3, *Commissioned Officer Professional Development and Career Management*, will be changing soon, which will alter the AACoE's approach to its curriculum.

The old approach provided the same basic instruction to every acquisition officer, so that he or she could be assigned any acquisition job and have a basic understanding of what to expect. The DAPam 600-3 changes translate to a more focused approach on acquisition careers, with specific career field tracks depending on assignment.

"If they're going to a program management job, they will get program management instruction. If they're going to a contracting job, they will just get contracting instruction in preparation for their first assignment," Zurmuehlen said.

He sees the changes as making the AACoE more efficient, allowing it to double student throughput without a significant increase in facilities or faculty.

As DOD identifies trends within acquisition and makes corresponding changes in training, it's important that the AACoE have the flexibility to incorporate those changes. A recent agreement with the U.S. Army Training and Doctrine Command (TRADOC) supports this flexibility, Zurmuehlen said.

The AACoE courses are currently under the TRADOC umbrella, but the two organizations recently reached an understanding that the AACoE would be better able to manage its mission of leading both Title X legislative requirements and DOD acquisition requirements if it stood up as a separate Army proponent school. This will give the AACoE the flexibility of a unified command chain, so that curriculum changes based on changing DOD acquisition requirements won't require approval from different organizations that don't necessarily specialize in acquisition.

Details of a memorandum of agreement are being worked out to allow the AACoE to become a stand-alone proponent school in FY14.

Overall, the AACoE is striving to meet ever-changing acquisition training needs, Zurmuehlen said. "We have to make sure that we have the right staff, the right people who have the requisite experience in their career field but also have a passion for making sure that the next generation is prepared for what their upcoming missions are going to be in Army Acquisiton."

SOURCE SELECTION TRAINING
CPT Matthew Sullivan (center), a student at the AACoE, gives a presentation on behalf of his source selection briefing team. An important part of the AACoE's mission is illustrating how the knowledge that students are gaining for certification will help their acquisition careers.

MICHAEL P. TRUMAN provides contracting support to the U.S. Army Acquisition Support Center. He holds a B.A. in English from the University of North Florida and has attended the M.F.A. Program at George Mason University. He has worked in various communication capacities at the Missile Defense Agency; the Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics, Test Resource Management Center; the Office of the Director, Operational Test and Evaluation; and the Business Transformation Agency.

TRAIL-BOSSING THE NIE *allows* ACQUISITION CORPS *to* 'GO GREEN'

MAJ Jason Wamsley could be sitting at a desk every day, spending most of his time in meetings and reviews. Instead, he goes to work in a motor pool, making sure a battalion of Soldiers has the integrated vehicles and tactical communications equipment they need to execute a major Army exercise.

"In this job, we are much closer to the Soldiers, as opposed to another acquisition job where you work mostly with the civilian workforce and industry and don't always get the opportunity to be in the field," Wamsley said.

Wamsley is a "trail boss" for the Network Integration Evaluations (NIEs), a series of semiannual field exercises designed to further integrate and mature the Army's tactical network, and to accelerate the way network technologies are delivered to Soldiers through integrated "capability sets" of communications gear.

NIEs leverage the 3,800 Soldiers of 2nd Heavy Brigade Combat Team, 1st Armored Division (2/1 AD), putting them through realistic operational scenarios at White Sands Missile Range, NM, to assess new network capabilities from government and industry. Test results help the Army determine whether the systems perform as needed, conform to the network architecture, and are interoperable with existing capabilities.

OPERATIONAL EXPERIENCE

Assigned to the System of Systems Integration (SoSI) Directorate of the Assistant Secretary of the Army for Acquisition, Logistics, and Technology (ASA(ALT)), the trail bosses are a group of Army acquisition officers who serve as a link between 2/1 AD and the acquisition, training, and test communities. As part of the "re-greening" initiative for the U.S. Army Acquisition Corps (AAC), senior leaders now require officers who reach the rank of major to spend time in operationally intensive assignments, such as an NIE trail boss.

" 'Re-greening' provides an opportunity for AAC officers to refresh their exposure to current tactics, techniques, procedures, and weapon systems in operationally current and relevant environments," stated LTG William N. Phillips, Military Deputy to the ASA(ALT) and Director of Acquisition Career Management, in a March 30, 2012, memo to the workforce.

Along with the opportunity to interact with maneuver units and understand current tactics, techniques, and procedures, trail bossing offers a chance for acquisition officers to work with a wide variety of the newest network technologies developed by government and industry, said LTC Keith Taylor, SoSI Product Manager Capability Package Integration, who oversees the trail bosses. Trail bossing is also an opportunity to see firsthand the challenge of integrating network systems across multiple project managers (PMs) and industry vendors, to provide seamless communications throughout the brigade combat team (BCT).

"We are the PMs of PMs: We do more than deliver a box, we take everyone's boxes and deliver an integrated capability to 2/1 AD so it can eventually be fielded as capability sets to other BCTs within the Army," Taylor said. "The Army is only going to continue to get more system-interdependent, so understanding how to do that from the ground level is the skill set you gain from being a trail boss. You lose your stovepiped mental model."

A CHANGE IN MINDSET

MAJ John McGee, one of the original NIE trail bosses who is now assigned to Project Manager Mine Resistant Ambush Protected Vehicles in Program Executive Office Combat Support and Combat Service Support, said the challenge of working across different communities and portfolios provided valuable perspective for subsequent assignments.

"Having the experience of being a trail boss, and really seeing the position develop from a concept into reality, exposed me to a much wider variety of the Acquisition Corps than I would have experienced in my first PM shop," McGee said.

"As a trail boss, I daily and personally interacted with the user [2/1 AD], industry partners, PMs from multiple program executive offices outside my own, and with the government technical base." This varied interaction and exposure to programs "was one of the most valuable parts of being a trail boss," he said.

Another mindset change that comes from working in the NIE environment is a more "agile" approach to acquisition, Wamsley said, in which the Army can revise requirements to more realistically meet Soldiers' needs, saving time and dollars.

