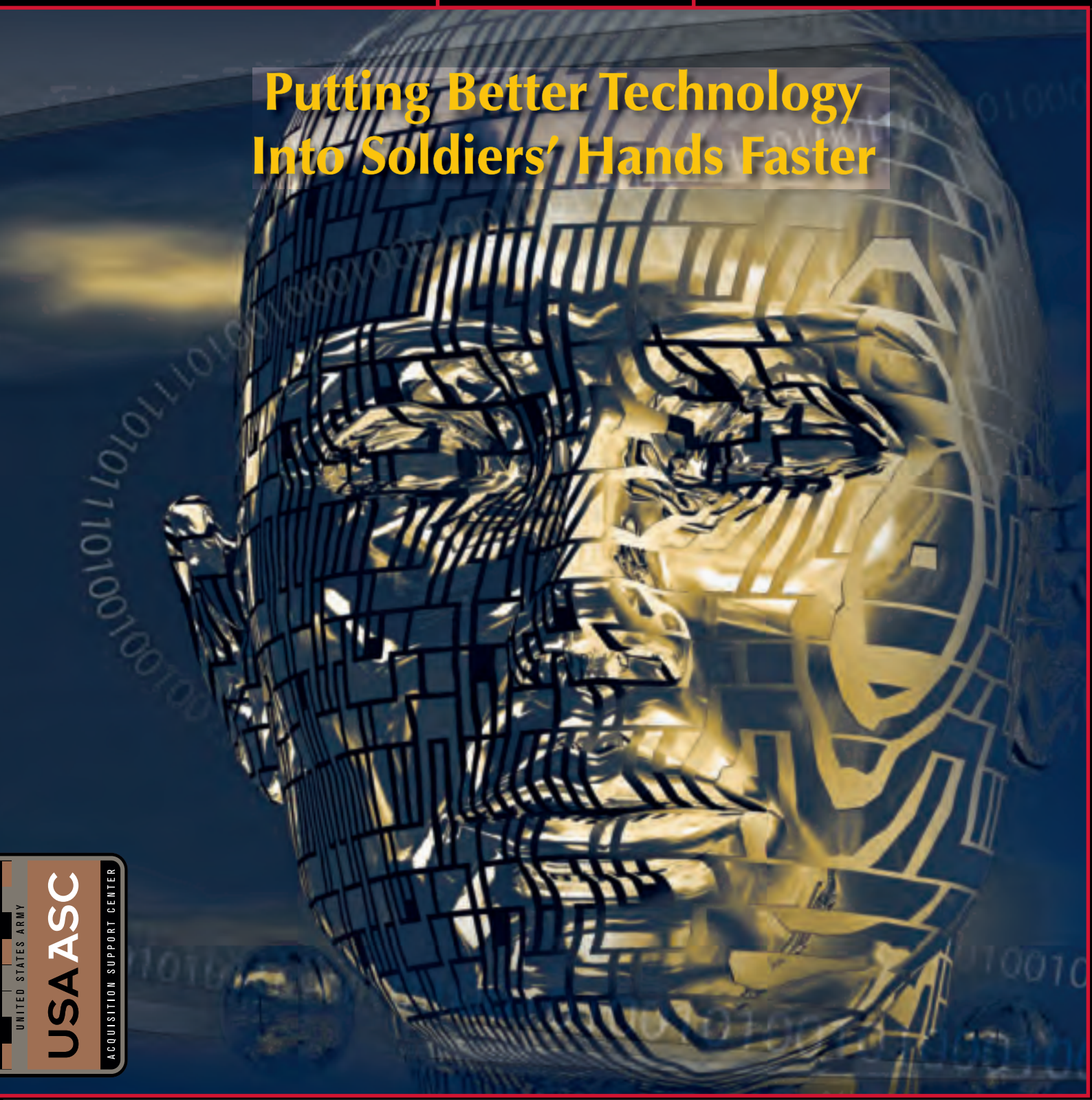
ARMY AL&T

April - June 2007

Putting Better Technology Into Soldiers' Hands Faster



USA ASC
UNITED STATES ARMY
ACQUISITION SUPPORT CENTER

From the Army Acquisition Executive

A Better Army Through Focused Research and Technology Development

Throughout history, the Army has focused on Soldier needs, combat requirements and the lessons of history as opportunities to build a force that is the most powerful, most capable and most respected in the world. Army science and technology (S&T) has had a major role in our success.

Through our S&T program, we pursue technologies to enable the Future Force while simultaneously seeking opportunities to enhance Current Force capabilities. We develop technology through investments in the three S&T components:

- For the near-term, demonstrating mature technology in relevant operational environments and facilitating technology transition to acquisition programs.
- In the mid-term, translating research into militarily useful technology applications.
- In the far-term, conducting research to create new understanding for technologies that offer paradigm-shifting capabilities.

The Army's laboratories and research, development and engineering centers support the focused research and technology development necessary to enable our Army to maintain its preeminence within the world. Army scientists and engineers execute their work in world-class Army facilities and also in cooperation with industry, academia and other government scientists and engineers.

In addition, the Army currently maintains four University Affiliated Research Centers that partner with industry and Army laboratories to transition new knowledge and novel technology concepts for further development. The Institute for Advanced Technology (IAT), established with the University of Texas-Austin, conducts focused, long-term, theoretical and applied research and development in electrodynamics and hypervelocity physics. IAT's primary focus is to enable military applications for electromagnetic gun capabilities.

The Institute for Creative Technologies (ICT), established with the University of Southern California, performs research in advanced simulation and immersive environments. The ICT enlists and leverages the resources and talents of the entertainment and game development industries to work collaboratively with Army computer science experts in graphics, audio and artificial intelligence. This collaboration has been critical in improving the realism and usefulness of simulation for Soldier training and mission rehearsal.

The Institute for Soldier Nanotechnology, established with the Massachusetts Institute for Technology (MIT), performs research in nanotechnologies for Soldier protection and survivability applications. Nanotechnology is the design and creation of novel materials or devices at the nanometer scale, often at the level of individual atoms and molecules. Finally, the Institute for Collaborative Biotechnologies (ICB), established by the University of California-Santa Barbara, in partnership with MIT and the California Institute of Technology, researches the processes, structures and features found in nature and biology. ICB is developing revolutionary technological innovations in bio-inspired materials and energy, biomolecular and infrared sensors, bio-inspired network science and biotechnological tools targeted to a broad spectrum of Army needs.

It is within the very nature of mankind to question how things are done and this natural curiosity is essential to the progress the S&T community continues to make. As technology becomes more and more advanced, it opens the opportunity to reassess how we go about making progress. The system-of-systems (SoS) approach to technology is one area that is challenging us to question how we are conducting technology development and ask the question, "How do we do this better?"

The initial Future Combat Systems versions will require approximately 33 million lines of software code, and subsequent systems will undoubtedly contain ever-more lines of code. While we can tweak our software development tools and methods, it is uncertain that they will be up to the task of developing future systems. Recently, Carnegie Mellon University's Software Engineering Institute (SEI) conducted a year-long study to investigate ultra-large-scale (ULS) systems software. This study addressed the question, "Given the issues with today's software engineering, how do we build future systems that are likely to contain billions of lines of code?"

SEI brought together engineering experts with software and systems expertise from various institutions and organizations across the country to participate. The study indicated something that we all knew, but didn't truly appreciate — the magnitude of the impact that our SoS would have on how we do business. That increased code size brings with it increased scale in multiple dimensions; number of people employing the system; amount of data stored, accessed and manipulated; even to the number of connections and hardware systems required. This poses challenges that strain the foundations of current software development. The sheer scale of ULS systems will change everything. People will not just be ULS system users, they will be elements of the system. Software and hardware failures will be the norm rather than the exception. ULS system acquisition will be simultaneous with its operation and will require new methods for control. A broad, multidisciplinary research agenda for developing the ULS systems of the future, like our SoS, is required and the S&T community has shouldered this challenge.

The U.S. Army is the most powerful land force on Earth. Still, there is no natural law that says that we will always remain that way. People will make that happen. People are central to everything we do in the Army. Institutions do not transform — people do. Platforms and organizations do not defend the Nation — people do. Units do not train, they do not stay ready, they do not grow and develop leaders, they do not sacrifice and they do not take risks on behalf of the Nation — people do. That is why each and every one of us has an important role in keeping the U.S. Army the most powerful, most capable and most respected land force in the world.

Claude M. Bolton Jr.
Army Acquisition Executive

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ACQUISITION, LOGISTICS & TECHNOLOGY

Call for 2007 Army Acquisition Award Nominations

There is no greater time than the present to recognize Army acquisition professionals whose outstanding contributions and achievements merit special recognition and reflect accomplishments that have been made in direct support of Soldiers and the Army's business transformation initiatives.

The season for submitting nominations for the 2007 Army Acquisition Awards has arrived. Three of the awards the U.S. Army Acquisition Support Center (USAASC) will be coordinating the call for nominations and running the award boards for are the Army Acquisition Excellence (AAE) Awards; the Product/Project Manager (PM) and Acquisition Director of the Year Awards; and the David Packard Excellence in Acquisition Awards.

USAASC Director Craig A. Spisak has approved a new timeline that allows for a longer call for nominations period for these awards. This will give more preparation time to the organizations that would like to submit nomination packets. All organizations employing Army acquisition professionals are strongly encouraged to submit nominations.

For more information regarding the awards, please go to the Acquisition Awards section of the USAASC Web site (**http://asc.army.mil**). Questions regarding the awards may be directed to **usaasc_events@us.army.mil**.

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

By order of the Secretary of the Army

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Chief of Staff

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0708704

Putting Better Technology Into Soldiers' Hands Faster

This edition of *Army AL&T* Magazine features articles from Program Executive Office (PEO) Intelligence, Electronic Warfare and Sensors (IEW&S) and the U.S. Army Research, Development and Engineering Command's (RDECOM's) Systems of Systems Integration (SOSI) Office. Both organizations are showcasing some of the latest developments coming out of their respective science & technology and research & development programs to better address Soldier equipment and communications requirements as U.S. Forces continue to wage the global war on terrorism.

SGT Jason D. Schwien, Bravo Troop, 3rd Squadron, 71st Cavalry Regiment (Recon), 10th Mountain Division (Light), leads his squad along a trail high in the Hindu Kush Mountains during a patrol near Kamdesh, Nuristan Province, Afghanistan, Aug. 10, 2006. Soldiers like Schwien continue to push the limits of human endurance and the equipment, weapons and communications systems that U.S. Forces are employing in this harsh, extremely desolate region, punctuated by violent sectarian, ethnic and economic conflict. This issue is dedicated to the U.S. Soldiers who selflessly serve on Freedom's Frontiers with honor and distinction. (Photo by Robert Nickelsberg/Getty Images®. Used with permission.)

Distributed Common Ground Systems-Army (DCGS-A)
PEO IEW&S's initiatives have led to full DCGS-A development and deployment. DCGS-A provides the U.S. Army fully integrated, timely and actionable battlefield intelligence. As PEO Edward T. Bair illustrates in his article, DCGS-A establishes the core framework for a worldwide, distributed, network-centric, system-of-systems architecture that conducts collaborative intelligence operations and uses multisource intelligence products to aid real-time battle command. Further, his organization's other articles describe how DCGS-A has developed the necessary Service-Oriented Architecture to link the Army's business and computational resources (organizations, applications and data) to achieve the desired results for Army intelligence analysts and battlefield commanders.

RDECOM SOSI
BG Genaro Dellarocco, RDECOM SOSI Deputy Commanding General, discusses his organization's mission, initiatives and capabilities, and how SOSI integrates the various technologies being developed at RDECOM laboratories around the globe. He also discusses RDECOM's Joint collaboration initiatives with the other services, the Department of Energy and the International Technology Centers (ITCs), and how RDECOM SOSI is fulfilling its mission of providing the right technology at the right place at the right time. A second SOSI article relates how RDECOM uses its ITCs to constantly search the globe for state-of-the-art equipment and basic/applied reseach opportunities. The final SOSI article describes the Army Materiel Command's Rapid Support Network and how RDECOM SOSI is supporting immediate warfighter battlefield requirements initiated through real-time life cycle management acquisition, logistics and technology (AL&T) sustainment conduits.

The balance of this edition focuses on a wide array of information important to AL&T Workforce members to include: the U.S. Army Test and Evaluation Command's development and fielding of effective combat systems for aviators; technological advances in laser research and their potential use in the near future; highlights from the 25th Army Science Conference; and how Force XXI Battle Command Brigade and Below is providing unprecedented situational awareness for battlefield commanders and their Soldiers. In addition, the U.S. Army Training and Doctrine Command Capability Manager-Cannon provides an update on cannon artillery and munitions programs and future artillery system lethality. Also, don't miss conference coverage updates provided by our staff writers Ben Ennis, Meg Williams and Robert E. Coultas.

Michael I. Roddin
Editor-in-Chief

DCGS-A — Creating the Army's Intelligence, Surveillance and Reconnaissance (ISR) Net-Centric Enterprise System

Edward T. Bair

My intention is to return the focus where it belongs, to the Soldier struggling to kill or avoid being killed and to his commander struggling to master the remorseless logic of carnage.
— Max Boot, War Made New (Technology, Warfare and The Course of History)

DCGS-A V2 has clearly demonstrated its ability to meet tactical challenges on the ground in Iraq providing a range of ISR capabilities to support intelligence requirements for security patrols and peace enforcement, and force-on-force engagements to counterinsurgency/counterterrorism operations. Here, SSG Miguel Ramirez from Charlie Troop, 8th Squadron, 10th Cavalry Regiment, 4th Infantry Division, provides security during a joint presence patrol with Iraqi security force elements near Ameriya, Iraq, last November. (U.S. Army photo by SGT Martin K. Newton, 982nd Signal Co. (Combat Camera).)

The Distributed Common Ground Systems-Army (DCGS-A) is leading the way in providing Future Force capability for today's fight. DCGS-A is the Army's ground portion of a Joint intelligence enterprise that unifies the collection, processing, analysis, extraction, query and visualization capabilities for tactical environments. The efforts in this area will benefit our warfighters by combining the preceding functions along with creating a predictive intelligence analysis environment that enables effective, dynamic battle command.

DCGS-A became reality through the Program Executive Office (PEO) Intelligence, Electronics Warfare and Sensors' (IEW&S') rapid response to Army G-2 acceleration efforts and fielding of an initial DCGS-A capability in theater to meet the most pressing operational needs. This fielded effort, initially called the Joint Intelligence Operations Center-Iraq (JIOC-I), is the DCGS-A Version 2 (V2) capability and has been fully transitioned to the DCGS-A program office. DCGS-A is successfully merging the best capabilities of numerous Current Force systems with the best emerging technologies, to craft an enduring hardware and software architecture that will be operationally relevant now and for the Future Force. The DCGS-A road map will ease the rapid integration of internally developed innovative ISR capabilities and technologies from Future Combat Systems, our Joint service partners and coalition forces, while minimizing costs from unnecessary rework.

DCGS-A — Leading Transformation Strategy

The DOD and Army transformation strategies are designed to create a more efficient, effective, capable and cost-effective warfighting force. Transformation can be described as the adoption of a strategic vision to harness discontinuous or disruptive technological, organizational and infrastructural changes to increase the agility of U.S. combat power against existing and emerging threats. A critical requirement for Army transformation is an ISR capability that can adjust or scale to match both existing and evolving threats during its life cycle. Clearly, the current war on terror demands an ISR enterprise that can improve force effectiveness in operations ranging from traditional maneuver force-on-force engagements to nontraditional operations other than war missions, such as humanitarian aid and peace enforcement. The DCGS-A architecture, in its current level of execution, has demonstrated its robustness and ability to meet these challenges as demonstrated by the fielded DCGS-A V2 and soon-to-be-fielded DCGS-A V3 and Human Domain Workstation products.

The vision and architecture laid out for DCGS-A has been flexible enough, both in form and process, to quickly absorb developing capabilities from the theater, the schoolhouse, lab and industry. From a development and architectural perspective, the key lesson learned, while developing the initial DCGS-A capability, is that high-performance enterprise systems are built from a solid internal core and execute a defined strategy to deliver value to the edge points — in this case, our warfighters. The creation of an ISR enterprise, therefore, calls on DOD and the Army to leave behind the existing comfort zones of "stovepipes" and their single-purpose business rules and adopt

The DCGS-A platform provides an ISR capability that is robust, scalable and tailorable to meet both existing and evolving battlefield threats. Here, U.S. Army Soldiers from 3rd Battalion, 7th Field Artillery Regiment, 25th Infantry Division, provide security for Iraqi engineers responding to a major oil pipeline attack by insurgents. (U.S. Air Force photo by SSGT Samuel Bendet, 30th Space Communications Squadron.)

an architectural philosophy and enabling techniques that permit our system to continually adapt, scale and offer new capabilities while remaining economical and efficaciously supporting combatant commanders and their Soldiers on danger's frontiers.

Service-Oriented Architecture (SOA) Encapsulates the Vision

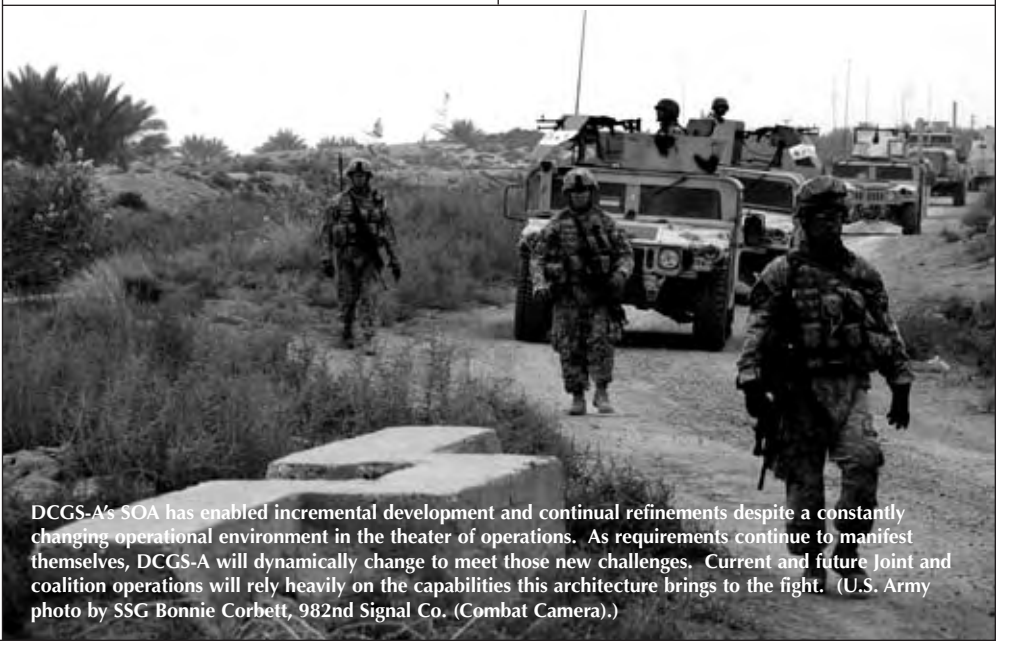
The DCGS-A development is unique, not only within the DOD community, but also within the broader universe of information technology (IT) theory and practice. DCGS-A is based on an SOA that helps define discrete IT software and system service capabilities that are discoverable, invocable and reusable by any other service or end user. While SOAs currently exist in many commercial mission-critical systems, DCGS-A represents their first tactical warfighting implementation within DOD. The Project Manager (PM) DCGS-A was tasked with assisting these existing Programs of Record (PORs) in identifying and distilling their key data assets and analytic capabilities and services, enabling their use in the end-state DCGS-A enterprise.

The POR analysis and distillation process is a critical driver to the acquisition and sustainment processes that will be used in ongoing DCGS-A development and deployment. The fact that we are currently involved in a war demands that we operate in a flexible manner, balancing prudent design risks against the reward of rapidly providing critical information that can save Soldiers' lives. The development of enterprise information technologies necessitates an acquisition environment that supports situations where it may not be possible for the end user to articulate exact requirements. Our solution to meeting this dynamically changing situation was the implementation architecture chosen for DCGS-A that easily enables incremental development and continual refinement as the requirements become better defined. The SOA strategy permits us to explore how we could refactor, rather than completely recode, capabilities from the existing services set that would enable us to meet the user-requested capabilities or effects.

The PM DCGS-A created a strategic road map that keeps the transformational end state in sight while addressing significant current needs. The road map outlines a crawl, walk, run model. This means that while the ultimate aim is to create the perfect, fully capable, transformational, net-centric enterprise, it will be accomplished in a stepwise fashion. Our requirement is that the process be reasoned and deliberate with clear warfighter-relevant deliverables along the way. This process allowed us to deploy interim capabilities to the field such as DCGS-A V2 and DCGS-A Fixed without compromising the program's long-term effectiveness.