GEARING UP FOR NIE

LTC Keith Taylor, Product Manager Capability Package Integration in the System of Systems Integration (SoSI) Directorate, and MAJ Alexander Gonzales, Trail Boss for 1st Battalion, 35th Armor Regiment of the 2nd Heavy Brigade Combat Team, 1st Armored Division (2/1 AD), work with engineers in the Integration Motor Pool at Fort Bliss, TX, in preparation for the Network Integration Evaluation (NIE) 13.1 this fall. (Photos by Travis McNeil, SoSI)

A FAR-REACHING ROLE
Taylor oversees the NIE trail bosses, whom he calls "the PMs of PMs: We do more than deliver a box, we take everyone's boxes and deliver an integrated capability to 2/1 AD," Taylor said.

"In a lot of cases, requirements are your biggest time constraint on a traditional acquisition program," he said. "From an acquisition standpoint, if NIE does nothing other to clarify requirements for systems, then we're successful."

MAJ Alexander Gonzales, a current trail boss, said another rewarding aspect of the job is seeing capability sets take shape for delivery to deploying Soldiers. Fielding is now underway for the first such package, known as Capability Set (CS) 13, which was developed and validated through the NIEs.

"This is the stuff that is going to make it, or have the potential to make it, into Soldiers' hands," Gonzales said.

CONCLUSION

Trail bossing is also expanding beyond the NIE. The Army has adopted the same system as it fields CS 13, embedding acquisition officers with the first three brigades slated to receive the capability set.

"The BCT CS Trail Boss serves as the critical synchronization agent between the operational force and the acquisition community," said COL Darby McNulty, who serves as the Army Level Trail Boss for CS 13 Brigade Combat Teams. "We are applying the model that has been so successful at NIE to ensure a smooth fielding and training process for Capability Set 13."

For more information, contact LTC Keith Taylor at ***keith.l.taylor4.mil@mail.mil****. Also, SoSI has released a video on the NIE, at* ***http://www.dvidshub.net/video/145389/network-integration-evaluation****.*

—SoSI Directorate Staff

EDUCATION and TRAINING UPDATE

EDUCATION AND TRAINING OPPORTUNITIES

The **Competitive Development Group – Army Acquisition Fellows** announcement will be open through Nov. 15 to all eligible personnel in grade GS-12 through -13 or broadband/pay equivalent positions who are Level III certified in any career field. The program provides expanded training, leadership, experiential, and other career development opportunities. For more information, go to **http://asc.army.mil/web/career-development/programs/competitive-development-group-army-acquisition-fellowship/announcements/**.

The **Acquisition Leadership Challenge Program** (ALCP) is the newest program in the Army's Acquisition Education and Training Portfolio. Based upon the huge success our sister service the Air Force has had with ALCP, we piloted multiple offerings of the 2½-day course in FY12. For FY13, we are bringing the course to you. For more information on how to apply, go to **http://asc.army.mil/web/career-development/programs/acquisition-leadership-challenge-program/**. Below is the FY13 ALCP training schedule, by location.

DEFENSE ACQUISITION UNIVERSITY HIGHLIGHTS

Planning and applying early for Defense Acquisition University (DAU) classes will give students a better chance of obtaining a class in the timeframe requested. Encourage your supervisor to approve your training request as soon as you apply.

To view the DAU I-catalog, go to **http://icatalog.dau.mil** and ensure that you meet the prerequisite(s) before applying to a DAU course.

A weekly low-fill list is posted at **http://icatalog.dau.mil/online**

FY13 ALCP Plan

DATE	OFFERING TYPE (ALCP I or II)	LOCATION
Jan. 14 – 18	Level I & Level II	Atlanta, GA
Feb. 25 – March 1	Back-to-back Level I offerings	Huntsville, AL
March 11 – 15	Level I & Level II	Huntsville, AL
April 29 – May 3	Level I & Level II	Aberdeen, MD
May 20 – 24	Level I & Level II	Atlanta, GA
June 10 – 14	Back-to-back Level I offerings	Warren, MI
July 29 – Aug. 2	Level I & Level II	Huntsville, AL
Aug. 19 – 23	Back-to-back Level I offerings	Aberdeen, MD

catalog/tabnav.aspx, affording students the opportunity to attend classes coming up in the next 60 days. Low-fill classes are available on a first-come, first-served basis within that 60-day period.

Apply through the Army Training Requirements and Resources System (ATRRS) Internet Training Application System (AITAS) at **https://www.atrrs.army.mil/channels/aitas**. For more information on DAU training, including systematic instructions, training priorities and frequently asked questions, go to **http://asc.army.mil/career/programs/dau/default.cfm**.