Implementing the DCGS-A SOA Vision

The first, or "crawl," phase consists of the process of inventorying potential POR services and generating a broad

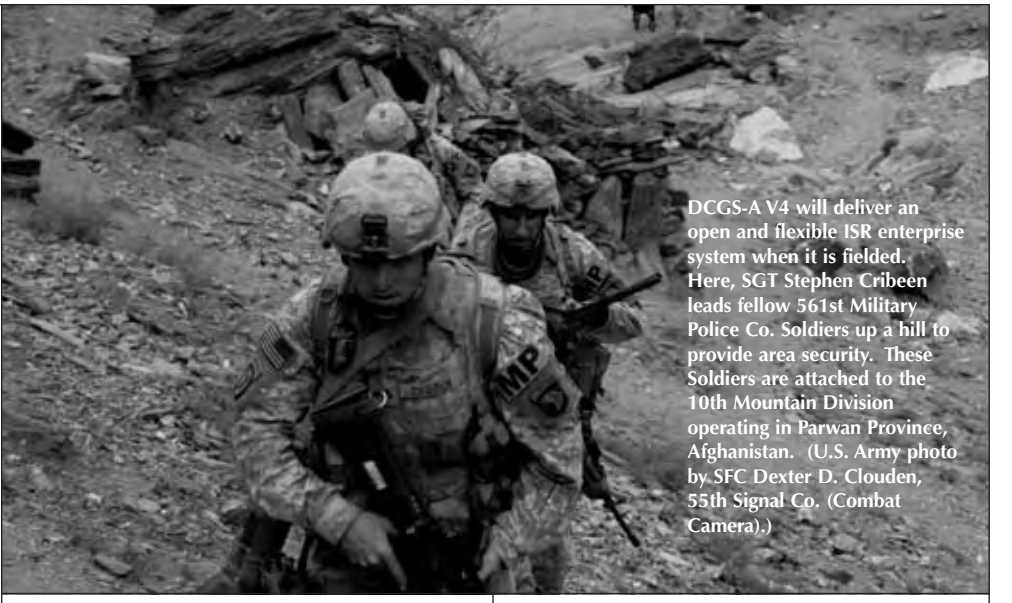


DCGS-A's SOA has enabled incremental development and continual refinements despite a constantly changing operational environment in the theater of operations. As requirements continue to manifest themselves, DCGS-A will dynamically change to meet those new challenges. Current and future Joint and coalition operations will rely heavily on the capabilities this architecture brings to the fight. (U.S. Army photo by SSG Bonnie Corbett, 982nd Signal Co. (Combat Camera).)

set of specifications to provide guidance to our industry counterparts. These specifications serve as catalysts for lively and pointed discussions that provide a strong theoretical and practical basis for DCGS-A's initial executions.

In addition, the use of prior work done by the U.S. Air Force, specifically the DCGS Integration Backbone (DIB), enabled DCGS-A to make a quick start toward its objective system. DCGS DIB adoption and implementation started us walking on the road to service-enabling Army systems. Initial work on DCGS-A V3 uses the DIB to interface with the Joint MetaData Catalog (MDC). While V3 was being developed, we were afforded the opportunity to assimilate the Joint Intelligence Operations Capability. DCGS-A, like any enterprise system, consists of a wide range of transactional information processing capabilities. These transactional capabilities require an institutional memory repository or warehouse. In the commercial world, a data warehouse is a database geared toward an organization's business intelligence requirements. In the DCGS-A enterprise, the JIOC-I capability served this key function.

The JIOC-I data warehouse ingests data from the various operational systems at regular intervals and distributes mined, analyzed and packaged information across the enterprise. JIOC-I facilitates the analysis of historical operational performance over time, which is needed to refine future operational mission execution. These capabilities were productized and deployed as DCGS-A V2. The assimilation of JIOC-I into the DCGS-A enterprise provided total validation of the PM acquisition approach and the decision to implement an enterprisewide SOA architecture. This was further leveraged through DIB infrastructure integration and a visualization capability called the Multi-Function Workstation (MFW) that permitted integration of the best portions of these programs into our "walk" phase called DCGS-A V3.



DCGS-A V4 will deliver an open and flexible ISR enterprise system when it is fielded. Here, SGT Stephen Cribeen leads fellow 561st Military Police Co. Soldiers up a hill to provide area security. These Soldiers are attached to the 10th Mountain Division operating in Parwan Province, Afghanistan. (U.S. Army photo by SFC Dexter D. Clouden, 55th Signal Co. (Combat Camera).)

V4 Proof of Concept (PoC)

DCGS-A V3 proves that PORs can be successfully integrated in a loosely coupled, nonproprietary, incremental manner. DCGS-A V3 includes functionality from JIOC-I, access to the Joint MDC through the DIB, visualization capabilities through the use of an MFW and collaboration with the Army Battle Command System. In effect, V3 helped us transition from the crawl phase to the walk phase. Building on the successes of V3, the V4 PoC is accelerating us into the DCGS-A enterprise "run" phase.

The DCGS-A V4 PoC was built around two fundamental service-oriented components. The first was a fully developed Enterprise Service Bus (ESB) with a complementary business process management capability, and the second was a thin-client browser-based portal. An ESB is a loosely coupled, highly distributed and scalable integration infrastructure framework that connects, controls and mediates the interactions between applications. The ESB enables the objective DCGS-A V4 system to scale beyond the ingestion-based, hub-and-spoke-type V3 initial implementation. This is the ideal direction or infrastructure to grow or evolve from V3 and build V4. It was also consistent with the road map migration from walk to run. The DCGS-A V4 PoC, first demonstrated in the summer of 2006, integrated multiple POR capabilities making them visible through the use of the thin-client browser-based portal. DCGS-A V4, when delivered, will be an open and flexible ISR enterprise system that will support the current fight and be easily extended by recomposing or integrating new services as they become available or when required to meet the Future Force's needs.

EDWARD T. BAIR is the PEO IEW&S. He is responsible for executive leadership, oversight, direction and total cost ownership for Army IEW&S modernization strategies and program capabilities. Bair holds a B.S. in industrial management from Purdue University, an M.S. in national resources strategy from the National Defense University and is a Defense Acquisition University Senior Acquisition Capstone Course graduate.

DCGS-A — Lessons Learned Developing the Army's Premier Intelligence, Surveillance and Reconnaissance (ISR) Platform

COL Henry E. Abercrombie

Enterprise: (a) a project undertaken or to be undertaken, especially one that is important, difficult or that requires boldness or energy, (b) a plan for such a project, or (c) participation or engagement in such projects.

— Dictionary.com Unabridged (v 1.1)

DCGS-A's SOA will better support Soldier tactical requirements and provide military intelligence analysts unprecedented access to diverse databases and advanced analysis tools. Here, SPC Victor Ramos (left) and SSG George Castro from Bravo Co., 1st Battalion, 23rd Infantry Regiment, 2nd Infantry Division, gather information following a residential raid of a suspected insurgent in Baghdad, Iraq, Feb. 6, 2007. (U.S. Army photo by SGT Tierney P. Nowland.)

The preceding definition accurately describes not just the Distributed Common Ground System-Army (DCGS-A), but also the process by which it has been undertaken and managed. Other articles in this magazine will discuss the architecture, specific program technology, military intelligence, strategic import and DCGS-A's use in operational art. This article is intended to review for program managers in DOD and civilian agencies, who are building enterprise systems, some techniques we used in DCGS-A. Let me begin by defining DCGS-A and its supporting concepts. After these points are discussed, I will provide observations gathered from delivering each initial execution's component of the DCGS-A enterprise.

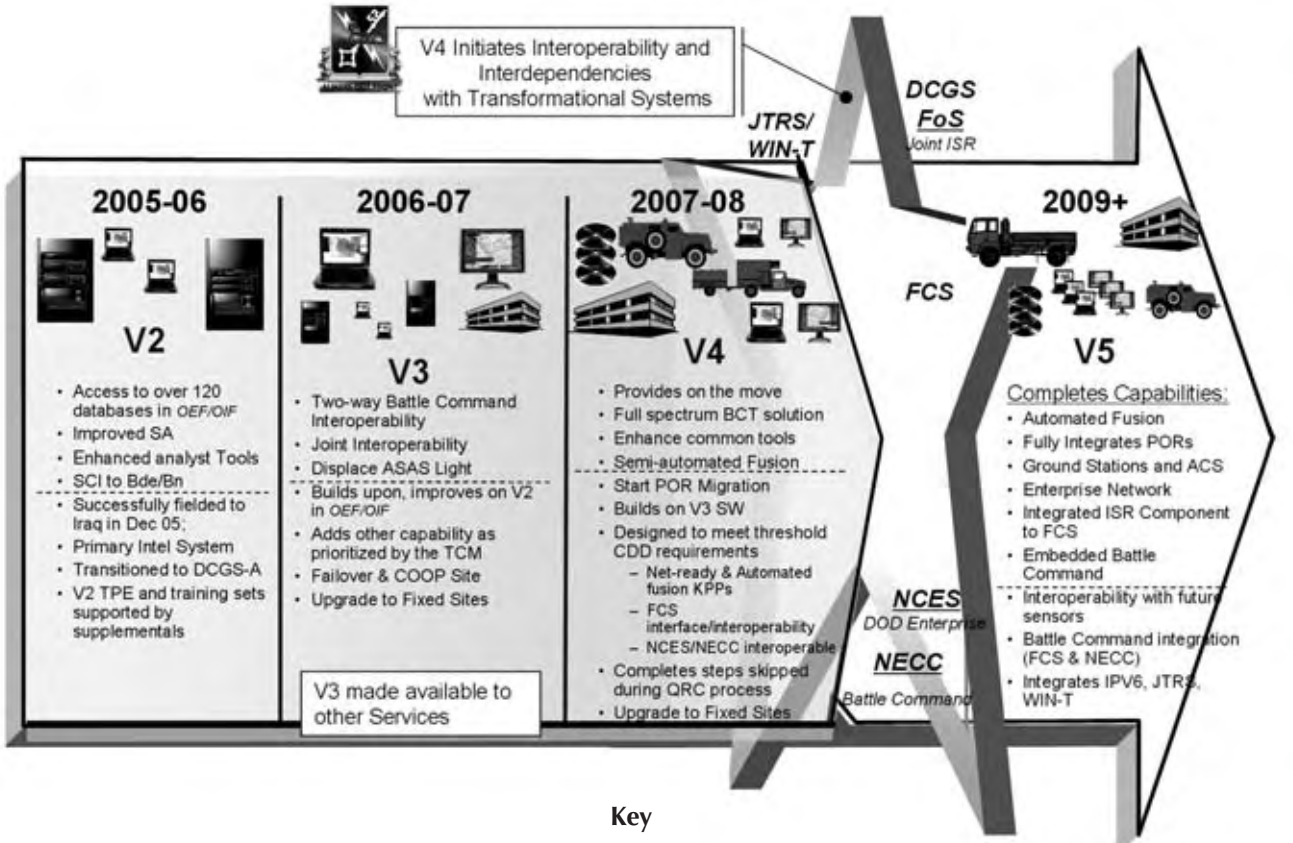
DCGS-A Definitions

DCGS is a family of fixed and deployable multi-source ground processing systems that support a range of ISR systems such as national or commercial satellite systems and unmanned aerial systems. DCGS, when fully operational, will provide continuous on-demand intelligence brokering to achieve full-spectrum dominance so that American and coalition forces can change the course of events in hours, minutes or seconds. The environment provides physical and electronic distribution of ISR data, processes and systems, as illustrated in the figure on Page 10.

The Army's contribution — and a key DCGS component — is DCGS-A. DCGS-A is the Army's enterprise platform for ISR. DCGS-A's objective is to integrate in a seamless enterprise 10 Programs of Record (PORs) that comprise the bulk of the Army's ISR capabilities.

Managing Paradigm Shift

DCGS-A's development has not been as much a technical challenge as one of changing the philosophical and operational context of the way ISR platforms



Key

ACS – Aerial Common Sensor
ASAS – All Source Analysis Platform
BCT – Brigade Combat Team
Bde/Bn – Brigade/Battalion
CDD – Capabilities Development Document
COOP – Continuity of Operations
FoS – Family of Systems
IPV6 – Internet Protocol Version 6
JTRS – Joint Tactical Radio System
KPP – Key Performance Parameter
NCES – Net-Centric Enterprise Services
NECC – Net-Enabled Command Capability
OEF – *Operation Enduring Freedom*
OIF – *Operation Iraqi Freedom*
QRC – Quick Reaction Capability
SA – Situational Awareness
SCI – Sensitive Compartmented Information
SW – Software
TCM – U.S. Army Training and Doctrine Command (TRADOC) Capabilities Manager
TPE – Theater Provided Equipment
WIN-T – Warfighter Information Network-Tactical

DCGS-A Development Evolution

are designed, developed, implemented and, ultimately, acquired. Transformation has recently become a very popular phrase in DOD organizational concepts. In managing enterprise system development, the critical question in transformation, or of going from an Industrial Age to an Information Age military, is the objective quantification of the value that distributed, networked forces bring to modern combat.

This networked or enterprise question is not uncommon in commercial information technology (IT) projects that require the upgrading or transitioning of legacy systems to a more modern system execution. In that context, the calculus of return on investment is much more sharply defined than in the one DCGS-A exists in. The additional challenge in the DCGS-A program was the need to explain to and align the stakeholders with the new vision while also gaining their confidence as to its technical basis and capabilities. Each POR had its own prime contractor(s), management structure and constituency. Future Combat Systems (FCS) and our Joint service partners that were dependent on some of our sensors for mission requirements were also key factors in our development strategy. In order for the net-centric, implementation DCGS-A Joint vision to prevail, the Project Manager (PM) DCGS-A had to convince each group of two things. The first was that the essential value/contribution of their individual program would be effectively leveraged and, the second, was that the DCGS-A architecture would yield a system that was greater than the "sum of its parts" to combatant commanders and their Soldiers.

At PM DCGS-A, we developed a technical program management philosophy that was broad in its applicability and focused in operational execution. This overall philosophy was derived directly from the program name. We were looking for a truly distributed system that leveraged the capability of common elements and would not lock the Army into a costly proprietary solution. It was important that we not make the same mistakes pointed out by Jeff Cares in his book, *Distributed*

Networked Operations (*Foundations of Network Centric Warfare*). His key observation: "The military community often confuses IT-enhanced, rarefied Industrial Age processes with distributed networked systems that are truly transformed for the Information Age." The lessons learned from DCGS-A's successful development to date can help future practitioners to distinguish between these two and to manage the rapid development of a truly transformed "distributed enterprise."

Managing Legacy System to Enterprise Transformation

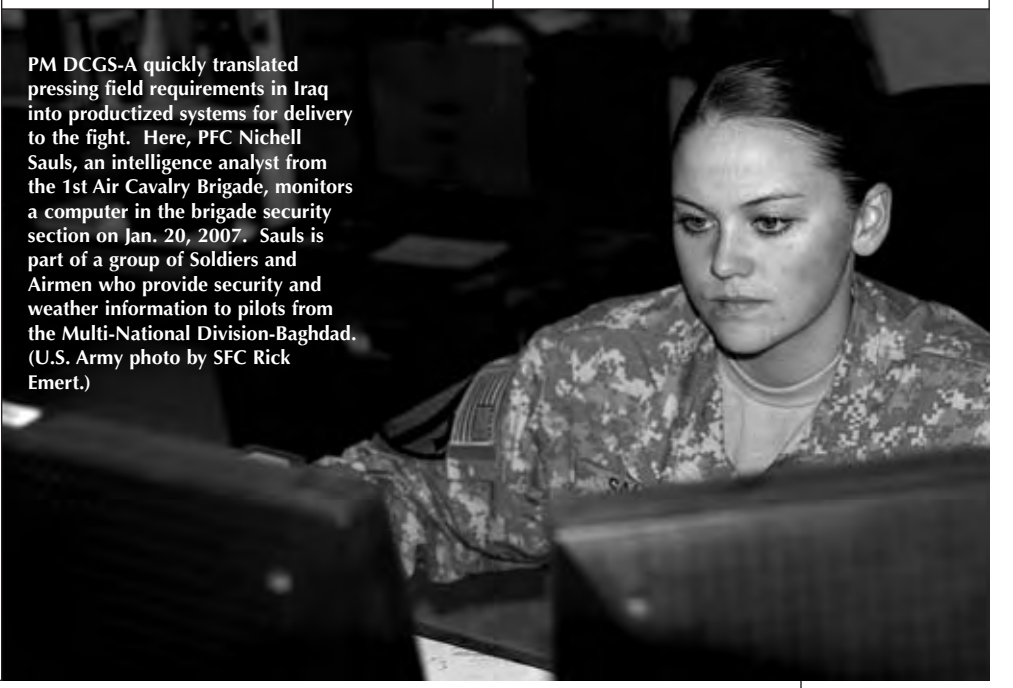
The plan for developing the DCGS-A enterprise was straightforward and based on a sound acquisition strategy. The key strategy in controlling costs and mitigating risks involved modifying the existing PORs so that they were enterprise-enabled in a concretely measurable fashion. This was done using these acquisition strategy steps and can be widely applied to any similar situation:

- Web-enable each POR to the fullest extent possible. This can start with something as simple as identifying a uniform resource locator hypertext endpoint for the functionality. From this starting point, use differing levels of sophistication all the way up to a Representational State Transfer or full Web service.
- Enforce data-level interoperability through the use of wrappers and adapters following a wrap-and-adapt strategy. These wrappers or adapters would be designed to conform to interoperable specifications. The infrastructure supporting these should be message-based with, at the lowest level, appropriate application program interface.
- Make widespread use of eXtensive Markup Language (XML) tagging and construct a meta-data capability.
- When able, use the service-enabling infrastructure of the DOD-proven DCGS Integration Backbone (DIB).

Determine What Enterprise Components Already Exist

Most programs start with a defined single-service requirements set. DCGS-A, as is the case in all enterprise projects, had a set of requirements derived from the DCGS-A Capabilities Development Document that encompassed the aggregated select number of individual requirements from each of the individual PORs along with other intangible stakeholder requirements that are part of most organizations' enterprise vision. Therefore, the first step was to inventory each POR's relevant capabilities and map them against an enterprise infrastructure that ensured the functionality covered was complete. Additional considerations between a standard DOD acquisition process and DCGS-A is that the DCGS-A program had an immediate operational deployment window it had to meet and that the system would be initially put together at a government-owned Systems Integration Laboratory (SIL). This operational fielding window was routinely accelerated from the originally stated program delivery schedule to meet operational rotation requirements and the overall Army Force Generation commitments. The SIL concept yielded advantages as it accelerated our ability to integrate new technologies. The most critical lesson was to immediately address how to inventory the data, spot redundancies and evaluate this inventoried dataagainst several factors. The data inventory process consisted of conducting a series of Soldier characterization user studies and tool surveys and engaging government,

The plan for developing the DCGS-A enterprise was straightforward and based on a sound acquisition strategy. The key strategy in controlling costs and mitigating risks involved modifying the existing PORs so that they were enterprise-enabled in a concretely measurable fashion.



PM DCGS-A quickly translated pressing field requirements in Iraq into productized systems for delivery to the fight. Here, PFC Nichell Sauls, an intelligence analyst from the 1st Air Cavalry Brigade, monitors a computer in the brigade security section on Jan. 20, 2007. Sauls is part of a group of Soldiers and Airmen who provide security and weather information to pilots from the Multi-National Division-Baghdad. (U.S. Army photo by SFC Rick Emert.)

as well as civilian, subject matter experts in each program.

The next step was to map the user (consumer research in a commercial environment) against a workable system model. Because DCGS-A is primarily an aggregated software system, the unified model used was the model/view/controller pattern. This was critical because it permitted us to map the inventoried capabilities against a generally accepted software pattern. In his book, *A Timeless Way of Building*, Christopher Alexander states that each pattern represents a decision that must be made and the corresponding considerations that go into that decision. From this model, service specifications were developed and mapped against an execution of the enterprise as a Service-Oriented Architecture (SOA).

> V3's success is just a step in the overall process to build on operational interoperability with NCES and full FCS functionality.

SOA expresses a software architectural concept that defines the use of services to support software users' requirements.

The DCGS-A Version 2 (V2) Baseline

The U.S. Army's Intelligence and Security Command (INSCOM) had developed a significant capability that enabled Soldiers advanced analysis capability through accessing a large number of databases and advanced analysis tools. The tremendous and insightful effort that allowed this to happen is described in another DCGS-A article in this magazine. The contribution and effort as a result of this development cannot be understated. Given that this development has been adequately covered, I will continue describing DCGS-A enterprise development.