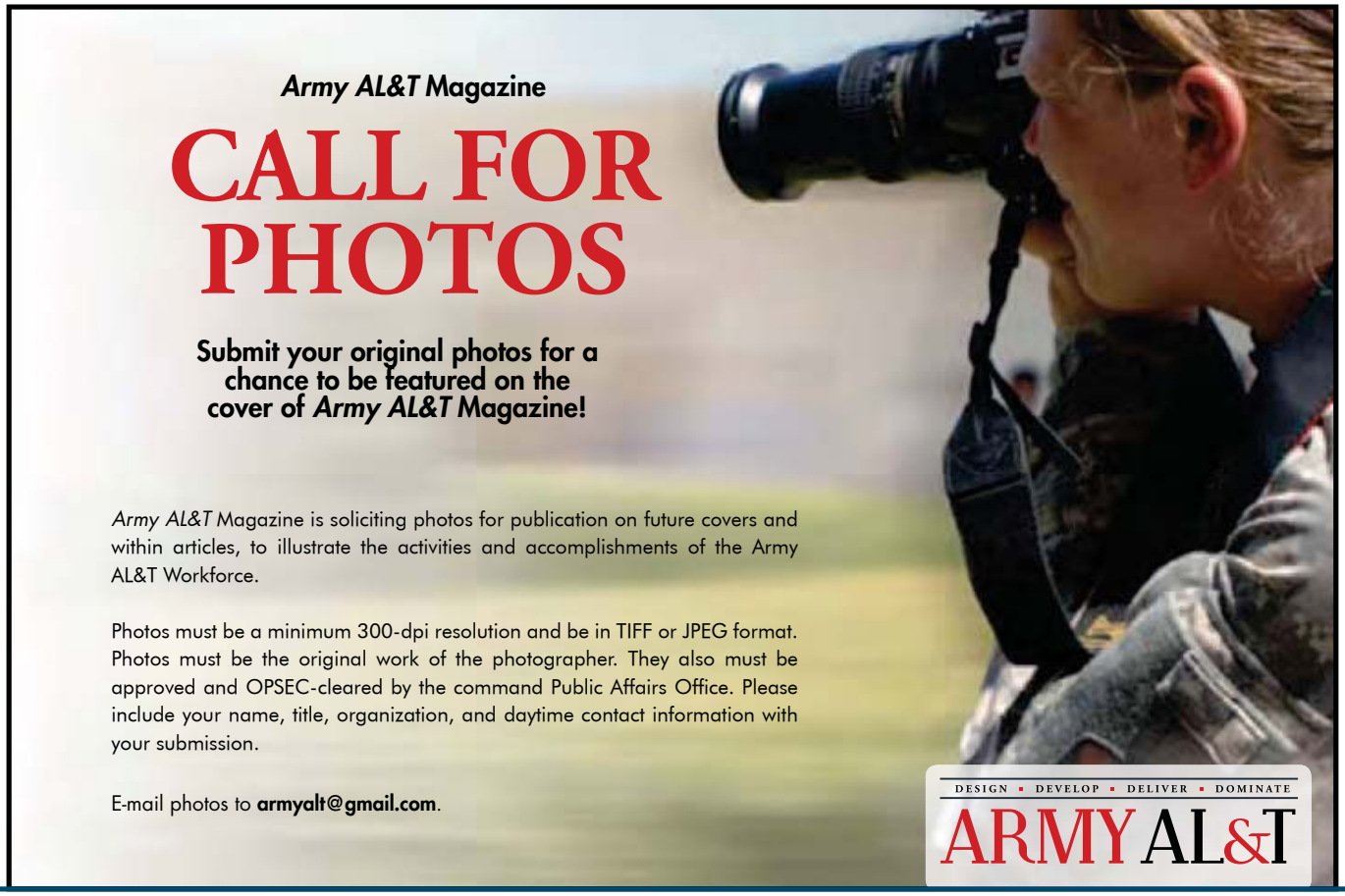
After receiving a confirmed reservation in the requested class, ensure that you attend the class as scheduled. Cancellation requests for a confirmed reservation must be submitted at least 30 calendar days before the class starts or by the reservation cutoff date, whichever is earlier, to avoid a "no show."

DAU is developing a new Student Information System to replace the current distinct DAU registration systems for DOD. PORTICO, the official name of this acquisition workforce initiative, is a commercial-off-the-shelf, Web-based system that integrates critical capabilities including career training management, schedule development, course registration, *Defense Acquisition Workforce Improvement Act* transcripts, and reporting.

PORTICO will interface with DAU and sister DOD systems, ATRRS, and the Career Acquisition Management Portal/Career Acquisition Personnel and Position Management Information System (CAMP/CAPPMIS).

PORTICO will standardize functionality and capability for all services. For Army students, the system will completely replace the current AITAS student registration system at **https://www.atrrs.army.mil/channels/aitas**. It will allow a better user experience and more transparency and up-to-date status information for students applying for DAU courses. Army workforce members will be able to authenticate using a DOD common access card.

PORTICO's release is scheduled for the fourth quarter of FY13. For more information on PORTICO and the latest PORTICO newsletter, go to **www.dau.mil/sis**.



ON THE MOVE

SENATE CONFIRMS SHYU AS ASA(ALT)

By voice vote, the Senate on Sept. 22 confirmed the nomination of **Heidi Shyu** to be Assistant Secretary of the Army for Acquisition, Logistics, and Technology (ASA(ALT)). Shyu, whom President Barack Obama nominated for the post on Feb. 3, was serving as both the Acting ASA(ALT) and the Principal Deputy ASAALT, a position she had held since November 2010.

Shyu also serves as the Army Acquisition Executive and Senior Procurement Executive. She is responsible for all logistics matters in the Department of the Army. Shyu leads the Army's acquisition function and the acquisition management system, providing oversight for life-cycle management and sustainment of Army weapon systems and equipment. She also manages program executive officers, the Army Acquisition Corps, and the Army Acquisition Workforce.

Shyu holds a B.S. in mathematics from the University of New Brunswick in Canada, an M.S. in mathematics from the University of Toronto, and an M.S. in system science (electrical engineering) from UCLA.

MCQUISTION RECEIVES 3RD STAR

MG(P) Patricia E. McQuistion, the new Deputy Commanding General (DCG)/Chief of Staff of U.S. Army Materiel Command (AMC), is promoted to the rank of lieutenant general during a ceremony Aug. 2 at Redstone Arsenal, AL. GEN Ann E. Dunwoody (left), then AMC's CG, presided over the ceremony. McQuistion, formerly CG of U.S. Army Sustainment Command, Rock Island, IL, assumed her duties as the AMC DCG on Aug. 7. (AMC photo by Ratia Purdy)

CHANGES IN OASA(ALT)

Lee Thompson departed his position as Deputy Assistant Secretary of the Army (DASA) for Strategy and Performance Planning July 27. No replacement has been named. **Gabriel Camarillo**, Special Assistant to the Army Acquisition Executive, is managing strategic communications. **Wimpy Pybus**, Deputy Assistant Secretary of the Army for Acquisition Policy and Logistics, is handling strategic planning.

The Secretary of the Army has approved the assignment of **Carmen Spencer**, DASA for Elimination of Chemical

PASSING THE FLAG OF AMC
Before relinquishing command of AMC to GEN Dennis L. Via (center), GEN Ann E. Dunwoody receives the flag for the last time from AMC's CSM Ronald T. Riling during the change-of-command ceremony Aug. 7 at Redstone Arsenal, AL. (AMC photo by Cherish Washington)

Weapons, to the position of Joint Program Executive Officer Chemical and Biological Defense, Aberdeen Proving Ground, MD, effective Nov. 6. Spencer will succeed **BG Jess A. Scarbrough**.

Tommy Marks, Executive Director for the Logistics Civil Augmentation Program, U.S. Army Materiel Command, Rock Island, IL, was selected for the position of Executive Director for Acquisition Services, effective Nov. 4.