DCGS-A V3 — Building An Enterprise

Based on previous work, V3 development was able to rapidly enhance the V2 system. To meet the pressing field requirements in Iraq, the information contained in the service specifications and user surveys needed to be quickly productized for delivery to the fight. The approach with the least risk was to take select high-value components highlighted in the POR survey and quickly make them ready to work in an enterprise context. This was accomplished by using two well-known enterprise architecture patterns defined earlier — the wrapper and adapter patterns.

The wrapper allows switching of implementations of application functions without impact to other communications partners by encapsulating (or transforming) messages in some fashion, typically XML. This is one component in implementing a loose coupling of an enterprise's elements.

PM DCGS-A's technological innovation has resulted in fielded ISR systems that benefit warfighters today and promise combatant commanders even greater intelligence analysis capabilities tomorrow. Here, SPC Timothy Foltz (left) and SSG Chris Bertomeu from Headquarters Co., 5th Battalion, 3rd Stryker BCT, 2nd Infantry Division, provide security during a joint patrol with Iraqi army soldiers near Salhea, Iraq, last November. (U.S. Army photo by SGT Antonieta Rico, 5th Mobile Public Affairs Detachment.)

The adapter seeks to place emulations or filters around or within business processes to affect the loose coupling's second half. The result of this was the first step in the DCGS-A implementation framework that formed the basis of all future development. We were very fortunate that INSCOM, with G-2 support, had created the enterprise's data warehouse portion called the "brain." This valuable contribution could not have been leveraged, however, had we not carefully followed the step-by-step operational plan illustrated earlier to transform legacy systems into an integrated enterprise context that permitted us to prepare and field a fully functional subset of the required DCGS-A components as DCGS-A V3.

The successful production so far of DCGS-A V3 would not have been possible without the use of a clear technical development methodology that permitted the aggregation of a broad range of software products and capabilities to be harnessed so that all available data could be made available to warfighters without temporal or geographic limitations.

Another key experience accrued from this process's execution was that we almost became victims of our success. The rapid and successful SOA-based integration of V2 into V3, followed by V3's fielding, left many feeling that we had reached the end state. While this operational capability is extraordinary, the enterprise target of having all the relevant information quickly available to the core users regardless of temporal or geographic location in a seamless fashion is still not complete. V3's success is just a step in the overall process to build on operational interoperability with NCES and full FCS functionality. Paraphrasing Winston Churchill, "it is the end of the beginning" and certainly not as far as we can go with the foundation we have built. Perhaps this is the most important process lesson.

We also reached out to other programs and agencies that were developing components that we could leverage. From the DOD DCGS community, we incorporated the U.S. Air Force-developed DIB to enhance Joint interoperability. We have been working with both the National Geospatial Agency and National Security Agency to be compliant with accessing their most available information and intelligence products and leveraging their most advanced developments. We are currently working with the Product Director for Intelligence Fusion to host the latest DCGS-A developments within the ASAS platforms.

DCGS-A V4 is now bringing enterprise capabilities to maturity as follows:

- ISR component to battle command.
- Actionable intelligence.
- Running estimates.
- Planning and collaboration capabilities.
- Modularity and scalability.
- Mobility/transportability.
- Distributed operation capability.
- Supports the Evaluation BCT.
- Provides full data access, including BCT sensors.
- Intelligence fusion.
- Net-centric compliance.
- NECC and interoperability.

The final lesson we learned is that it is important to keep the end state in mind. If not, it is easy to settle for intermediate success. The successful production so far of DCGS-A V3, and the imminent arrival this year of DCGS-A V4, would not have been possible without the use of a clear technical development methodology that permitted the aggregation of a broad range of software products and capabilities to be harnessed so that all available data could be made available to warfighters without temporal or geographic limitations. A key component — multiple source exploitation — which includes signals intelligence, geospatial intelligence, measurement and signals intelligence, ASAS and other open source intelligence-gathering capabilities, will help DCGS-A V4 achieve full POR capability. The use of a clearly directed capability inventory, best practices in the use of enterprise integration patterns and a solid data warehouse and application server framework has permitted us to field a system that is benefiting our warfighting customers every day and promises even greater capabilities tomorrow.

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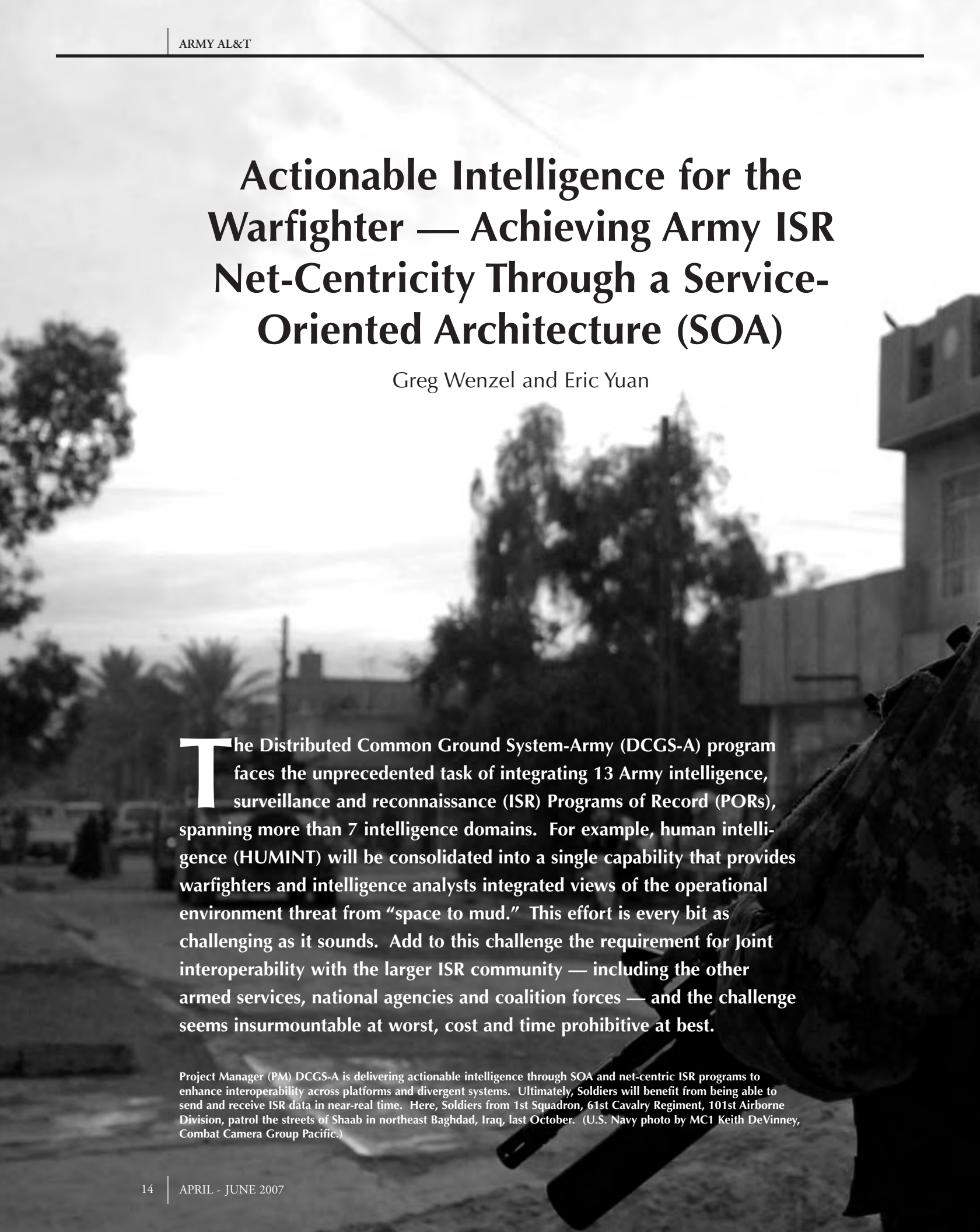
Actionable Intelligence for the Warfighter — Achieving Army ISR Net-Centricity Through a Service-Oriented Architecture (SOA)

Greg Wenzel and Eric Yuan



The Distributed Common Ground System-Army (DCGS-A) program faces the unprecedented task of integrating 13 Army intelligence, surveillance and reconnaissance (ISR) Programs of Record (PORs), spanning more than 7 intelligence domains. For example, human intelligence (HUMINT) will be consolidated into a single capability that provides warfighters and intelligence analysts integrated views of the operational environment threat from "space to mud." This effort is every bit as challenging as it sounds. Add to this challenge the requirement for Joint interoperability with the larger ISR community — including the other armed services, national agencies and coalition forces — and the challenge seems insurmountable at worst, cost and time prohibitive at best.

Project Manager (PM) DCGS-A is delivering actionable intelligence through SOA and net-centric ISR programs to enhance interoperability across platforms and divergent systems. Ultimately, Soldiers will benefit from being able to send and receive ISR data in near-real time. Here, Soldiers from 1st Squadron, 61st Cavalry Regiment, 101st Airborne Division, patrol the streets of Shaab in northeast Baghdad, Iraq, last October. (U.S. Navy photo by MC1 Keith DeVinney, Combat Camera Group Pacific.)

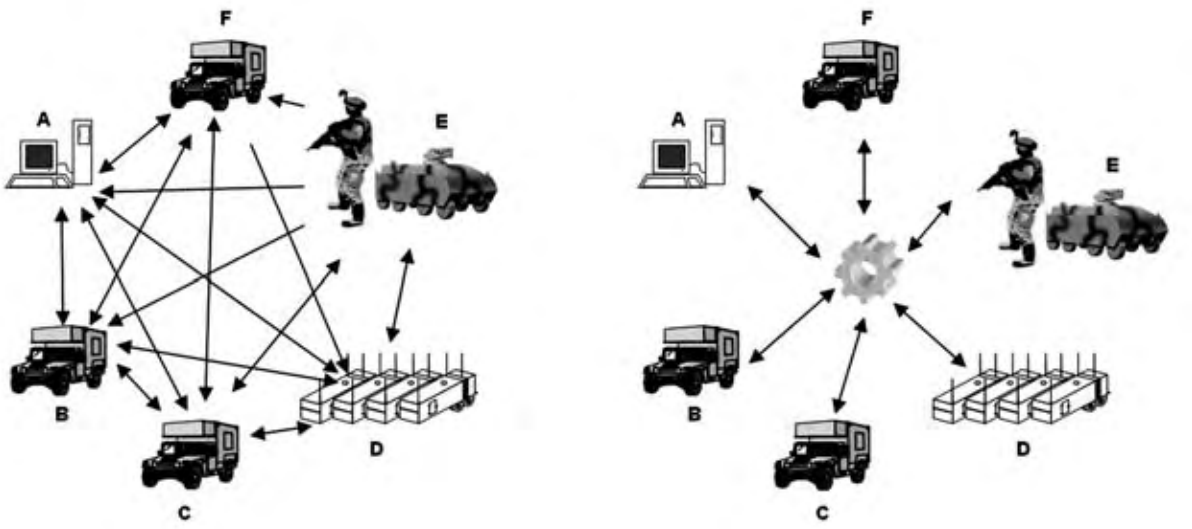
Indeed, the challenge might be insurmountable if the DCGS-A program took a more traditional approach to integration such as platform homogeneity, point-to-point integration or even message-broker middleware. Instead, DCGS-A is employing an SOA approach using Web services to achieve the goal of net-centric ISR systems interoperability.

Traditional Approach Limitations

To exchange information among systems using platform homogeneity, all legacy systems would need to be migrated to a single monolithic technology platform with identical data structures, programming languages and software configurations. This is not only cost prohibitive and time consuming, but is also undesirable because it would adversely impact system performance and degrade adaptability through vendor lock-in. Looking beyond DCGS-A, migrating all ISR community systems to a common technology platform is unrealistic because of the various platform standards already in use and the hundreds of millions of dollars invested to date.

DCGS-A is employing an SOA approach using Web services to achieve the goal of net-centric ISR systems interoperability.

Point-to-point integration involves tying one system to another by writing code that translates messages from the source system into a form that is understandable by the target system and vice versa. Specifically, this



Point-to-Point Integration for POR Systems

Hub-and-Spoke Integration for POR Systems

Figure 1. Traditional Integration Approaches

approach uses the underlying, usually proprietary, Application Programming Interfaces as the access mechanism. This approach is widely considered "tightly coupled" because the interface between the source and target systems is built unique to those two systems. Hence, the integration capability can't be leveraged across other systems. Additionally, whenever the system software and data structures are altered, programmers must change the integration code accordingly. This creates significant cost, maintenance and scalability problems. This scalability issue, which analysts call the "N2 problem," (handling data volume and path issues using sensible defaults and defined target lists) escalates exponentially as new systems are introduced into a network of integrated systems.

> As leveraged information services supplant large monolithic applications, the traditional system boundaries begin to disappear and ISR applications can be dynamically assembled in new ways to support changing missions and immediate commanders' needs.

Using a point-to-point approach, DCGS-A would need to build and maintain 156 unique system interfaces to achieve full integration between the 13 PORs. Elevate this scalability concern to the broader ISR community and this integration approach becomes highly impractical and extremely costly.

A traditional message broker middleware approach resolves the N2 problem by introducing a middleware "hub" that serves as the message-handling intermediary. Instead of communicating with one another using unique "one-off" interfaces, the systems interoperate using publish-subscribe style messages brokered by the centralized middleware hub. This "hub-and-spoke" approach, often referred to as Enterprise Application Integration, is implemented using commercial products such as MQSeries®, Tibco®, Web Logic® and webMethods®. Although effective in well-defined and clearly scoped enterprise settings, this approach is centralized within an enterprise (intra-enterprise), technology-dependent and platform-centric, rather than distributed across enterprises (inter-enterprise), open and net-centric. It offers limited scalability and adaptability that is insufficient for large-scale, cross enterprise, net-centric environments such as DCGS-A and the broader ISR community. These traditional integration approaches are depicted in Figure 1.

Net-Centricity and ISR Transformation

The DCGS-A program is transforming the Tasking, Processing, Exploitation, Dissemination (TPED) Intelligence Cycle, an inherently sequential and platform-centric process, to the new net-centric Tasking, Posting, Processing, Use (TPPU) paradigm. Although TPPU encompasses all TPED functions, it refactors them into a more open, dynamic and leveraged capability, making data available immediately for processing into actionable intelligence. The TPPU vision has some profound architectural implications as follows:

- *Pull Versus Push*. Information flows are no longer just a one-way "push,"

but will be both push and "pull." TPPU systems allow users to selectively retrieve only the data that is of interest to them.

- *Collaboration.* Because "post before process" becomes part of the norm under TPPU, the discrete information provider to information processor to information consumer chain is blurred and the sequential TPED "pipeline" is morphed into a many-to-many collaborative network.
- *System-to-System.* Many traditional ISR "stovepipe" systems architectures were built to support only human-system interfaces, but they now must support system-to-system integration as well. For example, instead of a user querying all systems for data on a regular basis, a Web portal may periodically query available ISR systems on a user's behalf and alert the user of any time-critical intelligence data.
- *Open Services.* In a TPPU environment, as leveraged information services supplant large monolithic applications, the traditional system boundaries begin to disappear and ISR applications can be dynamically assembled in new ways to support changing missions and commanders' immediate needs. The traditional stovepiped systems will give way to a set of net-centric technology services that can be leveraged across the ISR community.

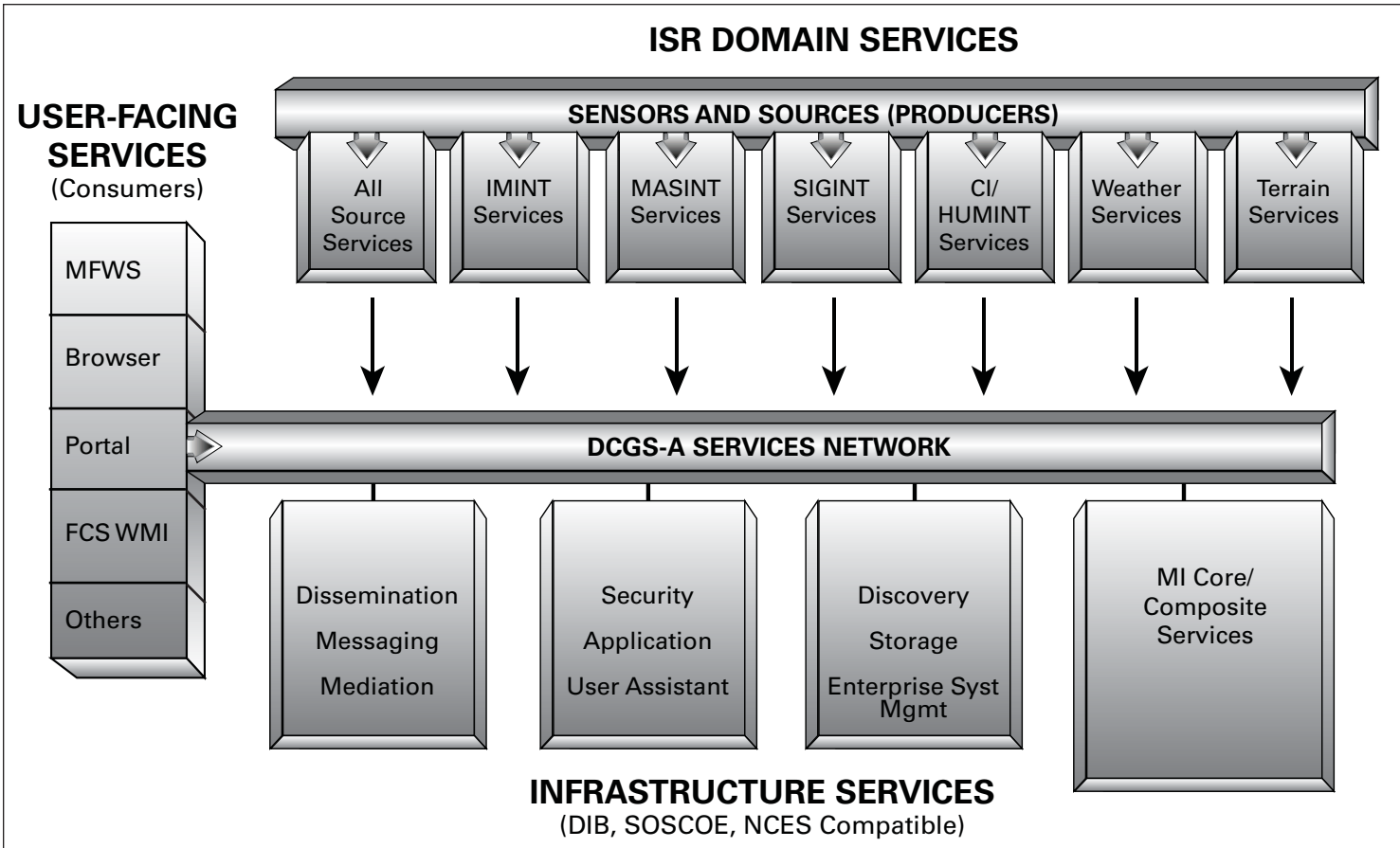
> Once an ISR organization achieves system interoperability by conforming to the interface specification, it gains the benefit of interoperability with all "networked" ISR systems that also conform to the interface specification.

As the Army's next-generation intelligence technology capability provider, DCGS-A is designing around these and other architecture tenets to support the future needs of warfighters and intelligence analysts.

Achieving Net-Centricity

Instead of using simple point-to-point or hub-and-spoke integration, DCGS-A is achieving net-centricity through SOA and Web services by constructing a set of leveraged ISR service interface specifications. These application and data interface specifications provide a layer of

Soldiers like SPC Andrew Ruhlman above are already benefiting from next-generation intelligence technology being developed by PM DCGS-A. New architecture tenets are supporting warfighters and intelligence analysts. Ruhlman, assigned to the 37th Armored Regiment, 1st Brigade Combat Team, 1st Armored Division, maintains radio contact with fellow platoon members during a patrol near Tal Afar, Iraq. (U.S. Air Force photo by SSGT Jacob N. Bailey, 1st Combat Camera Squadron.)