AMC CHANGE OF COMMAND

GEN Dennis L. Via assumed the leadership of the U.S. Army Materiel Command (AMC) from **GEN Ann E. Dunwoody** in a ceremony Aug. 7 at AMC Headquarters, Redstone Arsenal, AL. Dunwoody, the Army's first female four-star, assumed command of AMC in November 2008 and moved with AMC during the command's 2011 Base Realignment and Closure transfer from Fort Belvoir, VA. Dunwoody, a fourth-generation Army Soldier, retired after 38 years of service in a ceremony Aug. 15 at Joint Base Myer – Henderson Hall, VA.

Via had served as AMC's Deputy Commanding General (DCG)/Chief of Staff since May 2011. Succeeding him in that position is **LTG Patricia E. McQuistion**, formerly CG of U.S. Army Sustainment Command, Rock Island, IL. McQuistion assumed her duties as the AMC DCG on Aug. 7.

REASSIGNMENTS

The Chief of Staff of the Army announced the following general officer assignments:

BG Daniel P. Hughes, Director, System of Systems Integration, Aberdeen Proving Ground (APG), MD, to Deputy Commanding General (DCG), U.S. Army Research, Development, and Engineering Command, APG/Senior Commander, Natick Soldier Systems Center, Natick, MA.

BG Ole A. Knudson, Program Executive Officer Missiles and Space, Redstone Arsenal, AL, to Program Executive, Programs and Integration, Missile Defense Agency, Redstone Arsenal.

BG Jonathan A. Maddux, Program Executive Officer Ammunition/CG, Picatinny Arsenal, NJ, to DCG, Support, Combined Security Transition Command – Afghanistan, *Operation Enduring Freedom*, Afghanistan.

BG John J. McGuiness, DCG, U.S. Army Research, Development, and Engineering Command/Senior Commander, Natick Soldier Systems Center, to PEO Ammunition/CG, Picatinny Arsenal.

BG Michael E. Williamson, Joint Program Executive Officer Joint Tactical Radio System (JTRS), San Diego, CA, to Assistant Deputy for Acquisition and Systems Management, Office of the Assistant Secretary of the Army for Acquisition, Logistics, and Technology, Washington, DC.

The Joint PEO JTRS was redesignated the Joint Tactical Networking Center and the JTRS acquisition functions transferred to the Army Acquisition Executive, effective Sept. 30.

AACOE GETS NEW LEADER

Kevin Zurmuehlen assumed the responsibilities of Director, Army Acquisition Center of Excellence (AACoE), Huntsville, AL, in July, succeeding Shirley Hornaday, who retired from Army civilian service. Hornaday was the first director of the AACoE, which opened in January 2011, and previously was Director of the Southern and Western Regions for the U.S. Army Acquisition Support Center, which operates the AACoE.

CHEMICAL WEAPONS AGENCY REDESIGNATED

The U.S. Army Element, Assembled Chemical Weapons Alternatives (ACWA) has been redesignated the Program Executive Office (PEO) ACWA, effective Oct. 1.

MISSION ACCOMPLISHED
A banner at Anniston Chemical Agent Disposal Facility, AL, proclaims mission success after chemical munitions destruction operations concluded on Sept. 22, 2011. The Anniston Chemical Activity on July 12 marked its last change of leadership before its scheduled deactivation in 2013. (Photo courtesy of U.S. Army Chemical Materials Agency)

Under Permanent Orders 184-01, signed July 17 by Craig A. Spisak, U.S. Army Acquisition Support Center (USAASC) Director, ACWA will be reassigned from U.S. Army Material Command (AMC) to USAASC with the mission of performing the safe and environmentally sound destruction of the chemical weapon stockpiles stored at Blue Grass Army Depot, KY, and Pueblo Chemical Depot, CO.

ACWA was formally activated in 2007 under AMC. In total, the Army has managed the responsible elimination of roughly 90 percent of the Nation's overall chemical weapons arsenal; the remaining 10 percent will be eliminated by ACWA.

There will be no changes to physical location or duty stations in the redesignation to PEO ACWA. All personnel will remain in place. The PEO will have a direct reporting relationship with the Under Secretary of Defense for Acquisition, Technology, and Logistics.

CHANGES AT CMA

LTC Christopher A. Grice assumed command of Blue Grass Chemical Activity, U.S. Chemical Materials Agency (CMA), from **LTC Steven G. Basso** in a ceremony July 11. **Jesse E. Brown III** assumed responsibility of CMA's Anniston Chemical Activity (ANCA) in Anniston, AL, from **LTC Willie J. Flucker Jr.** in a ceremony July 12 marking the last change of leadership for ANCA, which is due to be deactivated in 2013. Brown was installed as ANCA's Civilian Executive in Charge, the only civilian leader in ANCA's 17-year history. He had been Deputy to the Commander since 2003. Chemical munitions destruction operations at ANCA concluded in 2011.

PEO C3T
CHANGES OF CHARTER

LTC Larry D. Glidewell assumed the role of Product Director Fire Support Command and Control (FSC2) for PEO Command, Control, and Communications – Tactical (PEO C3T) during a ceremony July 17 at Aberdeen Proving Ground (APG), MD, replacing **Jeffrey L. Weiss**, who was serving as interim Product Director and is now Deputy Product Director FSC2.

LTC J. Ward Roberts assumed the charter of Product Manager (PM) Warfighter Information Network – Tactical (WIN-T) Increment 3 from **LTC Robert M. Collins**, who will continue with his duties as PM WIN-T Increment 2. The change-of-charter ceremony was held June 29 at APG.

In a strategic move to place all computer and networking hardware under one organization, PEO C3T has realigned its Product Director Common Hardware Systems (PD CHS). In a change of charter ceremony June 28 at APG, PD CHS officially transferred from Project Manager Mission Command to Project Manager WIN-T, both assigned to PEO C3T. The ceremony recognized **Danielle Kays**, former deputy director of PEO C3T's Technical Management Division, as the new PD CHS. Kays is replacing **Dr. Ashok Jain**.

CHANGES AT PEO MS

Barry Pike, Deputy Program Executive Officer Missiles and Space (PEO MS), was named the Acting Program Executive Officer, effective Sept. 12.