Key:

CI/HUMINT – Counter & Human Intelligence
DIB – DCGS Integration Backbone
FCS WMI – Future Combat Systems Warfighter Machine Interface
IMINT – Imagery Intelligence
MASINT – Measurement and Signals Intelligence
MFWS – Multi-Functional Workstation
NCES – Net-Centric Enterprise Services
SIGINT – Signals Intelligence
SOSCOE – System of Systems Common Operating Environment

Figure 2. DCGS-A SOA Integration Approach

abstraction that allows for system interoperability regardless of the interoperating systems' underlying technology infrastructure, including hardware, software and data structures. These net-centric "over-the-wire" specifications serve to establish the standard formats and protocols that participating systems employ to exchange data and perform services, thereby making the integrating architecture platform-, programming language- and vendor-independent. The interface specifications serve as the DCGS-A SOA's building blocks and are built using Web services-based open standards such as eXtensible Markup Language; Simple Object Access Protocol; and Universal Description, Discovery and Integration.

The DCGS-A program's goal is to achieve interoperability with the broader ISR community, not just among DCGS-A PORs. To this end, the interface specification development effort continually works to be more and more inclusive so that the specification gains the broadest applicability in the ISR community. The specifications define more than 130 ISR services addressing HUMINT, geospatial intelligence, signals intelligence, measurement and signatures intelligence, and all source domains, and incorporates the DIB standards. DCGS-A is currently working with and expanding involvement with other ISR organizations and data standards working groups to improve and evolve the interface specifications. The DCGS-A SOA integration architecture is illustrated in Figure 2.

The advantage of this SOA approach is self-evident. With SOA/Web services, DCGS-A can publish services to the ISR "network" using a standard interface specification and then the decision to interoperate and the effort of integrating is pushed out to ISR community organizations that wish to access those services by "plugging into the

network." This promotes scalability by delegating the integration effort out to the network of ISR organizations. Once an ISR organization achieves system interoperability by conforming to the interface specification, it gains the benefit of interoperability with all "networked" ISR systems that also conform to the interface specification. A single integration effort reaps the benefits of all the systems networked via the interface specification — Metcalfe's Law. Metcalfe's Law states that the value of a telecommunications network is proportional to the square of users of the system (n2). First formulated by Robert Metcalfe in regard to the Ethernet, his law explains many of the network effects of communication technologies and networks such as the Internet and World Wide Web. Users gain additional information sources through unanticipated data providers as they are published and plugged into the net. This is the essence of net-centricity. The DCGS-A set of service interface specifications is the critical enabler for the rapid integration of systems into a DCGS-A ISR services "marketplace" that will significantly benefit the Army and the ISR community at large.

DCGS-A is aggressively examining operational scenarios and systems architecture in applying modular force structure, TPPU and service-oriented concepts to address the operational, acquisition and organizational aspects of Army ISR force transformation.

From an acquisition perspective, the SOA approach also provides great benefits and cost savings. Once the initial capability is in place, the DCGS-A program can more easily enhance, or even entirely replace, legacy systems and deliver greater capability to warfighters with no adverse impact on operational continuity. The DCGS-A Web services-based interface specification driven approach can reduce the integration effort by an order of magnitude allowing a much more rapid "time-to-capability" for warfighters. Interoperability is achieved through compliance with a community-endorsed, open standards-based set of interface specifications, which substantially reduces the number of interfaces required to develop, maintain and achieve a critical element in the evolution to net-centricity.

Net-Centricity Involves More Than Technology

ISR effectiveness depends on technology and on processes, people and organizations. Working with the U.S. Army Training and Doctrine Command Capability Manager, DCGS-A PORs and other intelligence community subject matter experts, DCGS-A is aggressively examining operational scenarios and systems architecture in applying modular force structure, TPPU and service-oriented concepts to address the operational, acquisition and organizational aspects of Army ISR force transformation. DCGS-A is not simply trying to reuse existing POR capabilities, but is striving to integrate those capabilities in innovative ways to support future ISR missions.

Leading commercial organizations, including Amazon®, eBay®, Google™, Dell™ and countless others, have unequivocally proven the net-centric power of interface specification-driven interoperability using SOA and Web services technologies. The Army and the larger ISR community can apply these same technologies to achieve similar net-centric transformational improvements. At PM DCGS-A, we believe that we owe it to our combatant commanders and their Soldiers to capitalize on technologies that are transforming the world today.

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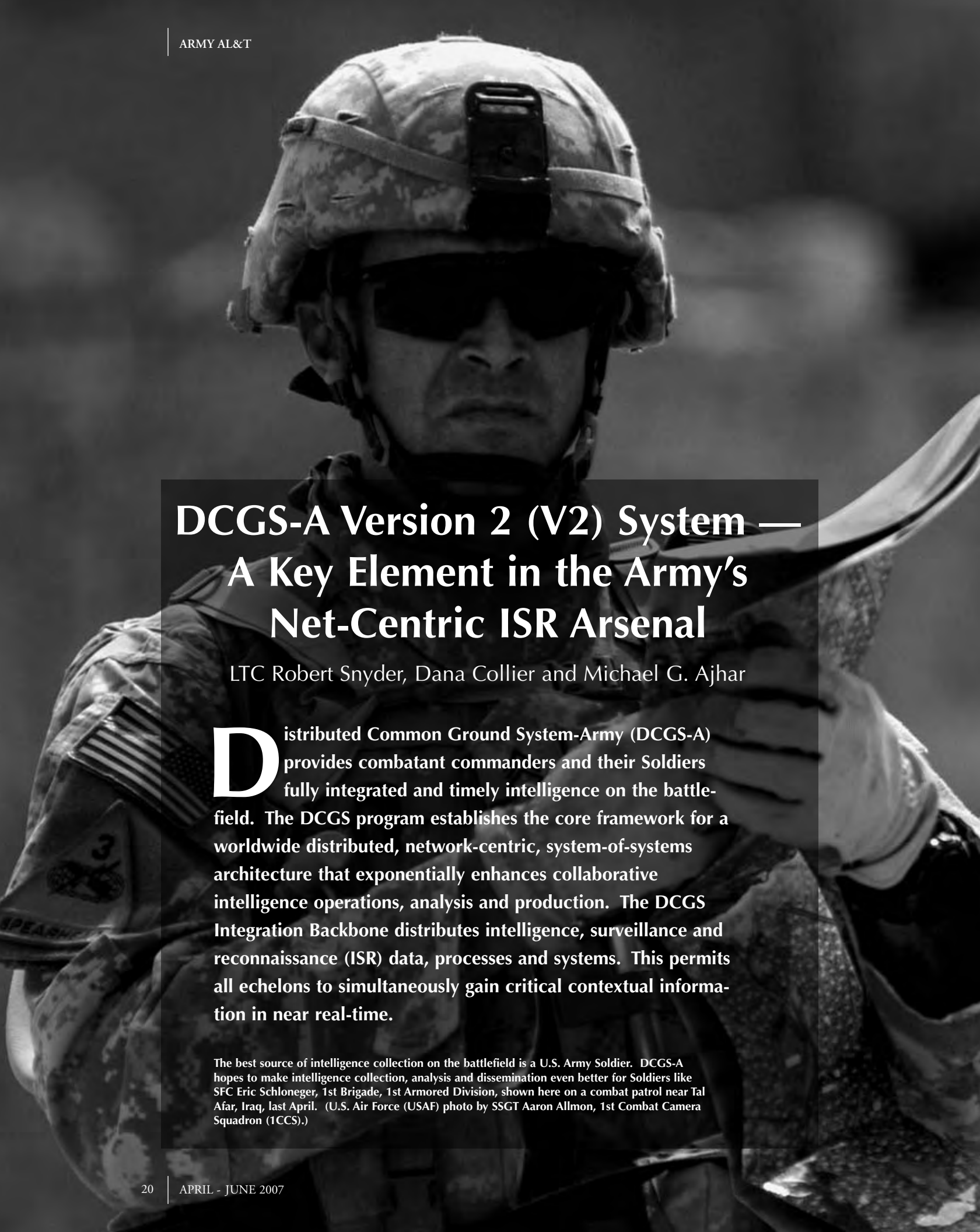
ERIC YUAN is an Associate and Senior System Architect with Booz Allen Hamilton's IT Team. He has more than 13 years of professional experience in software development and IT consulting in both the commercial and public sectors. He is currently supporting PM DCGS-A in areas such as SOA standards and specifications, system-of-systems evolution and governance, architecture methodologies and IT portfolio management. Yuan holds a B.S. in computer science from Tsinghua University, Beijing, and an M.S. degree in systems engineering from the University of Virginia.



DCGS-A Version 2 (V2) System — A Key Element in the Army's Net-Centric ISR Arsenal

LTC Robert Snyder, Dana Collier and Michael G. Ajhar

Distributed Common Ground System-Army (DCGS-A) provides combatant commanders and their Soldiers fully integrated and timely intelligence on the battlefield. The DCGS program establishes the core framework for a worldwide distributed, network-centric, system-of-systems architecture that exponentially enhances collaborative intelligence operations, analysis and production. The DCGS Integration Backbone distributes intelligence, surveillance and reconnaissance (ISR) data, processes and systems. This permits all echelons to simultaneously gain critical contextual information in near real-time.

The best source of intelligence collection on the battlefield is a U.S. Army Soldier. DCGS-A hopes to make intelligence collection, analysis and dissemination even better for Soldiers like SFC Eric Schloneger, 1st Brigade, 1st Armored Division, shown here on a combat patrol near Tal Afar, Iraq, last April. (U.S. Air Force (USAF) photo by SSGT Aaron Allmon, 1st Combat Camera Squadron (1CCS).)

The DCGS-A will consolidate the functions of 12 Programs of Record (PORs) into a unified, integrated ISR capability:

- All Source Analysis System-Light.
- Analysis and Control Team-Enclave.
- Block II Analysis and Control Element.
- Common Ground Station.
- Counter- and Human-Intelligence Management System.
- Prophet Control.
- Integrated Meteorological and Environmental Terrain System-Light.
- Digital Topographic Support System-Light.
- Guardrail Ground Processing.
- Tactical Exploitation System.
- Ground Control System.
- Enhanced Trackwolf.

DCGS-A's V2 configuration is specifically tailored to have a regional focus capable of continuous collection/analysis to provide direct support and overwatch to operationally engaged units.

Origins of DCGS-A V2 Capability

The DCGS-A V2 capability was significantly accelerated by the preliminary work done on the Information Dominance Center (IDC) and, more recently, the Joint Intelligence Operations Capability-Iraq (JIOC-I). The IDC concept involved IDC nodes or extensions, deployed and manned by U.S. Army Intelligence and Security Command (INSCOM) in theater (Iraq and Afghanistan) or established in INSCOM Theater Intelligence Brigades and Groups and other non-INSCOM units located worldwide. These worldwide extensions are continuously linked to the IDC via a number of communications means — common user circuits, strategic communications links and dedicated satellite terminals — to provide access to INSCOM's dollar database and CONUS-based analysts. Tailored analytical products are generated, frequently on a quick-response basis, to meet a deployed team's immediate needs. The IDC also provides tactical overwatch (TO) on current and potential trouble spots worldwide, providing direct support to contingency operations with intelligence support and intelligence operations-related products should the need arise.

The IDC provides TO on current and potential trouble spots worldwide, providing direct support to contingency operations with intelligence support and intelligence operations-related products should the need arise.

Collectively, the ability to communicate worldwide permits the small number of analysts resident in the IDC to provide intelligence support and tailored intelligence assessments and products rapidly and efficiently. The Project Morning Calm initiative that began in late 2003 validated the new technology and techniques from the Korean peninsula operational environment. In response to the acute needs of *Operation Iraqi Freedom* (*OIF*), the critical IDC capabilities proven in Korea were further developed into the JIOC-I, which acts as a virtual data repository ingesting information from a comprehensive network of sensors and data sources, regardless of echelon. The JIOC-I, as a quick-reaction capability, was assembled from commercial-off-the-shelf (COTS) and government-off-the-shelf (GOTS) hardware and software intended to rapidly augment and dramatically improve ISR capabilities in the *OIF* area of operations. The evolving threat and nature of the counterinsurgency fight necessitated a quick-reaction augmentation of existing ISR capabilities and systems residing in theater.

The JIOC-I goals were to:

- Improve the overall effectiveness of all-source intelligence fusion and information sharing in support of *OIF*.
- Enable tactical elements below division level to report information and receive alerts at tactically useful classification levels.
- Improve agility of collection cuing, tasking and integration of theater assets.
- Serve as a foundation for collaborative overwatch, including tipping/cuing, indications and warnings, and effects-based targeting at all levels.

The JIOC-I also increased situational awareness and transitional memory by providing a consolidated, theaterwide data repository with "institutional memory" between incoming and outgoing units and provided historical context and linkages for operational planning. The IDC's evolution laid the foundation for the JIOC-I, which in turn has laid the foundation for the DCGS-A V2. DCGS-A V2 will leverage the U.S. information technology advantage by consolidating disparate data sets and applying advanced data retrieval and visualization tools available at every echelon, thereby ensuring timely, deliverable and actionable intelligence where and when it is needed most. The dynamic nature of theater intelligence plays a significant role in DCGS-A V2, which is why new databases, data sources and tools are continually being updated.

The JIOC-I formally transitioned to the DCGS-A POR in June 2006 for management and sustainment. The Program Executive Officer (PEO) Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance and the Program Manager (PM) DCGS-A

INSCOM and the JIOC-I are providing strategic communications links and dedicated satellite terminals through the IDC to ensure battlefield commanders and their troops are receiving intelligence analyses quickly. Here, 1LT Michael Campbell, 4th Squadron, 14th Cavalry Regiment, 172nd Striker Brigade Combat Team (BCT), leads a combat patrol through Sinjar, Iraq, last summer. (USAF photo by SSGT Jacob N. Bailey, 1CCS.)

adopted and will continue to enhance the architecture that permitted the JIOC-I functionality as a proven practical initial system to be readily assimilated into DCGS-A and launched within the available budget. Ultimately, DCGS-A will satisfy critical warfighter ISR needs.

> The JIOC-I was assembled from COTS and GOTS hardware and software intended to rapidly augment and dramatically improve ISR capabilities in the *OIF* area of operations.

DCGS-A V2 Benefits

Operationally, DCGS-A is already reaping huge benefits for combatant commanders and their Soldiers as follows:

- *Rapid Fielding to Tactical Units.* By the end of calendar year 2006, the INSCOM/DCGS-A fielding teams had fielded DCGS-A V2 to 11 BCTs and three theater-level units in Iraq as well as 7 of the 10 Army divisions and 3 of 4 Army corps. The mobile training team, consisting of contractors and non-commissioned officers, trained more than 200 Soldiers at the various fielding locations in Iraq. Each training event was tailored to the individual unit's specific unit missions. In many cases, trainers performed one-on-one training to ensure any and all specific requirements were met.
- *Servers Down to Bridgade Level.* The fielding package included database and application servers on Secure Internet Protocol Router (SIPR) and Joint Worldwide Intelligence Communications System to each BCT. This allowed the BCT and subordinate battalion (on the same BCT forward operating base (FOB)) to quickly access the V2 services and databases without the latency associated with inter-theater communications. The BCT servers also served as complementary backups to each other. As an example, if a BCT's SIPR server went down, the BCT could reach the same services and information from the division server on the same FOB without incurring any latency constraints.
- *Rapid Response to Theater Requirements.* Static and dynamic database sources were quickly added to the V2 database and discoverable by all users.
- *Increased Analyst Speed.* Most analysts valued the time V2 saved by consolidating sources discoverable by one search process and the corresponding mentor support provided at BCT level.

Lessons Learned From DCGS-A V2 Configuration

There were several major benefits resulting from the leading-edge work undertaken by INSCOM in DCGS-A V2 development.

- Because of the significant amount of real-life research conducted in developing the IDC/JIOC-I capabilities and the PM DCGS-A's implementation of sound acquisition principles early in the program, supportability issues were addressed up front and this investment will yield greatly reduced life-cycle ownership costs.
- The choice convergence on a service-oriented architecture system as the base of the DCGS-A architecture ensured that highly reliable COTS products could be effectively used in the program. This helped to ensure that the high-mission profile operational requirements and equipment sustainability was maintained with a minimum of contractor support.
- The purchase of spares along with the procurement of end items again aided in the reduction of life-cycle costs and eased cross-leveling responsibilities.
- The importance of the information assurance effort cannot be overstated or overlooked. Because JIOC-I was a quick-reaction capability, the documentation effort had to play catch-up to the fielding effort and individual units were responsible for the accreditation process. PM DCGS-A is developing type accreditation documentation to speed up the process and take the burden off the receiving units.

> The dynamic nature of theater intelligence plays a significant role in DCGS-A V2, which is why new databases, data sources and tools are continually being updated.

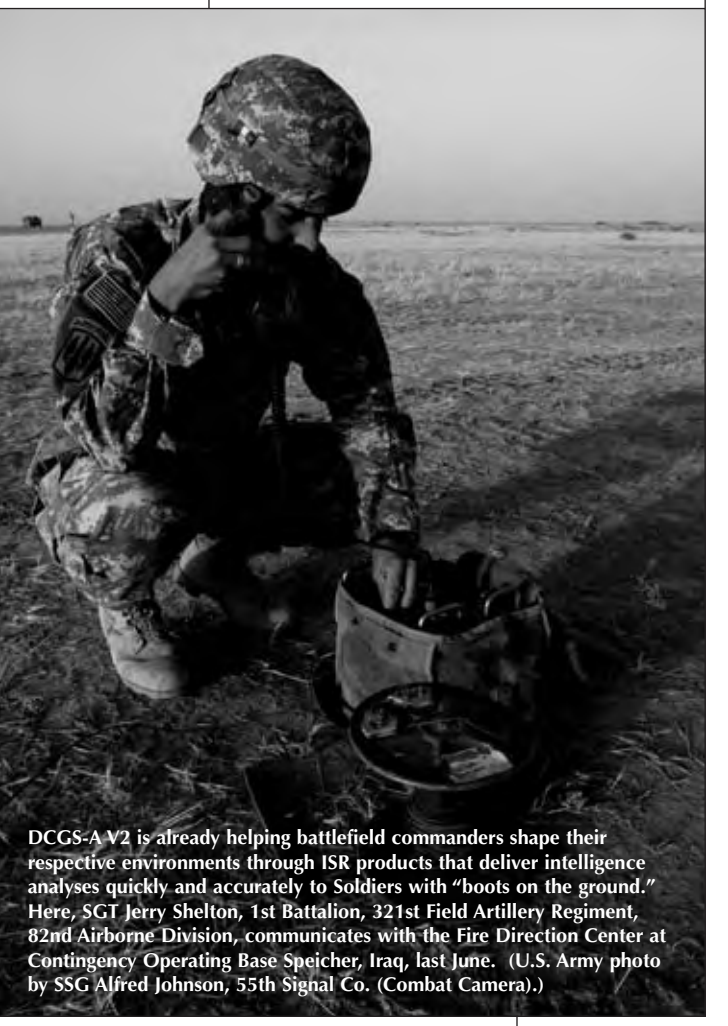
The INSCOM IDC and JIOC-I initiatives provided incredible intelligence value and were great successes in their own right. Cumulatively, they formed the basis for the DCGS-A V2 program and their value to the intelligence community continues. INSCOM and PM DCGS-A should both be justifiably proud of their productive and effective partnership during transition of the JIOC-I to the DCGS-A POR, an effort that will benefit the intelligence community for years to come.

Theater Operations Co.

INSCOM, the PEO Intelligence, Electronic Warfare and Sensors executive agent for DCGS-A (Fixed), has been instrumental in addressing the requirements of the DCGS-A (Fixed) configuration. Since 2002, INSCOM has accelerated, by 5 to 10 years, fielding of the DCGS-A (Fixed) site to its organic military intelligence brigades (MIBs).

The 513th MIB, the 66th MI Group and the 500th MIB configuration are the most mature. As such, the Theater Operations Co. of those units considers DCGS-A as its primary enabler to support BCT demand for information while setting conditions for theater engagement and security cooperation, early warning, precision action and collateral damage reduction. The Theater Operations Co. leverages DCGS-A in the fixed facility to produce actionable intelligence that provides commanders and Soldiers a unique level of shared situational understanding delivered with the speed, accuracy and timeliness necessary to operate at the highest potential.

The actionable intelligence paradigm includes eight initiatives: Every Soldier a Sensor, Human Intelligence Revitalization, TO, DCGS-A, Red Teaming, IDC, Pantheon Project and Project Foundry. The MIB, enabled by DCGS-A (Fixed), manages five of the eight initiatives: TO, DCGS-A, Red Teaming, IDC and Project Foundry. These precepts require a



DCGS-A V2 is already helping battlefield commanders shape their respective environments through ISR products that deliver intelligence analyses quickly and accurately to Soldiers with "boots on the ground." Here, SGT Jerry Shelton, 1st Battalion, 321st Field Artillery Regiment, 82nd Airborne Division, communicates with the Fire Direction Center at Contingency Operating Base Speicher, Iraq, last June. (U.S. Army photo by SSG Alfred Johnson, 55th Signal Co. (Combat Camera).)

mindset and culture change relative to intelligence collection and Soldier placement to change the current system of vertical echelons to a single integrated network with relevant information accessible by all Soldiers.