COL Terrence Howard became Project Manager Cruise Missile Defense in a ceremony June 28 at Redstone Arsenal, AL. Howard succeeds **COL Warren O'Donell**, who became a Special Assignment Officer on the PEO MS Headquarters Staff.

COL James S. Romero assumed the charter of Project Manager Joint Attack Munition Systems (PM JAMS) from **COL Michael Cavalier** in a ceremony July 12 at Redstone Arsenal. Cavalier retired from the Army after 28 years of service, the last four as PM JAMS.

PEO STRI
CHANGE OF CHARTER

COL Harold Buhl assumed the charter of Project Manager Combined Arms Tactical Trainers, PEO Simulation, Training, and Instrumentation, from **COL(P) Francisco A. Espaillat**, in a ceremony Sept. 7 in Orlando, FL. Espaillat is now Executive Director for Logistics Operations, J-3, Defense Logistics Agency, Fort Belvoir, VA.

CONGRESSIONAL UPDATE

STATUS OF FY13 DOD BUDGET REMAINS MURKY AS CONGRESS CAMPAIGNS

It is no secret that times are tough in the United States. The Nation's economic woes are the backdrop for an election-year battle between Democrats and Republicans, and military spending is directly in the crossfire.

Because of DOD efficiencies initiatives, the drawdown of U.S. forces from Iraq and Afghanistan, congressional efforts to limit spending, and the looming specter of sequestration, the military base budget stands to fall from $553 billion in FY11 to a low of $491 billion in FY13. The air of uncertainty surrounding Election Day Nov. 6 and the possibility of sequestration in January 2013 have virtually paralyzed Congress, causing House and Senate leaders to plan for a six-month continuing resolution (CR) to fund the federal government through the first half of FY13.

WHY SEQUESTRATION?

The *Budget Control Act of 2011 (BCA)*, signed into law by President Obama in August 2011, was supposed to present a first step in addressing the Nation's budgetary problems. In addition to capping discretionary spending for FY12-FY21 at lower levels, the *BCA* created a bipartisan, bicameral special committee of Congress.

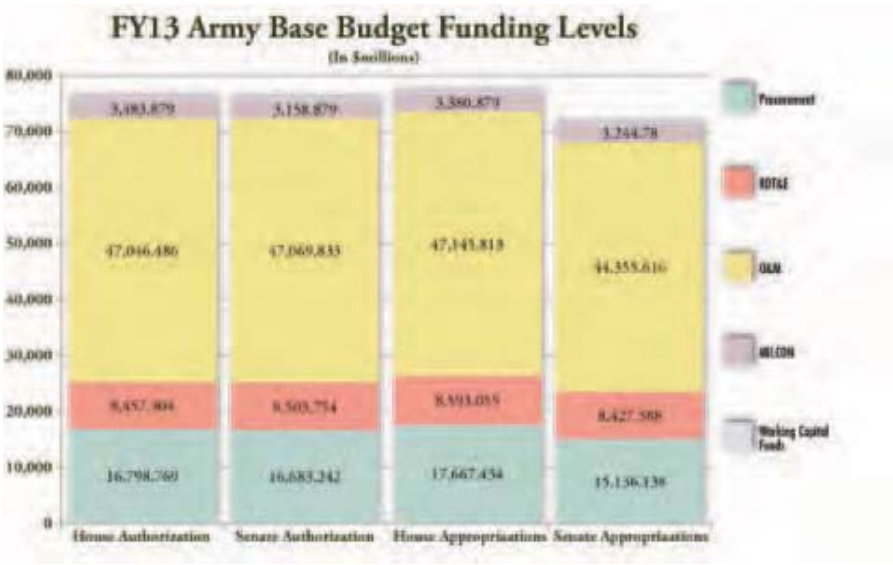
This panel, formally called the Joint Select Committee on Deficit Reduction but more commonly known as the "super committee," was then tasked with approving deficit reduction language cutting at least $1.2 trillion from the national debt over the next decade. Republicans refused to consider tax increases, while Democrats balked at GOP proposals to cut domestic programs deeply and alter entitlements such as Medicare and Social Security. The super committee failed to act, triggering an automatic sequestration process.

Created by the *BCA* as a "doomsday scenario" incentive for Congress to act, sequestration will take effect in January and automatically cut $1.6 trillion from discretionary spending over the next 10 years. Of these cuts, $800 billion will come from national security programs, nearly all of them under DOD's jurisdiction, while the other $800 billion will be spread across other federal departments and agencies.

According to the letter of the law, the sequester affects every line of the federal budget equally. The *BCA* does not offer the Secretary of Defense, for example, the authority to apply sequestration cuts to one program while exempting another. Those choices will have to be made later and sent to Congress for approval as reprogramming actions.

For more information on sequestration, the House Armed Services Committee has compiled a Sequestration Resource Kit, online at **http://armedservices.house.gov/index.cfm/defense-cuts-resources**.

Figure 1



CONGRESS BUYS ITSELF MORE TIME

FY13 began on Oct. 1, but Senate Majority Leader Harry Reid (D-NV) told

reporters in July that he would not call up any FY13 spending bills for Senate approval, out of frustration with Republicans in the House of Representatives. "We passed last August legislation [the *BCA*] that is now a law, that set forth the spending for this country during the next fiscal year," said Reid. "They refuse to adhere to that, so that makes it hard to do these appropriations bills."

The House, unlike the Senate, approved a FY13 Budget Resolution that altered the spending caps set by the BCA. This gave the House Appropriations Committee authority to spend more in its FY13 *Defense Appropriations Act*, for example, and less in its FY13 *Labor, Health and Human Services, and Education Appropriations Act*. The Senate, rather than approve a FY13 Budget Resolution of its own, opted to stick with the spending caps in the *BCA*.

Senate Republicans fired back that Reid was simply trying to protect his caucus in an election year. "If you start voting for the appropriations bills, you actually have to say publicly what you are for," said Sen. Roy Blunt (R-MO).

Regardless of the reasons, the House has approved seven of the 12 FY13 spending bills, while the Senate has approved none. The House has approved the FY13 *Defense Appropriations Act* and the FY13 *Military Construction and Veterans Affairs Appropriations Act*, as well as the FY13 *National Defense Authorization Act (NDAA)*. On the Senate side, those three bills have been through committee markups but have not been considered on the Senate floor. (See Figure 1 for a comparison of funding amounts for major military programs in the House and Senate authorization and appropriations bills, including procurement; research, development, test, and evaluation; operation and maintenance; military construction; and working capital.)