The Theater Operations Co. supports the warfighter with multidisciplined, full-spectrum intelligence activities that result in relevant data and on-demand support to improve warning and reaction time, provide situational understanding in support of theater engagement and security cooperation, force protection operations and precision action by engaged forces. Operationally responsive, the Theater Operations Co., through TO, uses DCGS-A to convey all intelligence disciplines as one intelligence apparatus to provide sustained recognition in order to identify threats and provide indications and warnings, prevent battlefield ambiguity and cover-down on tactical and operational intelligence gaps, and support emerging requirements and engaged forces. Additionally, the Theater Operations Co.'s principal mission focus in support of engaged forces includes: ISR operations, indications and warning, ground order of battle, precision engagement, mobility and information security. Regionally focused operations enable day-to-day interaction and process refinement with engaged forces and provide extensive synergy in Joint and combined operational environments.

> Because of the significant amount of real-life research conducted in developing the IDC/JIOC-I capabilities and the PM DCGS-A's implementation of sound acquisition principles early in the program, supportability issues were addressed up front and this investment will yield greatly reduced life-cycle ownership costs.

The Theater Operations Co. supports engaged forces using DCGS-A with a detailed set of refined business practices currently in place within the organization's single-source intelligence production sections. Each section (Measurement and Signals Intelligence, Imagery Intelligence, Signals Intelligence and Counterintelligence/Human Intelligence) has developed, or is developing, a set of procedures that build credibility with the unit on the ground, streamline the requirements process and are Web-enabled to reduce dissemination time.

The single-source production sections are tied together by the collection manager through the command and control visualization center responsible for maintaining focus on the engaged forces' requirements and battle rhythm. This Battle Captain Visualization center is also directly responsible for the cross-queuing of requirements among the individual single-source producers, enabling requirements managers to quickly identify the intelligence gaps,

An M2A2 Bradley Fighting Vehicle crew from 1st Battalion, 36th Infantry Regiment, 1st Brigade, 1st Armored Division, moves into overwatch position during a combat patrol in Tal Afar, Iraq. DCGS-A V2 is helping Soldiers on point identify potential enemy threats more quickly and with greater reliability. (USAF photo by SSGT Aaron Allmon, 1CCS.)

UH-60 Black Hawk helicopters from 2nd Squadron, 6th Cavalry Regiment, lift off from FOB McHenry, Iraq, carrying Soldiers from 2nd Battalion, 27th Infantry Regiment, for an aerial patrol over the Hawijah District of Kirkuk Province, Feb. 12, 2007. (U.S. Army photo by SFC Michael Guillory.)

and adjust taking and production requirements to support emerging battlefield requirements for engaged forces.

INSCOM's goal is to achieve DCGS-A (Fixed) Early Capability at the five MIBs by the end of FY07. That goal will be mitigated by funding and schedule constraints. However, capabilities at the 513th MIB and 66th MI Group are mature enough to allow for the next phase of operationalizing the system, which includes installation of DCGS-A V4 and the operational instanciation of DCGS-A V2.

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DANA COLLIER is the Government Lead for the INSCOM DCGS-A (Fixed) Program Management Office. PM DCGS-A has been delegated as the Executive Agency for DCGS-A (Fixed) to INSCOM at Fort Belvoir, VA. She has a B.S. in psychology from California State University. Collier is an Army Reserve lieutenant colonel with more than 23 years in the MI Combat Development and Materiel Development arenas.

MICHAEL G. AJHAR is a General Dynamics contractor and the Systems Integration Manager at the 513th MIB, Fort Gordon, GA, where he is responsible for DCGS-A integration. Ajhar is a retired Army Signals Intelligence Chief Warrant Officer with more than 27 years of experience in intelligence production, collection management and systems integration.

DCGS-A V3 — An Innovative Approach to Design and Development Between Government and Industry

Alan S. Hansen and LTC Daniel Cunningham

The Army has developed an array of intelligence Programs of Record (PORs) possessing exceptional capabilities. A common element shared with all intelligence systems are their unique ground processing facilities. However, the ability to share data or cross-correlate information between intelligence systems in near real-time is extremely difficult and rarely occurs in operational environments. The Joint Intelligence Operations Capability-Iraq (JIOC-I) is an Army G-2/U.S. Army Intelligence and Security Command (INSCOM) initiative that recently transitioned to Project Manager Distributed Common Ground Systems-Army (PM DCGS-A). This effort merges various intelligence products into a unified operational view providing the Soldier with a more accurate representation of situations and events while following the Army DCGS-A program's system architectural goals.

In December 2005, the Army G-2 and INSCOM fielded a Quick-Reaction Capability (QRC) called JIOC-I. Deployed on a flat network, JIOC-I provided Soldiers with a means of obtaining intelligence data seamlessly across multiple echelons, right down to the individual warfighter. The JIOC-I system's primary strengths are its ability to ingest databases and sensor information from as many sources as possible, and then connect this information to the an alysts and operators hosted on the network. JIOC-I also provides the Soldier access to an array of analytical tools necessary to support counter-terrorist and counterinsurgency operations. In June 2006, JIOC-I mission management was transitioned to PM DCGS-A. Formally named DCGS-A Version 3 (V3), the effort merged the DCGS-A Spiral 4 program using the JIOC-I as the systems baseline.

Intelligence and Information Warfare Directorate (I2WD)

The U.S. Army Research, Development and Engineering Command (RDECOM) I2WD has provided technical and engineering support on the Common Ground Station (CGS) program for the past several years and currently supports the PM on the DCGS-A mission. PM DCGS-A turned to I2WD and its unique capability with intelligence systems product development, which included knowledge of existing POR systems, and its core infrastructure and on-site facilities. The I2WD, located at Fort Monmouth, NJ, has recognized the need for net-centric integration experience and advanced technology insertion in support of the Army's next generation intelligence gathering systems. PM DCGS-A initiated the development of a Systems Integration Laboratory (SIL) hosted at I2WD. The SIL is an outgrowth of work performed on the CGS program, internal technology-based (tech-based) initiatives in information fusion and various other intelligence products and exploitation tools. Moreover, the I2WD SIL has provided technical support on legacy systems such as CGS, Guardrail Common Sensor, All Source Analysis System (ASAS) and other POR systems projected for migration to the future DCGS-A.

The SIL is an outgrowth of work performed on the CGS program, internal tech-based initiatives in information fusion and various other intelligence products and exploitation tools.

As currently established, the SIL is a government-managed venue possessing state-of-the-art infrastructure with the capability to host and support the development, integration and testing of DCGS-A products and services. Further, the SIL provides an operational, modeling and simulation environment for user communities to host their products for demonstration. In addition, the SIL offers an independent environment permitting users the ability to "bench test" or validate through interaction in a realistic synthetic environment and permit system configuration management before production and fielding.

SPC Aaron Lawrence, 1st Battalion, 13th Armor Regiment, 3rd Brigade, 1st Armored Division, maintains radio contact with local units following an improvised explosive device detonation near Tarmiya, Iraq. Better ISR products and analyses will help U.S. troops pinpoint insurgents more quickly before triggermen can rein destruction on innocent Iraqi citizens. (USAF photo by TSGT Russell E. Cooley IV.)

The DCGS-A SIL is providing next generation net-centric integration capability and advanced technology insertion for today's and tomorrow's intelligence gathering systems to enhance Soldier battlefield situational understanding. (Photo courtesy of DCGS-A SIL.)

Current federation connectivity exists between the SIL and other major program participants. These participants include operational activities such as INSCOM's Information Dominance Center, the Army DCGS Fixed Sites and Joint Improvised Explosive Device Defeat Organization; research and development SILs including the U.S. Air Force (USAF) Defense Ground System-Experimental (DGS-X); DCGS-Navy; Future Combat Systems (FCS) Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR) Laboratory; U.S. Army Communications-Electronics Life Cycle Management Command; and industry contractor facilities. Using a federated SIL approach has allowed independent development of system products at dispersed contractor and government sites, has enabled initial ad-hoc system testing through simulation and has provided immediate feedback on system design and functionality to system developers.

In responding to the Army's Current and Future Force warfighting requirements, with respect to the DCGS-A system architecture JIOC-I QRC objectives, decision makers identified significant project initiatives and goals. A primary target goal is the development of V3 to provide a common framework, leveraging the strengths of JIOC-I and incorporating them into a DCGS-A enterprise. In conjunction with this goal, the DCGS-A V3 initiative would design and fabricate for the operator/analyst a Multi-Function Work Station (MFWS) having 4-D visualization, mapping services and an analyst tool suite supporting data mining, correlation, link analysis and interoperability with the existing Army Battle Command System (ABCS). The initial capability is scheduled for delivery to the Central Technical Support Facility (CTSF) at Fort Hood, TX, for testing and accreditation. Finally, the DCGS-A V3 build must possess the design flexibility to support migration of functionality and capabilities from existing POR intelligence systems.

System/Functionality	Responsible Proponent
ABCS Interoperability Services	Overwatch Systems
DIB	Raytheon Corp.
Work Suite Software Enhancements	Science Applications International Corp. (SAIC)
Map Visualization Services	TEC/Northrop Grumman Corp. (NGC)
MFWS	I2WD
Software Integration	I2WD/AII
Testing and Fielding	PM DCGS-A/NGC/SAIC

Figure 1. DCGS-A V3 Primary Systems' Functions and Proponents

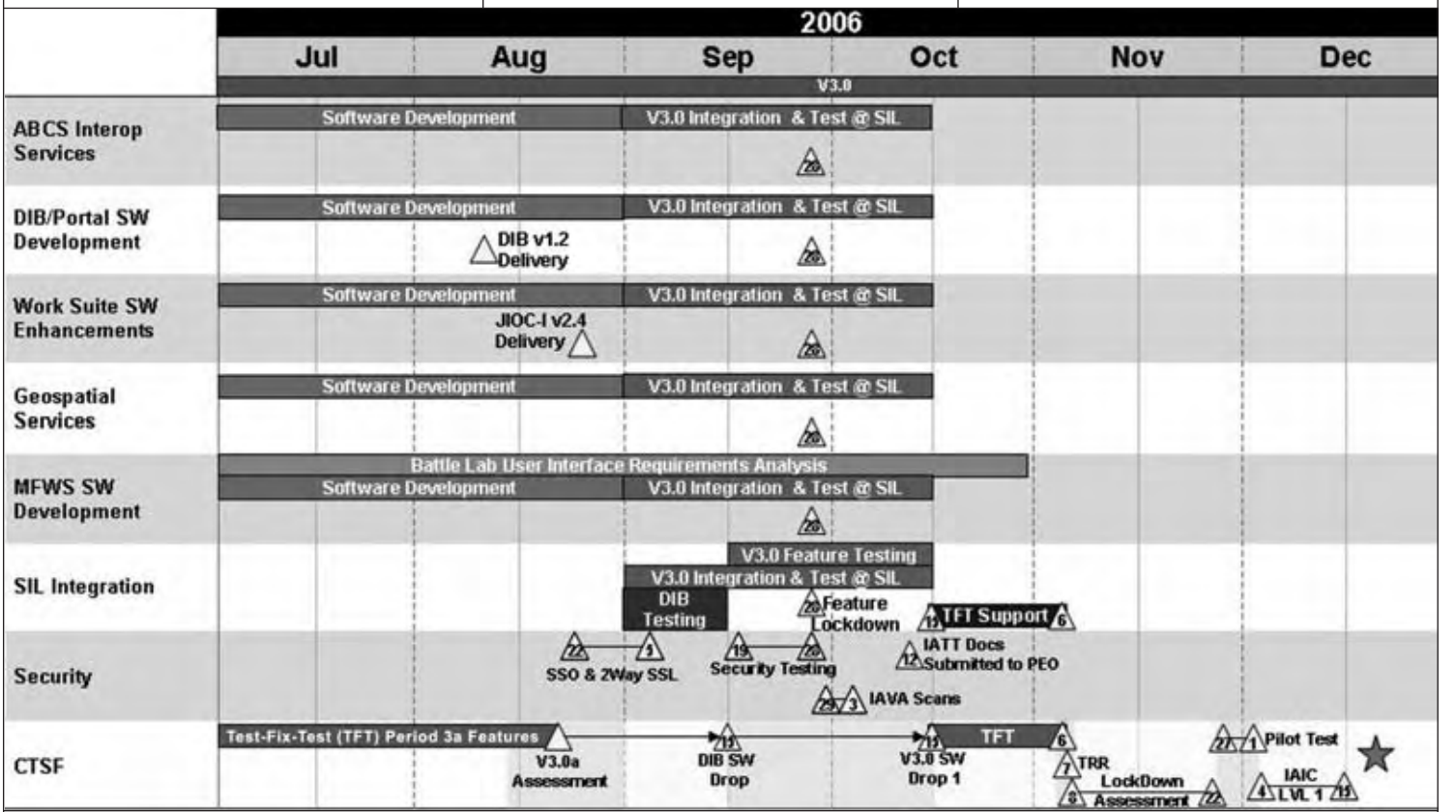
Acquisition and Development Model

The design, development and fielding of the DCGS-A V3 capability has followed a nontraditional approach by

having the I2WD laboratory facility perform the integration and predeployment testing of a fielded operational system. Designated as the product development lead, I2WD worked side-by-side with industry contractors and other government agencies in this unique combination of expertise toward a common goal of fielding the V3 system on a very short schedule. As the lead, I2WD carried out all Preliminary Design Review and Critical Design Review functions normally performed by an industry Lead Systems Integration contractor. Figure 1 on Page 28 lists the major team members and their associated system functional area. By using the federated SIL approach already described, concurrent design and development for the major system elements enabled the aggressive schedule required to meet PM DCGS-A program requirements. In addition, by designating a government entity as the lead, the PM and other government managers had unrestricted instantaneous access to the development process.

As illustrated in Figure 2, the planned government/industry integration and test schedule for the DCGS-A V3 systems and capabilities was conducted at the I2WD SIL facility September through October 2006 with a scheduled deployment soon thereafter. The schedule clearly shows the short development cycle driven by the effort. As seen in the schedule, the development team performed extensive systems and integration testing compared to the time spent on development, consequently helping to mitigate potential integration difficulties. For the DCGS-A V3 development and fielding, I2WD and PM DCGS-A decided on an incremental approach by phasing in new capabilities over time, thereby ensuring an achievable fielding schedule. The ability to incorporate the entire functionality in an initial build as required by the U.S. Army Training and Doctrine Command (TRADOC) Capabilities Manager (TCM) was clearly unfeasible in the target time frame because of the vast list of capabilities required and their complexity to implement. Therefore, the TCM prioritized functional capabilities into major capability areas and the development team worked toward scheduled incremental releases.

The highest priorities concerned were access to data by all echelons from battalion to theater, the use of an enterprise data management architecture and the provision of ISR data reach operations. In addition to the data interoperability requirements, enhanced



Key:

DIB	– DCGS Integration Backbone	SSL	– Secure Socket Layer	SW	– Software
IATT Docs	– Interim Authority to Test	SSO	– Single Sign-On	TRR	– Technical Readiness Review

Figure 2. DCGS-A V3 Integration and Testing Schedule

Former Secretary of the Army Dr. Francis J. Harvey (left) and Army Chief Information Officer/G-6 LTG Steven W. Boutelle (center) review digital maps and imagery produced for C4ISR systems by the Configuration Management Shop, CTSF, during a visit to Fort Hood. Looking on are LTG Thomas F. Metz (center right), then III Corps and Fort Hood Commanding General, and COL Evin Planto (right), Office of the G-6. (DOD photo by Grazyna Musick.)

functionality would be required to support the user with visualization of geospatial products and contextual data in conjunction with "all source" analysis tools. A benefit of using an incremental approach permits the operators to work with the system capabilities and provide input back to the engineering teams on improvements, enhancements or new functions not previously considered.

Another critical issue in planning the DCGS-A V3 development process concerned using the DCGS Integration Backbone (DIB). As a building block for net-centricity, the DIB provides a means to share information across the intelligence enterprise. Being developed by the USAF, the DIB presented the V3 program with unanticipated challenges as it necessitated a synchronization of releases that required adjustments to the overall V3 software integration schedule. In addition, as with the DIB, the FCS architecture and system applications will also have a direct impact on the DCGS-A system design and implementation. As FCS capabilities — for example Level 1 Fusion and Sensor Management functions — are being leveraged by DCGS-A, these updates will also influence the DCGS-A system's schedule and operational capability. Therefore, having an incremental approach allows the design team to mitigate any unanticipated effects encountered with new DIB releases and FCS functionality on the other system software.

> The DCGS-A V3 build must possess the design flexibility to support migration of functionality and capabilities from existing POR intelligence systems.

Accomplishments

As a precursor to this effort, I2WD achieved a major milestone with DIB integration into an overall DCGS-A architecture. I2WD designed, developed and implemented a Resource Adapter software component between target POR systems and the DIB. This exposed POR intelligence products to the enterprise service. The DCGS-A Spiral 4 demonstration showed that it was possible to transfer data from Army POR systems, such as CGS, ASAS-Light, Integrated Meteorological and Environmental Terrain Systems, and Advanced Field Artillery Targeting Designation System, using the DIB, and that Army POR data could be displayed on the USAF DGS-X Portal. As far as we know, this was the first application of the DIB on a system. Another DCGS-A V3 "alpha" (V3.0a) system build accomplishment was the integration and delivery of four Work Suites to the CTSF in June 2006, and formal training for its staff. This currently places the V3.0a Work Suites under CTSF formal Configuration Management. The delivered systems are designated under an Interim Authority to Test, thereby following a path leading toward final field certification of system hardware and software components.

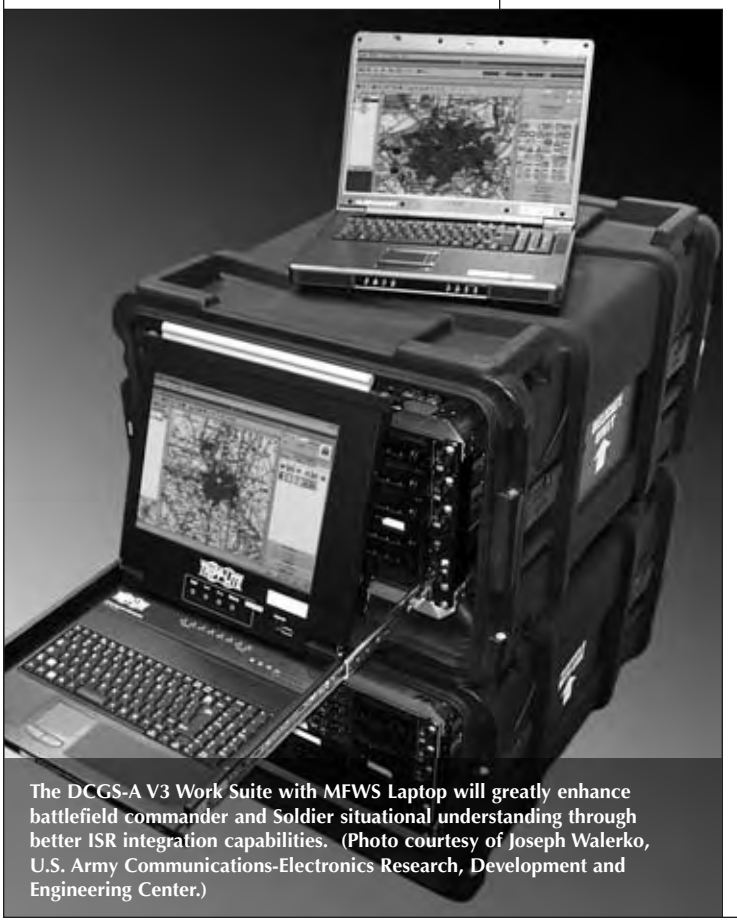
The near-term approach for the DCGS-A V3 project includes obtaining an Interim Authority to Operate by the end of 2007. This will permit formal interoperability testing with the other POR systems and provide a pathway to certify V3 as a fielded capability.

Furthermore, a noteworthy success was the horizontal integration at brigade between ABCS and the JIOC-I system. This now provides operators and commanders with quicker and more reliable access to DCGS-A intelligence information. Nevertheless, the most significant accomplishment and consequence of the effort resides with transitioning V3 to the DCGS-A V4 effort that is currently underway.

> A benefit of using an incremental approach permits the operators to work with the system capabilities and provide input back to the engineering teams on improvements, enhancements or new functions not previously considered.

The Way Ahead

The DCGS-A V3 program has successfully demonstrated that government and industry teams can work in a cooperative environment toward a quick-reaction solution together, while having a government entity lead the effort. This initiative has provided an unprecedented capability and functionality for Soldiers in the field for intelligence gathering and data exploitation. The DCGS-A V3 effort addresses core technology areas by providing a unified display of intelligence products to the operator on the MFWS while using the DIB architecture. For the future, the DCGS-A SIL will continue performing experimental laboratory work on emerging technologies in support of PM DCGS-A. As the feasibility of these technologies matures and attains Technology Readiness Level 6 or beyond, I2WD envisions using the SIL rather than a full production environment for initial integration and testing. This methodology provides the best option for PM DCGS-A to incorporate newer capabilities or technologies while mitigating risk on the future DCGS-A production contract and subsequent product improvements using the I2WD SIL as and adjunct to the future LSI contractor.



The DCGS-A V3 Work Suite with MFWS Laptop will greatly enhance battlefield commander and Soldier situational understanding through better ISR integration capabilities. (Photo courtesy of Joseph Walerko, U.S. Army Communications-Electronics Research, Development and Engineering Center.)

Another goal for the V3 effort is to obtain formal Certification to Operate in the field, leading to classification of the system as a Limited Unit Production (LUT). By attaining the LUT designation, the fielded system will have full field and logistic support and not suffer from identification as a piece of laboratory equipment. In addition, the V3 development team will fulfill capabilities left out of the V3.0 system build, such as full interoperability of ABCS at brigade and other echelons. Other upgrades may include any necessary system enhancements and additional software functionality initiated by users in the field for a V3.01 system build conducted in March 2007. Most importantly, the V3 system potentially moves from an associate to a core battle command membership, providing a path toward the future Armywide DCGS vision.

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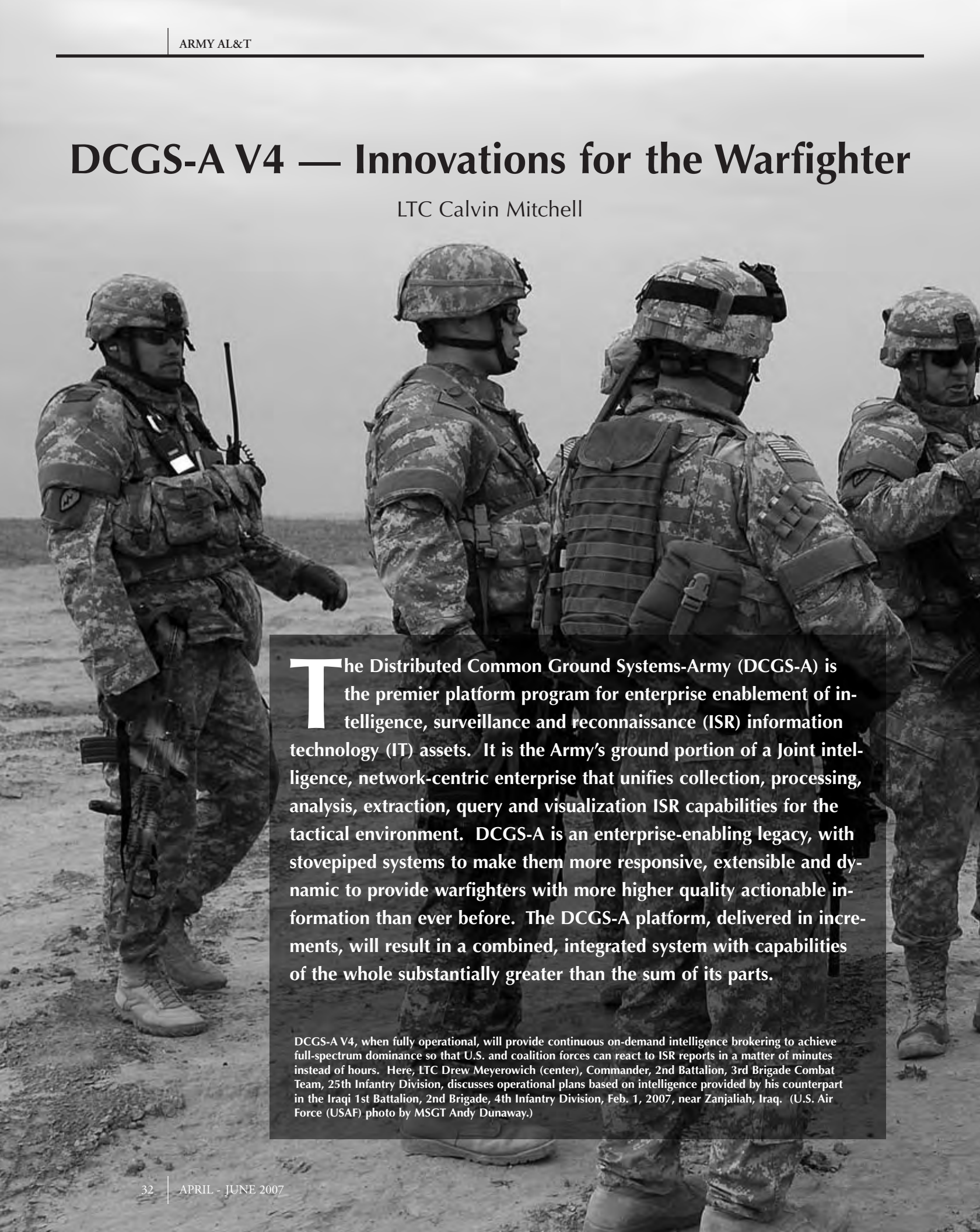
LTC DANIEL CUNNINGHAM is the PM Intelligence Fusion. He holds a B.S. from the U.S. Military Academy and his military education includes the Field Artillery Officer Basic and Advanced courses, the Combined Arms Service Staff School, the Command and General Staff College, the Material Acquisition Management Course, the Program Manager's Tools Course, the Program Management Office Course and the Program Manager's Skills Course. Cunningham is Level III certified in program management and is an Army Acquisition Corps member.

DCGS-A V4 — Innovations for the Warfighter

LTC Calvin Mitchell



The Distributed Common Ground Systems-Army (DCGS-A) is the premier platform program for enterprise enablement of intelligence, surveillance and reconnaissance (ISR) information technology (IT) assets. It is the Army's ground portion of a Joint intelligence, network-centric enterprise that unifies collection, processing, analysis, extraction, query and visualization ISR capabilities for the tactical environment. DCGS-A is an enterprise-enabling legacy, with stovepiped systems to make them more responsive, extensible and dynamic to provide warfighters with more higher quality actionable information than ever before. The DCGS-A platform, delivered in increments, will result in a combined, integrated system with capabilities of the whole substantially greater than the sum of its parts.

DCGS-A V4, when fully operational, will provide continuous on-demand intelligence brokering to achieve full-spectrum dominance so that U.S. and coalition forces can react to ISR reports in a matter of minutes instead of hours. Here, LTC Drew Meyerowich (center), Commander, 2nd Battalion, 3rd Brigade Combat Team, 25th Infantry Division, discusses operational plans based on intelligence provided by his counterpart in the Iraqi 1st Battalion, 2nd Brigade, 4th Infantry Division, Feb. 1, 2007, near Zanjaliah, Iraq. (U.S. Air Force (USAF) photo by MSGT Andy Dunaway.)

With Version 4 (V4), the DCGS-A program takes the next step toward the DCGS-A objective of creating a net-centric, Web-enabled, enterprise-based and open architecture for ISR systems. The DCGS-A end-state architecture will be capable of supporting multiple, simultaneous, worldwide operations through scalable and modular system deployments. The resulting enterprise architecture will integrate the current disparate ISR systems via a Service-Oriented Architecture (SOA), providing a consolidated and interoperable system of access for all DCGS Web-based services, applications, tools and information.

The DCGS-A V4 program implements many technical innovations over previous DCGS-A iterations. In keeping with the crawl, walk, run approach to integrating the various Program of Record (POR) domains DCGS-A now runs, V4 builds on and integrates all of the relevant capabilities of the successful V2 and V3 DCGS-A iterations, while bringing new capabilities and providing the infrastructure foundation for future capabilities that were never before possible. This article discusses the innovations that the DCGS-A V4 program brings to bear to arm our warfighters with the ISR capabilities needed to win the fight now and in the future.

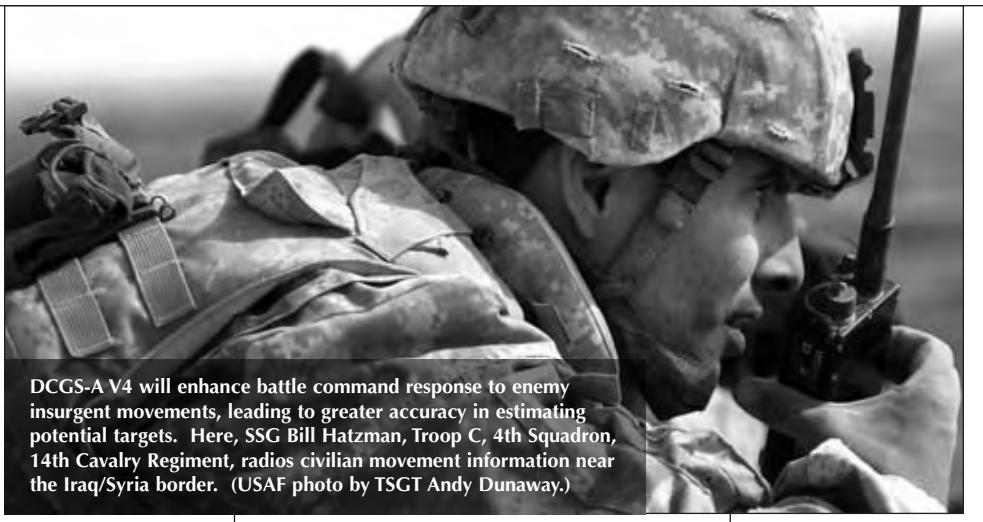
SOA

DCGS-A implements SOAs, which are defined by the idea that there exists within an enterprise, discrete IT capabilities or services that are discoverable, usable and reusable by remote users and applications. These services specify the rules under which they provide capabilities and exchange information. In the context of DCGS-A V4, the capabilities and data from each ISR domain are exposed as services available across the enterprise, rather than only to the traditional users of each domain's capabilities. This architecture enables the information from each previously stand-alone ISR system to be combined as fused workflows to provide more relevant and actionable information for warfighters than ever before. The services approach enables easy integration of new capabilities as they become available, without requiring changes to existing capabilities. The SOA foundation enables rapid development of new workflows and capabilities across the entire ISR spectrum and interoperability with other systems to meet warfighter needs both today and in the foreseeable future.

> The resulting enterprise architecture will integrate the current disparate ISR systems via an SOA, providing a consolidated and interoperable system of access for all DCGS Web-based services, applications, tools and information.

As promising as an SOA is, the path can be a rocky one, but through careful management and planning, it can be incremental. It is not an all or nothing integration approach, and the long-term benefits are without question. V4 uses an Enterprise Service Bus (ESB) as its SOA implementation

to provide a manageable, well-structured infrastructure on which to integrate various SOA components. ESBs connect, control and mediate the interactions between applications and services.



DCGS-A V4 will enhance battle command response to enemy insurgent movements, leading to greater accuracy in estimating potential targets. Here, SSG Bill Hatzman, Troop C, 4th Squadron, 14th Cavalry Regiment, radios civilian movement information near the Iraq/Syria border. (USAF photo by TSGT Andy Dunaway.)

Possibly, the most important benefit of using an ESB to realize an SOA is that business logic, previously implemented in each intelligence application, can be moved into a separate business logic engine with full enterprise visibility, making the integrated system more flexible and better able to address changing business requirements, such as, in DCGS-A's case, the need for more sophisticated fusion than is available today.

> The SOA foundation enables rapid development of new workflows and capabilities across the entire ISR spectrum and interoperability with other systems to meet warfighter needs both today and in the foreseeable future.

Multi-Intelligence (INT) Threads

While significant steps have been taken to provide actionable fused information across domains in the existing ISR systems, for the most part, the fusion of data from the various INTs is left to the analysts. Because of their architecture, state-of-the-art when they were developed, the current INT systems that provide fusion cannot be easily and quickly modified to meet evolving warfighter requirements. Most use tightly coupled interfaces to other INT systems, making them extremely difficult to maintain and upgrade. The SOA approach employed by V4 consolidates existing domain software and enables the creation of new multi-INT threads that do not exist in current PORs such as collection planning, common operational picture, cross-queuing sensors, multi-INT folders and others. In the past, new thread development required a significant software development effort. With V4, new threads become more of a business logic configuration task than a software development exercise, enabling DCGS-A to more quickly meet evolving ISR requirements.

Consolidated Portal and Multifunction Workstation (MFWS)

The V4 system uses a portal as the primary user interface. The portal enables users — assuming adequate communications bandwidth — access to the DCGS-A V4 system regardless of where they are located in the DOD enterprise. DCGS-A V4 also provides the foundation to enable access from virtually any device capable of supporting a standard Internet browser, including personal digital assistants and other lightweight access devices. The DCGS-A MFWS remains a critical V4 component and is used primarily for applications not well suited to a portal, such as streaming data. To the extent possible, the portal and MFWS have a common look and feel to enable analysts to easily switch between user interfaces.

Consolidated Infrastructure

V4 consolidates multiple independent INT software systems into a single software infrastructure reducing server footprint, simplifying maintenance, reducing costs, increasing performance

Intelligence analysis and information fusion provided by DCGS-A V4 will ensure that operational units on the ground receive actionable intelligence rapidly. Here, U.S. Army Soldiers from 5th Battalion, 20th Infantry Regiment, patrol the streets of Adhamiya, Iraq, with their Iraqi security force counterparts last December in an effort to decrease sectarian violence and insurgent activity. (U.S. Army photo by SPC Jeffrey Alexander, 982nd Signal Co. (Combat Camera).)

DCGS-A V4 will be capable of supporting multiple, simultaneous, worldwide operations through scalable, modular system deployments. Here, Soldiers from 1st Battalion, 68th Armored Regiment, 3rd Brigade Combat Team, 4th Infantry Division, conduct a population patrol operation in a small village adjacent to Forward Operating Base Warhorse, Iraq, last October. (USAF photo by TSGT Michele A. Desrochers, 4th Combat Camera Squadron.)

and improving overall system security and reliability. V4 also enables consolidation of disparate INT data stores. In V4, the common functionality needed by multiple INT domains, such as enterprise access and query, collaboration, messaging, integration infrastructure services, the DCGS Integration Backbone (DIB) Metadata Catalogue, portal framework, maintenance, communications hardware configuration and the gateways to the larger ISR enterprise, are all provided by the core system infrastructure, which reduces or eliminates functional duplication, while providing a common look and feel for analysts across the entire system.

V4 provides the foundation that will enable warfighters to receive sophisticated, fused, timely and actionable information based on raw data from all current and future INT capabilities in a single system.

Consolidated Modular Footprint

From a hardware perspective, V4 uses a consolidated server farm for all processing, providing more capability on less hardware than the same stand-alone INT systems in use today. In addition, V4 can be deployed in modules based on mission type, enabling the right footprint sizing. As time progresses and processors become more powerful, the footprint will continue to shrink, increasing mobility and reducing both capital and operational costs, all while increasing reliability.

The V4 SOA is an optimal way to build an integrated enterprise because the ESB streamlines SOA implementation. Although SOA can be built without an ESB, the ESB allows business logic to be removed from the applications it integrates, exposed as Web services, and executed as a separate and configurable non-coded process, greatly simplifying and speeding creation of new system capabilities. From DCGS-A's perspective, this means more advanced ISR fusion for battlefield commanders from existing and new basic services.

V4 SOA implementation is key to achieving the DCGS-A vision of an integrated, flexible, scalable, reliable and easily programmable ISR system. V4 provides the foundation that will enable warfighters to receive sophisticated, fused, timely and actionable information based on raw data from all current and future INT capabilities in a single system. In addition, DCGS-A V4 will employ Joint standards, protocols and services in a common DIB-based architecture to enhance interoperability and integration.

Through the effort of government and industry subject matter experts, including ISR users from the U.S. Army Training and Doctrine Command Capability Manager, working in concert with the integrated product teams and their associated working groups, the Project Manager (PM) DCGS-A and industry team is diligently working to ensure the Army's vision for a premier enterprise-enabled ISR platform.

LTC CALVIN MITCHELL is the PM Fixed and Mobile Systems, DCGS-A. He holds a B.S. in business management from Grambling State University, an M.S. in materiel acquisition management from the Florida Institute of Technology and an M.A. in computer resources and information management from Webster University. Mitchell's military education includes the Aviation Officer Basic and Advanced Courses, Combined Arms Services Staff School, the Materiel Acquisition Management Course, Army Command and General Staff Officer Course and the Executive Program Managers Course at the Defense Systems Management College.

BG Genaro Dellarocco Discusses RDECOM Systems of Systems Integration (SOSI)

Michael I. Roddin and Cynthia D. Hermes

On Feb. 7, 2007, BG Genaro Dellarocco, Deputy Commanding General (DCG) for the Research, Development and Engineering Command (RDECOM) SOSI, met with *Army AL&T* Magazine staff to discuss his organization's mission, initiatives and capabilities.

RDECOM SOSI takes its mission seriously: "To provide the right technology at the right place at the right time!" Here, SGT Nicholas Fate, 1st Brigade Combat Team, 4th Infantry Division, relies on that technology to help him safely locate a weapons cache in a field near Mushahda, Iraq, last year. (U.S. Navy (USN) photo by MC1 Michael Larson.)

Army AL&T: How does RDECOM's mission, to provide "the right technology at the right place at the right time," translate directly or indirectly into support for combatant commanders [COCOMs] and their Soldiers on the battlefield?

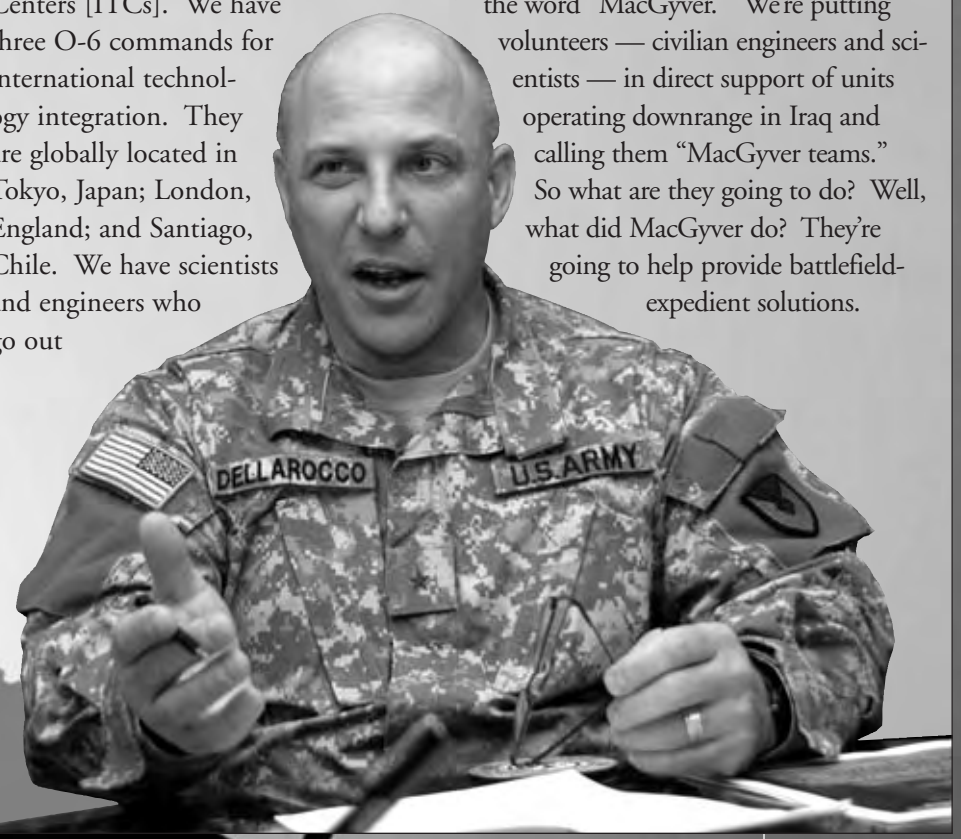
Dellarocco: We've got a lot of initiatives in the pipeline in different stages of development and if we can make that piece of equipment or device better, and it works for the warfighter, it's on the battlefield as soon as possible. We have a fairly significant battlefield presence. We have the Science and Technology Acquisition Corps Advisor [STACA] who is part of the Multi-National Forces Iraq staff. We are now on our sixth one. These are past O-6 level commanders or program managers [PMs] who go downrange and have earned quite a positive reputation for providing information and support to the warfighter. They ensure the right technology is delivered at the right time in terms of being a gatekeeper for Iraq.