In September, Congress passed the CR, and the president signed it into law (Public Law 112-175). The CR will run for the first six months of FY13 and "correspond to the top-line funding level of $1.047 trillion" set by the *BCA*, putting it in line with spending bills passed by the Senate Appropriations Committee but not in sync with the bills passed by the House.

POSSIBLE OUTCOMES AND IMPACTS

A delay in the FY13 *NDAA* delays changes to end-strength levels, acquisition policy, and force posture.

Of greater concern was the high probability that Congress would fail to enact legislation that prevents sequestration from taking effect in January. The same issues that prevented the "super committee" from enacting deficit reduction legislation last fall still divide Congress.

The way forward on sequestration will be dictated by the fallout from Election Day. If control of the House, Senate, or White House changes, the chances that Congress and the President will work together to prevent sequestration are slim to none. If Republicans maintain control of the House while Democrats keep the Senate and the Presidency, it is possible, if not likely, that they could reach a compromise in November or December to avert sequestration.

At some point Congress and the President are certain to approve legislation to minimize, delay, or do away with sequestration. Its devastating impact on national security simply cannot be ignored. The question is, what impact will sequestration have on military readiness and the economy even before it takes hold?

Key Events

Oct. 1	FY13 Begins
Nov. 2	WARN Notices Issued
Nov. 6	Election Day
Jan. 2	Sequestration Takes Effect
Jan. 20	Inauguration Day
April 1	FY13 CR Expires

Major defense corporations, including Pratt & Whitney and Lockheed Martin Corp., have announced that they will issue notices to tens of thousands of employees in anticipation of massive layoffs due to sequestration.

In compliance with the *Worker Adjustment and Retraining Notification Act (WARN)*, the companies plan to issue notices to more than 100,000 employees on Nov. 2, just four days before Election Day. *WARN* stipulates that companies must issue notices to employees no later than 60 days before large layoffs or relocations, although the U.S. Department of Labor has announced that *WARN* does not apply to sequestration.

"Right now the *WARN* Act is the law, and we always comply with the law," said Pratt & Whitney President David Hess Aug. 8.

In the end, the "doomsday scenario" created by the *BCA* to force Congress to act on deficit reduction will probably work. At some point, Democrats and Republicans will agree on enough spending cuts and tax code changes to achieve the required $1.2 trillion in debt reduction. In the meantime, the path to a resolution remains unclear.

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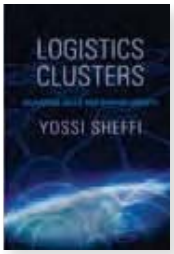
OFF THE SHELF

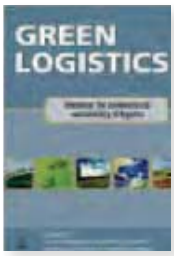
RECOMMENDED READING LIST

Numerous Army leaders over the years have commended the practice of reading to their Soldiers. Even—especially—in this age of information overload, the pursuit of knowledge through books is essential to gain a fuller understanding of acquisition, logistics, and technology. In the words of GEN Raymond T. Odierno, Chief of Staff of the Army, "We can never spend too much time reading and thinking about the Army profession and its interaction with the world at large. … There is simply no better way to prepare for the future than a disciplined, focused commitment to a personal course of reading, study, thought, and reflection." On that note, *Army AL&T* Magazine publishes *Off the Shelf* as a regular feature to bring you recommendations for reading from Army AL&T professionals.



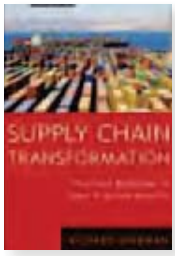
LOGISTICS CLUSTERS: DELIVERING VALUE AND DRIVING GROWTH
by Yossi Sheffi
(Cambridge, MA: MIT Press, 2012, 304 pages)

Sheffi, the Elisha Gray II Professor of Engineering Systems at Massachusetts Institute of Technology and Director of the MIT Center for Transportation and Logistics, explains the phenomenon of logistics clusters—geographically concentrated sets of logistics-related business activities. Sheffi writes about why places such as Memphis, TN; Singapore; Rotterdam, the Netherlands; and Los Angeles, CA, have succeeded in developing such clusters, while other places have not. Why does the tiny island-nation of Singapore handle one-fifth of the world's maritime containers and half the world's annual supply of crude oil? Sheffi describes a "positive feedback loop" and what specifically differentiates logistics clusters from other industrial clusters, showing how they draw other industrial activities and the value firms gain by locating their distribution within logistics clusters. He also touches on the role of government support in helping those clusters to thrive, through investment, regulation, and trade policy.



GREEN LOGISTICS: IMPROVING THE ENVIRONMENTAL SUSTAINABILITY OF LOGISTICS
edited by Alan McKinnon, Sharon Cullinane, Michael Browne, and Anthony Whiteing
(London, England: Kogen Page, 2008, 384 pages)

The editors, all logistics experts, have collected 17 papers that analyze the environmental consequences of logistics and how to achieve an effective balance of economic, environmental, and social objectives. In the past, the cost of logistics—coordinating the movement of products through a supply chain in a way that meets customer requirements—has been defined in purely monetary terms. These 17 essays illustrate, from different perspectives, that as concern for the environment rises, companies must also take into account the external costs of logistics associated with climate change, air pollution, noise, vibration, and accidents.



SUPPLY CHAIN TRANSFORMATION: PRACTICAL ROADMAP TO BEST PRACTICE RESULTS
by Richard Sherman
(Hoboken, NJ, John Wiley & Sons Inc., 2012, 208 pages)

Sherman, an internationally recognized author, researcher, speaker, and consultant on technology applications and trends in collaborative commerce and supply chain management, examines best practices in modern supply chain management. His book begins with guidance on how companies can make the case for change and walks through this potentially difficult process. Sherman touches on modern emerging technologies such as radio-frequency identification, cloud computing, and telematics. He acknowledges that one of the biggest hurdles to supply chain transformation is overcoming a culture that is resistant to change and outlines how to obtain senior management's commitment to change.

DEFENSE MANUFACTURING: TECHNOLOGY STRATEGY AND RISK MANAGEMENT

edited by Preston I. Brown and Travis E. Robinson
(Hauppauge, NY: Nova Science Publishers Inc., 2012)

The DOD Manufacturing Technology (ManTech) Program has been the department's investment mechanism for defense manufacturing capability for the past 50 years. When the threat was highly predictable and our industrial base was largely self-contained, ManTech helped keep the Nation positioned to produce the best military systems in the world. Now, in the 21st century, DOD faces new threats, the industrial base is globally networked, and the definition of best increasingly must consider affordability. This book examines ManTech's strategy for enabling DOD to use 21st-century manufacturing capabilities to address the growing challenges of weapon system affordability and timely delivery to the warfighter, and for enhancing U.S. competitiveness in global manufacturing.

THE AIR FORCE'S EXPERIENCE WITH SHOULD-COST REVIEWS AND OPTIONS FOR ENHANCING ITS CAPABILITY TO CONDUCT THEM

by Michael Boito, Kevin Brancato, John C. Graser, and Cynthia R. Cook
(Arlington, VA: RAND Corp, 2012, 45 pages; available in PDF at **http://www.rand.org/content/dam/rand/pubs/technical_reports/2012/RAND_TR1184.pdf**)

This RAND report examines the problem of cost growth in major weapon system acquisition programs that has plagued DOD for decades. Cook, Director of the Acquisition and Technology Policy Center at the RAND National Defense Research Institute, and her fellow RAND researchers studied the experience of the U.S. Air Force with should-cost reviews and options for enhancing the service's capability to conduct the reviews. They interviewed participants in should-cost reviews of Air Force programs from the 1980s through 2011 and reviewed the literature on the use of such reviews by DOD and commercial businesses. In the process, they discovered that few Air Force personnel had experience with should-cost reviews, and that there was little evidence that should-cost reviews saved money compared with other forms of contract pricing and negotiation. In their report, the authors discuss options for establishing a dedicated Air Force capability to conduct should-cost reviews, recommending that the service first confirm their effectiveness.

MILITARY TRANSFORMATION AND THE DEFENSE INDUSTRY AFTER NEXT: THE DEFENSE INDUSTRIAL IMPLICATIONS OF NETWORK-CENTRIC WARFARE (NAVAL WAR COLLEGE NEWPORT PAPERS 18)

by Peter J. Dombrowski, Eugene Gholz, and Andrew L. Ross
(Newport, RI: Naval War College Press, 2012, 120 pages; available in PDF on the Air University website **http://www.au.af.mil/au/awc/awcgate/navy/np18.pdf**)

While still adjusting to the end of the Cold War, the defense industry is now confronted with the prospect of military transformation. Dombrowski, a Professor of Strategy at the U.S. Naval War College and Chair of its Strategic Research Department, joins with Gholz, an Associate Professor of Public Affairs at the University of Texas Lyndon B. Johnson School of Public Affairs who served in the Pentagon as Senior Advisor to the Deputy Assistant Secretary of Defense for Manufacturing and Industrial Base Policy, and Ross, a Professor of Political Science and Director of the Center for Science, Technology, and Policy at the University of New Mexico, to emphasize that in the long run, the defense sector's military customers intend to reinvent themselves for a future that may require the acquisition of unfamiliar weapons and support systems.

*A wealth of suggested titles is in GEN Odierno's professional reading list, online at **http://www.history.army.mil/html/books/105/105-1-1/index.html**. Is there a book you'd like to recommend for this column? Send us an email at **armyalt@gmail.com**. Please include your name and daytime contact information.*

FLEXIBLE COMMUNICATIONS
A flexible display on a Soldier's sleeve could lighten the Soldier's battery load while providing invaluable information such as current mission requirements or battlefield commands. The display comprises e-ink printed onto a sheet of plastic, which is laminated to control circuitry. (U.S. Army photo by Conrad Johnson)

THEN & NOW

1983 & 2012

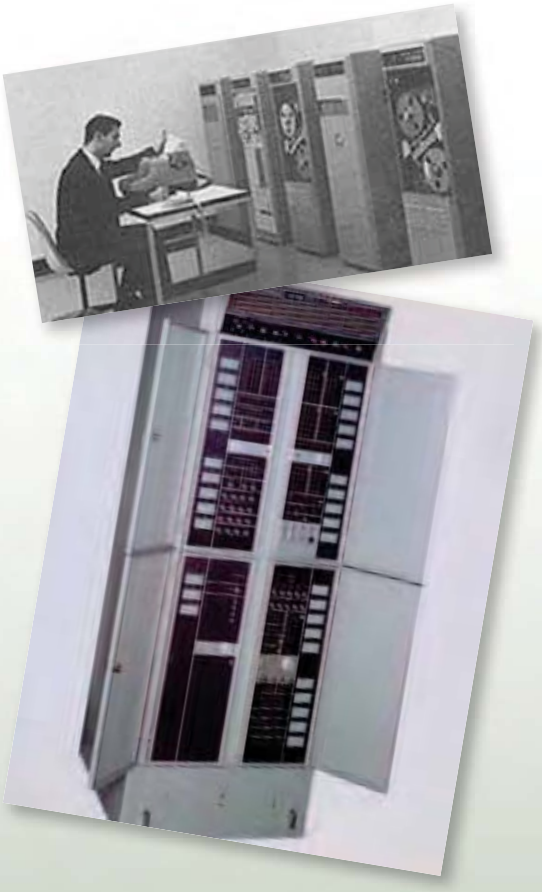
The observation that with computing hardware, the number of transistors on an integrated circuit doubles approximately every two years is known as Moore's Law, named for Intel Corp. co-founder Gordon Moore. (The period is often misquoted as 18 months, because an Intel employee predicted that it would take that long to double a chip's performance, taking into account the combination of more and faster transistors.)