Sometimes the right time is a couple of years, particularly with basic technology research and new prototypes, which, for safety reasons, must be matured to the right level before we deploy it for Soldier use. The right place may be Afghanistan or some other location. We've discovered some new technology through JIEDDO [Joint Improvised Explosive Device Defeat Organization] to take there for potential fielding. Not all technology works in the manner we hoped it would given variations in environmental conditions. Every technology has the right time and must go to the right place. When the technology is ready, we'll take it to the Soldier.

We're putting volunteers — civilian engineers and scientists — in direct support of units operating downrange in Iraq and calling them "MacGyver teams." They're going to help provide battlefield-expedient solutions. The REF has some shops over there and we're bending metal to see what works.

RDECOM has a global presence in 13 countries. This includes science advisors and International Technology Centers [ITCs]. We have three O-6 commands for international technology integration. They are globally located in Tokyo, Japan; London, England; and Santiago, Chile. We have scientists and engineers who go out to industry, academia and defense military organizations to talk to them and see what kind of technology they've developed that we can integrate into our own R&D [research and development] initiatives. Also, we have science advisors at each of the COCOMs. We put RDECOM FAST [Field Assistance in Science and Technology (S&T)] STATs [S&T Assistance Teams] in Iraq, and we're up to about 15 teams in country now. That's been a very successful program for us. These men and women have been around R&D institutions for years, they belong to our command and they support our mission. That's another piece of how we're actively supporting our warfighters and bringing technology to the field.

We're also working with the Rapid Equipping Force [REF]. I serve as the Milestone Decision Authority for them. We work to directly support them, and we provide a lot of different types and levels of support. For instance, CBS Television just gave us permission to use the word "MacGyver." We're putting volunteers — civilian engineers and scientists — in direct support of units operating downrange in Iraq and calling them "MacGyver teams." So what are they going to do? Well, what did MacGyver do? They're going to help provide battlefield-expedient solutions.



BG Dellarocco, DCG, RDECOM SOSI, discusses his organization's Joint collaborations with the U.S. Navy, U.S. Marine Corps and the DOE, among others, during his interview with *Army AL&T* Magazine. (U.S. Army photo by Richard Mattox, Program Executive Office Enterprise Information Systems.)

RDECOM SOSI takes initiatives that are in their development pipeline and makes that piece of equipment or device better. If it meets Soldier requirements, it's on the battlefield as soon as possible. Here, SPC Joshua Milstead, 506th Regimental Combat Team, 101st Airborne Division, performs a battle-site zero on his rifle at the small arms range at Forward Operating Base Rustimiyah, Iraq, last year. (USN photo by PH1 Bart A. Bauer.)

The REF has some shops over there and we're bending metal to see what works. We envision using these teams as much as a recruiting tool for civilians, engineers and scientists as for expedient resolution of emerging requirements on the ground in the desert.

Because RDECOM is at a crossroads of so many Army communities, and due to the complexity of the acquisition process when viewed across a broad range of commodities and technology maturity, we are forced to develop advanced processes and tools to help us get our job done. To address this, we have established an Enterprise Integrated Product Team [IPT] that focuses on system-of-system enabling processes and tools in the areas of Systems Engineering, Technology Demonstration, Modeling and Simulation [M&S] and Knowledge Management. This activity, coupled with our technology integration efforts, is enabling us to balance between Current and Future Force activities while achieving advancements in the way we operate. A great example is the STEM [Science and Technology Enterprise Management] knowledge management system. STEM is a collaborative effort across all the S&T Army commands and ASAALT [Assistant Secretary of the Army for Acquisition, Logistics and Technology] that enables us to view all of our S&T programs across multiple views, supports coordination for operations in theater, enables collaboration across multiple commodities and links us to the requirements activities in the U.S. Army Training and Doctrine Command [TRADOC] and in the program executive offices/program management offices (PEOs/PMOs).

Army AL&T: You mentioned the pipeline before. Historically, how do the requirements from the battlefield come into the pipeline?

Dellarocco: Requirements from the battlefield come to us in various forms, such as Joint Operational Needs Statements, Immediate Warfighter Needs, 10-liner requirements documents or something similar. They come in through our people, including the REF — who we send downrange —

our STACAs, the STATs and feedback from just about any source, frankly, including various Army Materiel Command [AMC] sources. RDECOM Command Sergeant Major [CSM] Alcivar brought back many lessons learned. He was very active with the noncommissioned officers and other CSMs and put a structure in place to leverage their expertise that had been overlooked before. A lot of kudos go to him because he's been able to collect a lot of valuable data and feedback. He's got quite a network established and has done a really terrific job. We have an IPT that is focused on current operations support, and the FAST and the IPT work together along with the Agile Development Center. I just reorganized the staff and put a colonel over all the current operations/force activities, and we're spinning up to support more JIEDDO activities as well. We're going to become one of the major sources of support for JIEDDO through our R&D and S&T initiatives and breakthrough technology.

Army AL&T: Current indicators estimate that 80 percent of the Army's S&T enterprise is being managed by RDECOM. What are some of the key S&T initiatives that RDECOM is working on for the Army, especially the new SOSI initiative? What comprises SOSI and how is it benefiting the Army's technology integration across Future Combat Systems [FCS]?

Dellarocco: We're a staff element technically focused on resource information and a catalyst to bring technology in, get it evaluated — a clearinghouse if you will. Our command is 13,000 strong with another 5,000 contractors within the lab structure and we're located all over the United States. What isn't widely known is that we have an agreement and reachback capability with the Department of Energy [DOE]. We're associated with nine of their labs directly and we do a lot of collaboration work with them. We've been fostering that relationship for the last 4 years. We're working a lot in terms of interagency collaboration as well, and we've teamed with the Navy on some critical projects. Last summer, we formally engaged with the Office of Naval Research. RADM William E. Landay III, Chief of Naval Research, and MG Roger A. Nadeau, CG RDECOM, reviewed potential programs for collaboration. When we performed the data call, it resulted in 17 pages of collaboration programs. Previously, no one knew that because it was a lot of engineers talking to engineers. We're reaching out to the U.S. Marine Corps and the U.S. Air Force as well, to see where potential exists for collaborative efforts and where we can share test results, research and technology transference. We already do a lot of collaboration with the Marines, and we're seeking to expand that relationship by establishing formal ties with my Marine counterpart.

> We evaluate technology integration and provide mission information for the warfighter and decision makers. The future of land warfare depends on the Army's ability to incorporate S&T into the Future Force.

We do everything from tactical evaluations to strategic road maps and support the ASAALT staff in that regard. We support Chief Scientist Dr. Thomas H. Killion and his staff in executing his goals and functions. We are organizing an initiative to support the Army Experimentation Task Force [AETF] at Fort Bliss, TX. This office was originally established to support FCS — and then the war occurred. Our focus then shifted to the current fight. What we're now doing — although we still have a lot of dual-use type developments with FCS in supporting spinout technology and rapid fielding — is we're supporting other critical projects as well. We're now getting organized to support FCS and TRADOC AETF efforts at Fort Bliss. It's an 8-year project. We're spinning up to do that and provide on-site support to various organizations developing technology for Soldiers. We provide a lot of other support such as M&S, training aids and technology development in integrating many of their systems.

We have numerous Cooperative Research and Development Agreements — more than 300 — with universities and colleges throughout the country and a few overseas. We're in just about every aspect of industry as well. One notable out of the Army Research Lab [ARL] is the Army Research Office [ARO] in Triangle Park, NC. ARL and ARO have been in existence since World War II, so they have a rich heritage of supporting Army R&D and S&T initiatives.

We've contributed to about 17 Nobel laureates. [See related story on Page 76 of this issue.] We've funded, in part and at some point in their careers, some of the research that went into their award-winning studies. Of course, we fund a lot of research at universities and in the private sector as well. We also contribute to a lot of patents and venture capital-type resourcing where appropriate. The Small Business Innovation Research [SBIR] program is also part of our organization. SBIR was just realigned

from ARL to SOSI within RDECOM this past fall and we are formally embracing the process. There is a lot of room for growing a better return on investment [ROI] and we're taking some positive steps to do that for the Army. I think we can probably increase our ROI fairly well in the next few years by applying Lean Six Sigma principles and techniques. We've looked at all of our processes to see what we could improve. We found areas where we could improve and refine our business processes so that we can spend our money more efficiently. This will benefit everything from patents to platform interjections to battlefield solutions, near term. It's an interesting program with unlimited room for development, and we're just now scratching the surface.

As far as S&T initiatives go, RDECOM takes science fiction and brings it to reality. That's the essence of a lot of our research in our labs and our Research, Development and Engineering Centers [RDECs]. Some of the scientific discoveries are literally stuff that you might have read about in comic books or science fiction magazines, or saw on television or in movies over the years. Additionally, the Army's Greatest Inventions program is managed here at RDECOM. We do basic research (6.1) — that's where a lot of this stuff comes from. During 6.2 research, we get the application going and then get the platform integration in 6.3 and 6.4. We bring science fiction to reality using the right technology and finding the right place for it at the right time, all to fulfill battlefield requirements that benefit our Soldiers.

Army AL&T: You mentioned ITCs. How is the ITC presence actually manifested in technology integration and the research support that you're doing for specific organizations?

Dellarocco: Our robust ITC presence accomplishes several things. The fact that we have a uniformed O-6 representing RDECOM, AMC and the Army to become the technology ambassador, the intent from a strategic standpoint is that it provides us a presence and a line of communication for many different international companies, government agencies, universities and ministries of defense. So it's another avenue where the ITCs contribute to the warfight by offering up their techniques or technologies to us for us to evaluate and see if we can adopt that technology to existing field requirements or future projects. We have a process to integrate, evaluate and then send those techniques or technologies to one of our RDECs or laboratories for further understanding of what the technology actually does. Occasionally, we buy things directly from overseas and field them for a particular mission, solving technology challenges that way. We also work with academia within a particular country. Our guys are out there talking about technology development from the standpoint of meeting immediate Soldier requirements. What the host country gains are:

- Political benefits with interaction between the U.S. and the host country on a scientific level.
- Respect and intellect ability of scientists in the international world.
- Joining of the brightest science-minded people on a truly inspirational collaboration effort in one location.
- Economic impacts if we adopt something and go into a joint venture or buy something from them based on their technology development.

So there are a lot of win-win situations out there that we foster in the R&D and S&T communities.

Army AL&T: In your experience, have other countries or companies been pretty forthcoming with their technology?

Dellarocco: They come forward with it generally. It's proprietary in many cases, and we understand the rules that are associated with that. That's what they hope for; they want us to buy their technology because it works. A lot of the innovative technological development is evolving and is no longer based solely in the United States or a few other technologically advanced countries. It's a global market economy. Just look at the tremendous technological innovations and products coming out of China, Korea, Taiwan, Japan, India, Europe and Australia, among others. All those countries have great technology bases. We monitor and look at them, establish relationships to understand the technology and try to leverage their technology to benefit our Soldiers on the battlefield. It's the same way in Europe where there are dozens of countries that have special niches — everything from software writing to lens grinding. This is also true of Canada, South America and Mexico. We had not really looked at Latin America as being a source of technology, but Mexico, Brazil, Argentina and Chile have a fairly robust technology development capability. Having a presence there shows that we're interested in their economy and the way they do business. There are some geopolitical positive spinoffs as well to establishing these working relationships.

Army AL&T: We are hearing a lot of buzz about AMC's Rapid Support Network [RSN] and we know that RDECOM is a major catalyst behind that. How is AMC leveraging RDECOM's procedures and capabilities into a focused, integrated and responsive

network concentrating the AL&T community's robust S&T capabilities to meet immediate warfighting needs through the RSN?

Dellarocco: We have a gap within the support structure of AMC and within the Army. PEOs and PMs have a pretty robust process and support network. In AMC, they are called Life Cycle Management Commands [LCMCs]. There we put several organizations together to support the PEOs/PMOs who are developing equipment, communications systems and weapons platforms for our Soldiers and the logistics systems that will sustain them. We feed the technology into the PMs via the RDECs and industry and that's how they get supported. We have a group of customers such as the REF, the Asymmetric Warfare Group, JIEDDO and Technology Support Working Group that have requirements for support and materiel solutions and have funding. When they come in with a funded requirement, where do they get their support from? Well, each LCMC is assigned particular customers to support. To complicate this process even further, many of these customers cross several LCMC competencies. For instance, the REF and JIEDDO touch just about every lab we have on the R&D side and they touch a lot of PEOs and PMs as well.

So what was the AMC structure to support this very small, but high-profile, group of customers with direct impact on the battlefield? Previously, we weren't organized to do that. But now, the RSN does two things. First of all, it establishes a process for life-cycle management of rapid acquisition that didn't exist before. AMC is a great command. It has a tremendous logistics reputation and capability. It also has a tremendous R&D and S&T capability — both are well known and respected worldwide. What is not widely known, but is germane to the very foundation of the command, is their contracting capability. The acquisition centers support every PEO and PM in the Army. So we needed

RDECOM's MacGyver teams are going to provide battlefield-expedient solutions to meet Soldier requirements on the ground in Iraq and Afghanistan. Here, Soldiers from 2nd Battalion, 377th Parachute Field Artillery Regiment, 25th Infantry Division, fire their M119A1 105mm Towed Howitzer during a fire mission outside Forward Operating Base Kalsu, Iraq, last November. (U.S. Army photo by SSG Sean A. Foley.)

to harness all three of those major command capabilities into a process to support these special customers and to do it rapidly, given the vital nature of their business. That was the intent behind the RSN. It's embryonic, and we're still writing the processes for it. So the RSN will fill the void for life-cycle management of those types of customer requirements. We'll manage it here out of SOSI, in coordination with the AMC G-3. It's pretty interesting stuff.

Army AL&T: I don't think our readers have a firm grasp of what SOSI is and what it does. In just a few sentences, could you summarize basically what SOSI is and the support that you're providing?

Dellarocco: We're a staff element of RDECOM Headquarters. SOSI was created for integration of all technologies that are being worked on within RDECOM labs. The hope is we will be able to eliminate duplicated efforts between the separate RDECOM organizations as well as save time and money. We evaluate technology integration and provide mission information for the warfighter and decision makers. As you can imagine, there's a lot of information to process, evaluate and then translate into potential capabilities. We evaluate it, disseminate it and package it. The future of land warfare depends on the Army's ability to incorporate S&T into the Future Force. Lots of coordination is involved — that's the integration aspect. From a SOSI aspect, we touch just about every platform the Army has in one way or another. We are consolidating S&T efforts that accelerate FCS technology transition.

SOSI's organizational mission is to deliver the right technology information at the right time — for the decision maker and the warfighter. To accomplish this wide-ranging mission, some key SOSI initiatives focus on technology integration and capability

Soldiers depend on the Army's corporate laboratory to deliver the scientific discoveries, technological advances and analyses that provide warfighters the capabilities with which to execute full-spectrum operations. ARL's investment portfolio is focused on maturing technologies for transition to the RDECs, PEOs/PMOs and Army Test and Evaluation Command (ATEC). Here (inset), an ARL scientist experiments with emerging laser technology. (U.S. Army photo courtesy of ARL.) A Soldier from 1st Brigade Combat Team, 125th Field Artillery Regiment, Minnesota Army National Guard, practices firing a non-lethal laser in preparation for a convoy support mission, Scania, Iraq, last November. Technology he is using in the field today is a result of ARL research conducted at an RDEC or ATEC facility. (U.S. Army photo by 1LT John Mastbergen.)

assessment by leveraging the global technology base; enterprisewide tools, processes and capabilities; and integrating M&S and technology demonstration activities.

Now, do we touch missiles? Yes, but we don't do a lot of R&D with the missile defense guys per se. We do have a missile capability that does transcend that. Do we do medical? Well, yes, we support the medical community as well. We collaborate with the RDECs and the Medical Research and Materiel Command, but they have their own R&D-focused activities. That's part of SOSI's coordination efforts.

Army AL&T: You mentioned before that RDECOM serves as a clearinghouse for information, especially technology information. How is that information integrated among the PEO and LCMC communities?

Dellarocco: My predecessor, BG Mark Brown, gets all the credit for establishing that process. We've got a lot of commodities, including survivability, and stood up 11 IPTs, stretching from hardware to software to information technology integration. The IPTs have membership from the TRADOC and LCMC community and the other services as appropriate. Working together, the IPTs perform technology assessments and develop road maps to work things around. The DOE is also part of our IPT. Some of the IPTs are small, about 40-50 people, while others are more than 150. All told, the 11 IPTs tap about 800 people on any given day. We put the information together from every source, from the international guys to the guys buying the newspapers. We look at this information, determine what's useful and then pass it to the people who actually have the authority to make decisions, whether it's the lab, the ASAALT staff or other decision makers.

Army AL&T: What total dollar amount is expended annually by RDECOM for basic S&T research? How much is spent on applied research? How much is spent on advanced technology development?

Dellarocco: While our annual operating budget exceeds $5 billion, about half of our S&T budget is Congressional Adds and it's well over a billion dollars. The President's Budget, coupled with the Congressional Adds, is really the core of our S&T and R&D funding. Another very large mission and part of our budget is engineering matrix support, which surpasses the budget levels of our S&T. So we have two very large mission areas. We provide the engineering support for most of the PEOs and PMOs in the Army, as well as for other defense agencies that may come in with reimbursables to hire our talents. We provide a good source of engineering support. So when you think about the 13,000-plus employees, a lot of them provide PEO/PMO support and that's in the neighborhood of about $1.7 billion annually. It's a pretty hefty budget, but then again, we touch every aspect of AL&T one way or another, directly or in support, to get the right technology at the right place at the right time. And we have fun bringing science fiction to reality. This is the best job for a new one star that the Army Acquisition Corps has to offer, and I'm extremely proud of what the SOSI family does to support our COCOMs and Soldiers at the "tip of the spear" every day!

I'm extremely proud of what the SOSI family does to support our COCOMs and Soldiers at the "tip of the spear" every day!

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International Technology Centers (ITCs) Search the World to Bring New Technologies to the Field

Mike J. Dudley and Ken Deylami

The U.S. Army Research, Development and Engineering Command's (RDECOM's) overarching goal is to support the current fight and the Current and Future Force by adding innovative technologies and reducing the size and weight of technological pieces and platforms for Soldiers. With RDECOM comprising 80 percent of the Army's science and technology (S&T) enterprise, it is important that this organization remain on the forefront of technology. To maintain this cutting-edge position, RDECOM's ITCs are constantly searching the globe for state-of-the-art equipment, cooperative opportunities with allied and friendly nations, and both applied and basic research opportunities.