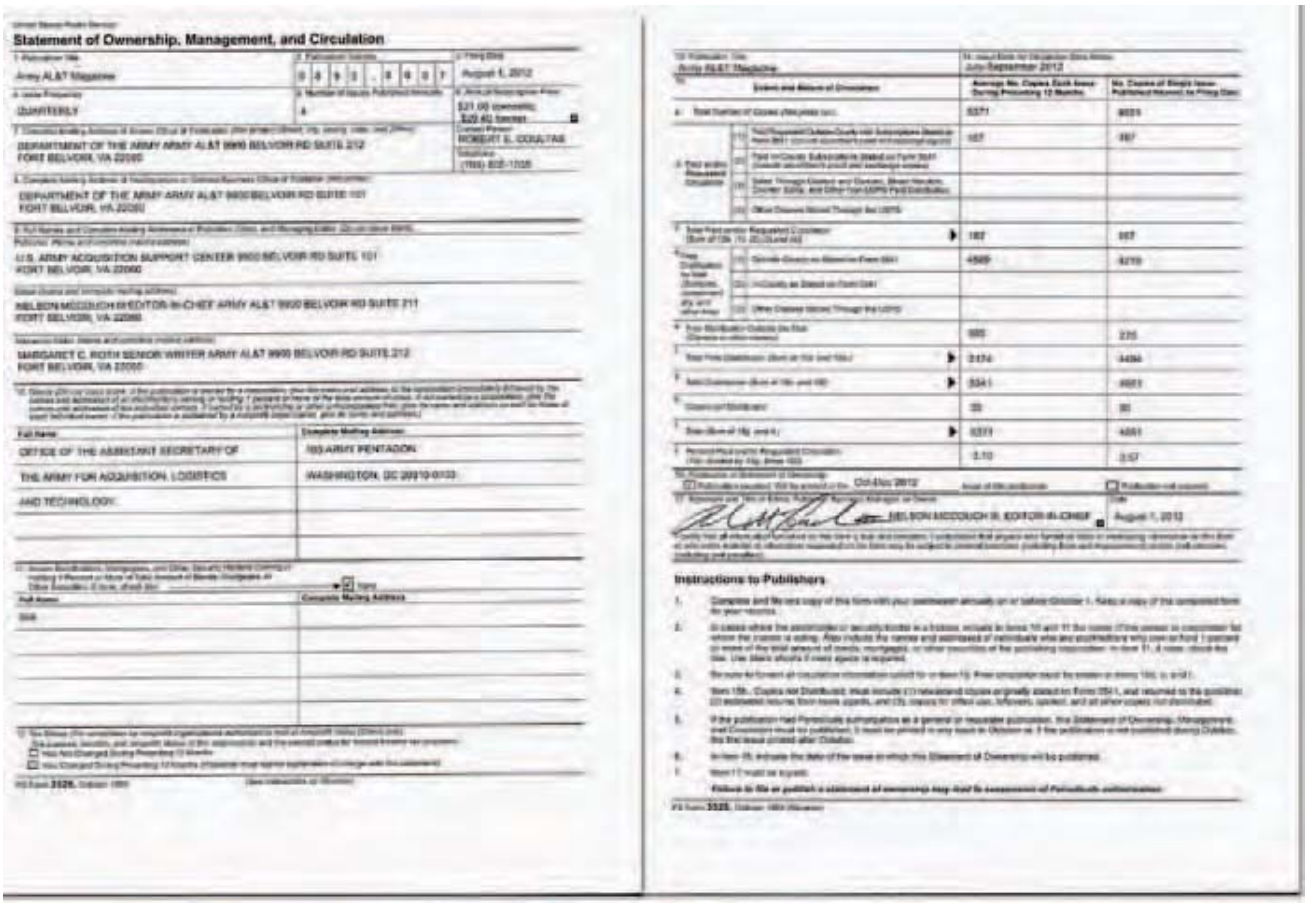
Almost 20 years ago, computer scientist Dr. Edward Lieblein, Director of the Military Computer Family Project at the U.S. Army Communications-Electronics Command, made this statement: "The computer has become an essential ingredient in almost all Army battlefield systems," in his article "The Military Computer Family" (*Army R,D&A* Magazine (now *Army AL&T* Magazine), January-February 1983). That statement has never been more accurate than it is today.

Networked computing and circuitry pervade the Soldier's world, on the battlefield and behind the scenes in support. From the flexible, fabricated plastic embedded with integrated circuitry that can relay battlefield information to Soldiers ("Flexible Communications," *Army AL&T* Magazine, July-September 2012) to the micro-grid hardware and software that provide more efficient power generation to operating bases all over the world ("Operational Energy," *Army AL&T* Magazine, January-March 2012), there is hardly an aspect of Army life that networked computer systems don't touch.

Back in 1983, a "super minicomputer" weighed 40 pounds and cost $75,000. Today, control circuitry can be laminated into plastic 1/16 of an inch thick and attached to a Soldier's uniform so inconspicuously that he or she hardly notices it. The cost to the Army of continued computer proliferation was estimated at $360 million per year by 1990, and $880 million per year by 2000. The cumulative cost to the Army over the period from 1981 through 2010 has been estimated at approximately $9 billion.

For a historical tour of Army AL&T *over the past 50 years, visit the* Army AL&T *Magazine archives at* ***http://live.usaasc.info/magazine/alt-magazine-archive.***





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DESIGN

"We started synthesizing the basic building blocks of the suspect interface components. One by one, we pieced together the story and found out exactly what protects the electrolytes from decomposing. This fundamental knowledge enabled us to develop this new 5-volt electrolyte."

Dr. Kang Xu
Senior Research Chemist,
U.S. Army Research Laboratory

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DEVELOP

"Our [workforce growth] plan cannot be stagnant but must remain cognizant of new developments related to emerging technology, contract pricing, cost estimating, and a variety of other dynamics central to our efforts and the current fiscal and developmental environment."

LTG William N. Phillips
Director, Army Acquisition Corps
and Director, Acquisition Career Management

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DELIVER

"We've optimized our structure and capabilities so we are able to support both the operating forces and the generating forces and quickly respond to changes in mission sets and workload that our customers require."

MG Camille M. Nichols
Commanding General,
U.S. Army Contracting Command

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DOMINATE

""The Soldier needs to be networked, mobile, linked digitally and have knowledge of the environments."

LTG Robert B. Brown
Commanding General,
I Corps and Joint Base Lewis-McChord, WA

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