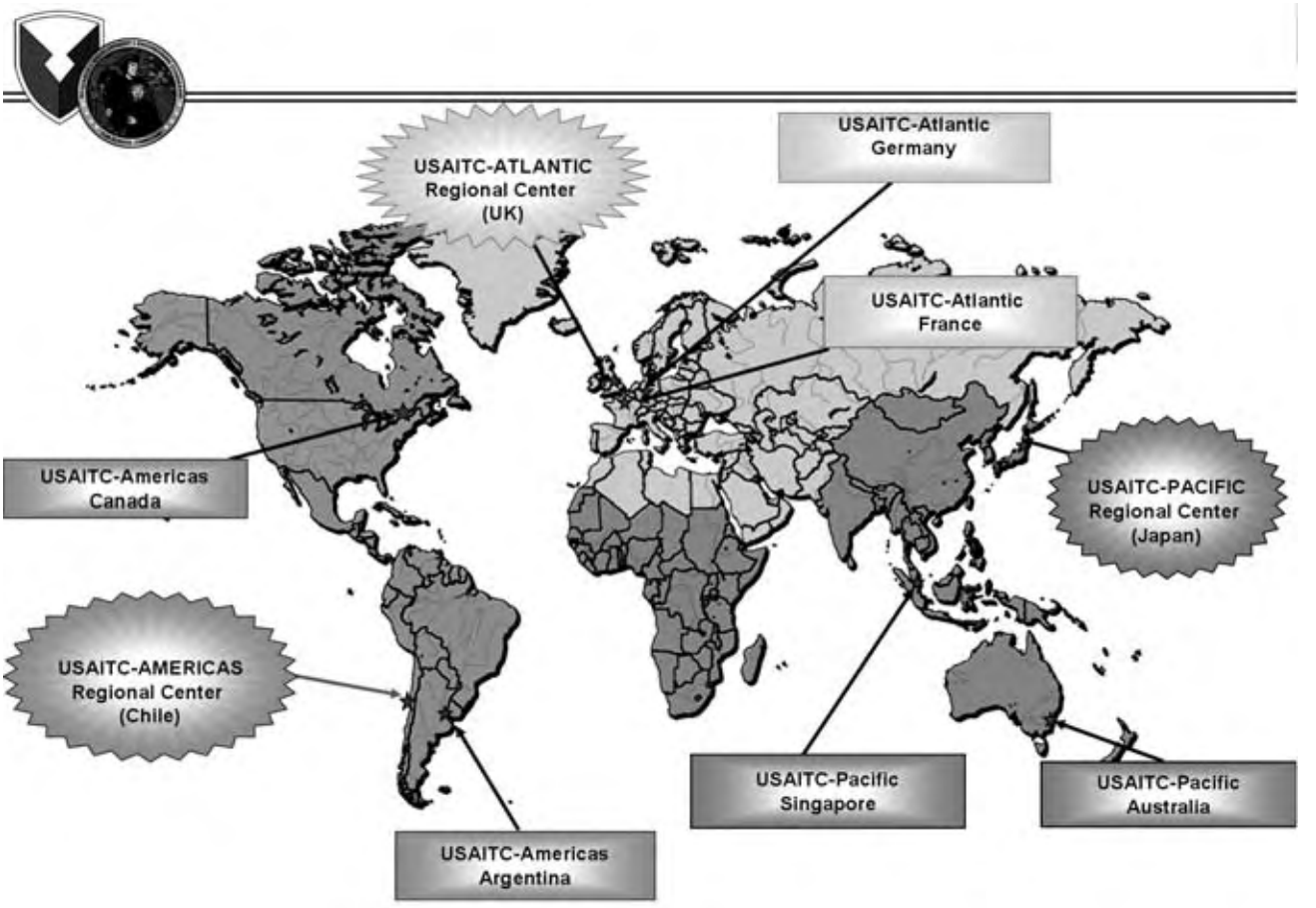
The M93A1 Fox Nuclear, Biological and Chemical Reconnaissance System (NBCRS) vehicle detects, identifies and marks areas of nuclear or chemical contamination, and reports accurate information to supported commanders in real time. The NBCRS can also collect soil, water and vegetation samples for analysis. Hazards to crew members are minimized through the presence of vehicle NBC collective protection and through positive overpressure with heating and cooling for the crew. (U.S. Army file photo.)

The U.S. Army has the lead in bringing forward technologies that will meet Soldier needs and improve capabilities within our own force and those of our coalition partners. The ITCs were established to help meet this objective. Their mission is to find the greatest technology and to leverage partnerships to bring new developments to the field quickly and keep abreast of new research and development (R&D) trends leading to the S&T breakthroughs of tomorrow. The nine ITCs search the world for emerging technologies from international commercial industry, universities and government and military R&D organizations involved in S&T. In addition, they seek out opportunities to meet with foreign S&T sources and work feverishly to develop strong relationships and build partnerships with other overseas and domestic U.S. government offices; Research, Development and Engineering Centers (RDECs); and the U.S. Army Research Laboratory (ARL) to support the Army's S&T investment strategy.

Global Search for S&T Developments

The ITC's primary goal is to seek niche capabilities that can't be found domestically or technologies that are superior to our own. The ITCs are looking for "juicy technology" — those exciting innovations that meet the relevant technology needs of our Soldiers in the field and provide the Army a significant return on investment (ROI). The goal is to find and assess technology to provide Army leadership with those developments that reduce Soldier load, increase deployment speed, enhance the abilities and capabilities of outfitting the Current and Future Force and prevent technological surprise on the battlefield.

The ITCs, as the international technology scouts for the U.S. Army, know where the state-of-the-art technologies are located and/or are being developed. The nine ITCs located throughout the world work through an interconnected network of contacts to fulfill their respective missions. The figure on Page 46 depicts the ITC office locations (United Kingdom (U.K.), Germany, France, Japan, Australia, Singapore, Argentina, Chile and Canada). Many of these offices are collocated with the U.S. Navy's Office of Naval Research and the U.S. Air Force's Office of Scientific Research counterpart technology search teams. This supports a



U.S. Army International Technology Centers (USAITCs)

highly collaborative tri-service relationship, allowing the Army to share information and leads with our sister services. Sometimes the other services are looking for solutions to similar requirements, and the ITCs can collaborate fully on potential solutions. For example, the Navy is looking for alternative power and energy technology solutions for ships while the Army needs the same technology, but at a much smaller scale, weight and size to place on several different tactical wheeled vehicle platforms.

In the event that the ITCs discover or are tipped off about a nascent technology, they can leverage the Foreign Technology and Science Assessment Support (FTAS) program to bring the technology to fruition. This program is designed to provide limited "seed money" to develop technologies that aren't yet ready for full funding by the U.S. Army's RDECs or ARL but are close. The FTAS program provides opportunities for RDEC and ARL researchers to apply for funding to undertake this development until the ITC-discovered technology is sufficiently mature for full funding by the RDECs or ARL.

The XM101 CROWS system integrates the MK19 Grenade Machine Gun, M2 Machine Gun, M240B Medium Machine Gun and the M249 Squad Automatic Weapon. The weapons operate from a larger ammunition supply than that of standard crew-served weapons. With larger combat loads, the weapon is reloaded less, keeping the crew inside the vehicle and less prone to insurgent small-arms fire. (U.S. Army file photo.)

The ITC Network Concept at Work

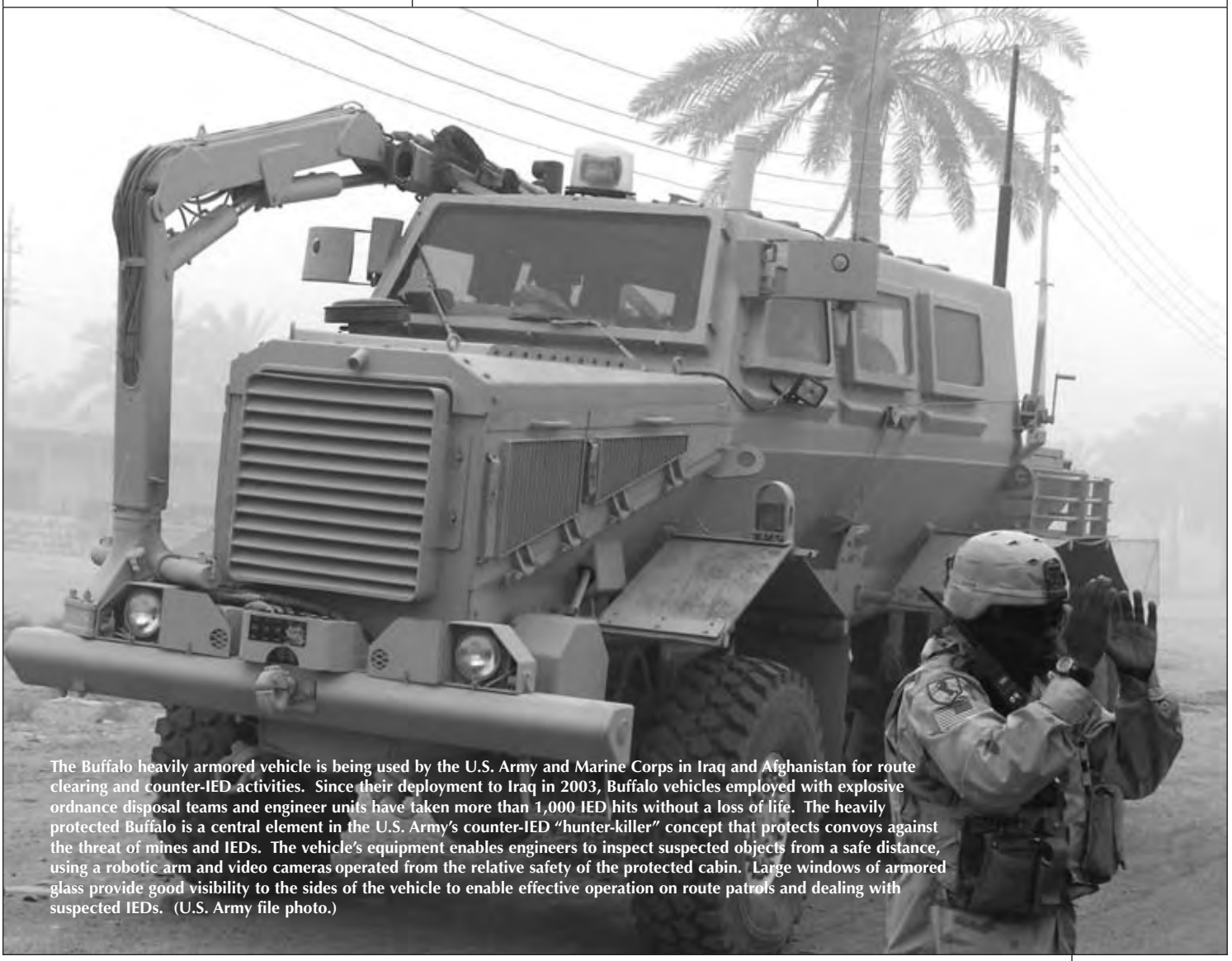
Based on the vision of BG Genaro Dellarocco, RDECOM Deputy Commanding General for Systems of Systems Integration (SOSI), key information from the ITC's global "network," such as available potential technology solutions to the Army's current and future materiel requirements, points of contact and updated information on international S&T activities and organizations, will soon be available instantaneously. The ITCs are developing a secure online tool that enables authorized users to have instant access to this information. The updates for new technologies and organizations

entered by the ITCs in the online ITC Network tool will be date-sensitive to ensure authorized users are accessing the latest information. The network will also contain contact information for the U.S.-based international military and government offices the ITCs interact with to achieve their mission objectives, facilitating more efficient and productive technology leveraging for our Soldiers in the field.

The ITC network tool, which will allow for global searches of all technologies in the system at the touch of a button, will be maintained by designated authorized administrators from each ITC and will reside in RDECOM's S&T Enterprise Management environment. The network will eventually include several added functions for providing summaries of new technology finds to RDECOM technology integrated product teams (IPTs), RDECs, ARL or directly to the Rapid Equipping Force (REF) or Joint Improvised Explosive Device Defeat Organization (JIEDDO) in support of the Army's Current and Future Forces.

> The ITCs are looking for "juicy technology" — those exciting innovations that meet the relevant technology needs of our Soldiers in the field and provide the Army a significant ROI.

To keep on top of Soldier needs, the ITCs hold semiannual conferences to discuss the latest requirements from the field and to focus their priorities, including what types of technology the ITCs need to find. They learn what the IPTs, RDECs and ARL are working on, discuss U.S. Army Training and Doctrine Command capability needs and ascertain where the gaps are in S&T programs and where they need to focus their technology searches. From this meeting, they return to their posts around the world with a targeted technology search list. They search for



The Buffalo heavily armored vehicle is being used by the U.S. Army and Marine Corps in Iraq and Afghanistan for route clearing and counter-IED activities. Since their deployment to Iraq in 2003, Buffalo vehicles employed with explosive ordnance disposal teams and engineer units have taken more than 1,000 IED hits without a loss of life. The heavily protected Buffalo is a central element in the U.S. Army's counter-IED "hunter-killer" concept that protects convoys against the threat of mines and IEDs. The vehicle's equipment enables engineers to inspect suspected objects from a safe distance, using a robotic arm and video cameras operated from the relative safety of the protected cabin. Large windows of armored glass provide good visibility to the sides of the vehicle to enable effective operation on route patrols and dealing with suspected IEDs. (U.S. Army file photo.)

technologies in the following broad areas: network, biotechnology, robotics, current operations support, survivability, counter-improvised explosive devices (IEDs)/countermine, supportability/maneuver sustainment, power and energy, enterprise management, nanotechnology and lethality. The goal is to find the best technology anywhere in the world to ensure RDECOM is able to get the right technology at the right time and place for the warfighter.

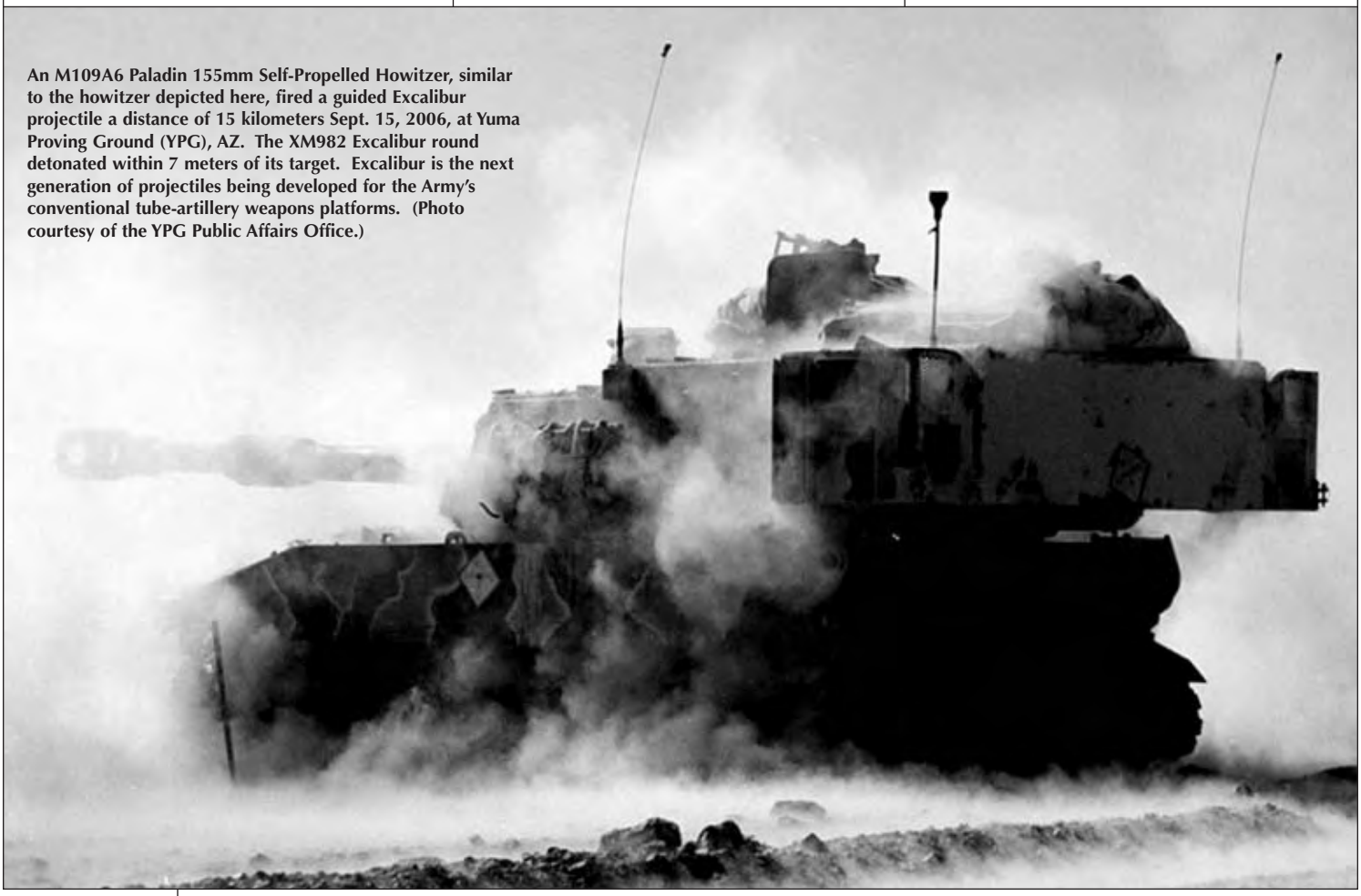
Challenges

The ITCs strive to ensure that the best Soldiers in the world have the best equipment in the world. To do this, they examine international basic research, applied research efforts, keep abreast of advanced technology development, evaluate nondevelopmental items, commercial-off-the-shelf equipment or technologies that may meet U.S. Army requirements and, if they do, enable advancement of Army S&T while saving development time and cost wherever possible.

One of the challenges ITC personnel face is false engineering promises. Companies occasionally make exaggerated claims about a particular piece of technology, and those claims that are plausible must be tested. For technology with current operations application, the ITCs forward their technology "finds" to the RDECOM Agile Development Center, the REF and JIEDDO to ensure technology is fully tested in relevant conditions. If the technology meets the requirement, the REF or JIEDDO buy it for expedited delivery to Soldiers in the field.

Another challenge the ITCs face is proving the ROI to the Army for their efforts. The ITCs, with their global presence, can seem costly at approximately $9 million per year, especially with long lead times in the acquisition life cycle before the benefit of a piece of technology is evident. The pace of searching for new technologies, sifting through the many leads and then getting them through the assessment and evaluation phases does not always lend itself to instant success stories. However, when the ITCs find a much-sought-after technology, the cost savings can be significant — years in design and production time and millions of dollars. This translates to a more efficient and effective product for Army use.

A third challenge faced by the ITCs is the so-called "not invented here syndrome." Sometimes the ITCs discover complete systems, components or alternative practices that have the potential to greatly enhance performance of existing systems. However, these



An M109A6 Paladin 155mm Self-Propelled Howitzer, similar to the howitzer depicted here, fired a guided Excalibur projectile a distance of 15 kilometers Sept. 15, 2006, at Yuma Proving Ground (YPG), AZ. The XM982 Excalibur round detonated within 7 meters of its target. Excalibur is the next generation of projectiles being developed for the Army's conventional tube-artillery weapons platforms. (Photo courtesy of the YPG Public Affairs Office.)

discoveries occasionally face skeptics who doubt their usefulness because they originate outside the U.S. To ensure the best technology is available for our troops, it is critical for both the Army research community and the materiel developers to keep an open mind to discoveries from abroad. The ITCs have worked tirelessly to break through the not invented here syndrome by hosting seminars, facilitating visits and encouraging U.S. researchers to dialog with their international counterparts and examine and test their technology. As a result, the ITCs have garnered praise from top Army leadership for their efforts to promote international armaments cooperation.

The ITCs are an essential part of the S&T process. In addition to locating and recommending the aforementioned equipment for Armywide use, the ITCs have been integral in providing the best technologies from around the world to both our Soldiers and our allies.

Successes

The ITCs have enabled win-win situations for the United States and its coalition partners. The equipment they have found and recommended for Armywide integration has saved countless Soldiers' lives and millions of dollars in development costs, and has also proven to be highly effective on the battlefield. One well-publicized piece of equipment that has been brought into the Army's inventory due in part to ITC efforts is the Buffalo, developed in South Africa. The heavily armored Buffalo vehicle is designed to give patrols a closer look at suspected IEDs. The vehicle is taller than a tank and equipped with a robotic arm that has a pitchfork-like hand and a camera for viewing hard-to-reach areas.

Other ITC equipment finds have included the Chemical Detector (U.K.), the Common Remotely Operated Weapon Station (CROWS) (Australia), the Excalibur (Sweden) and the Fox (Germany). The Chemical Detector is a lightweight chemical agent detector that exceeds the Joint Chemical Agent Detector's requirements for personal warning and protection. By using this piece of technology from the U.K., the Army saved 4 years and $330 million in R&D costs. The CROWS is designed to allow Soldiers to shoot from various vehicles while moving under cover. The Army saved 2 years and $20 million in development costs by adopting this piece of equipment. The Excalibur is a precision-guided, extended-range munition that improves accuracy for the 155mm artillery projectile. This Swedish invention saved the Army $57 million in R&D costs. The Fox is a type of mobile laboratory that takes air, water and ground samples, and analyzes them instantly for signs of weapons of mass destruction. This invention saved the Army 14 years in development time as well as millions in cost avoidance.

ITCs' Importance

The ITCs are an essential part of the S&T process. In addition to locating and recommending the aforementioned equipment for Armywide use, the ITCs have been integral in providing the best technologies from around the world to both our Soldiers and our allies. The ITCs have raised the capability and interoperability of our troops and have proven to be a driving force in getting S&T developments into the hands of Soldiers quickly.

The equipment they have found has saved countless Soldier lives as well as saved the Army and taxpayers millions of dollars. By accessing technologies that are already in development overseas, the ITCs are able to meet Soldier needs in an efficient and effective way and free up limited resources for additional R&D and S&T initiatives that address emerging Soldier field requirements.

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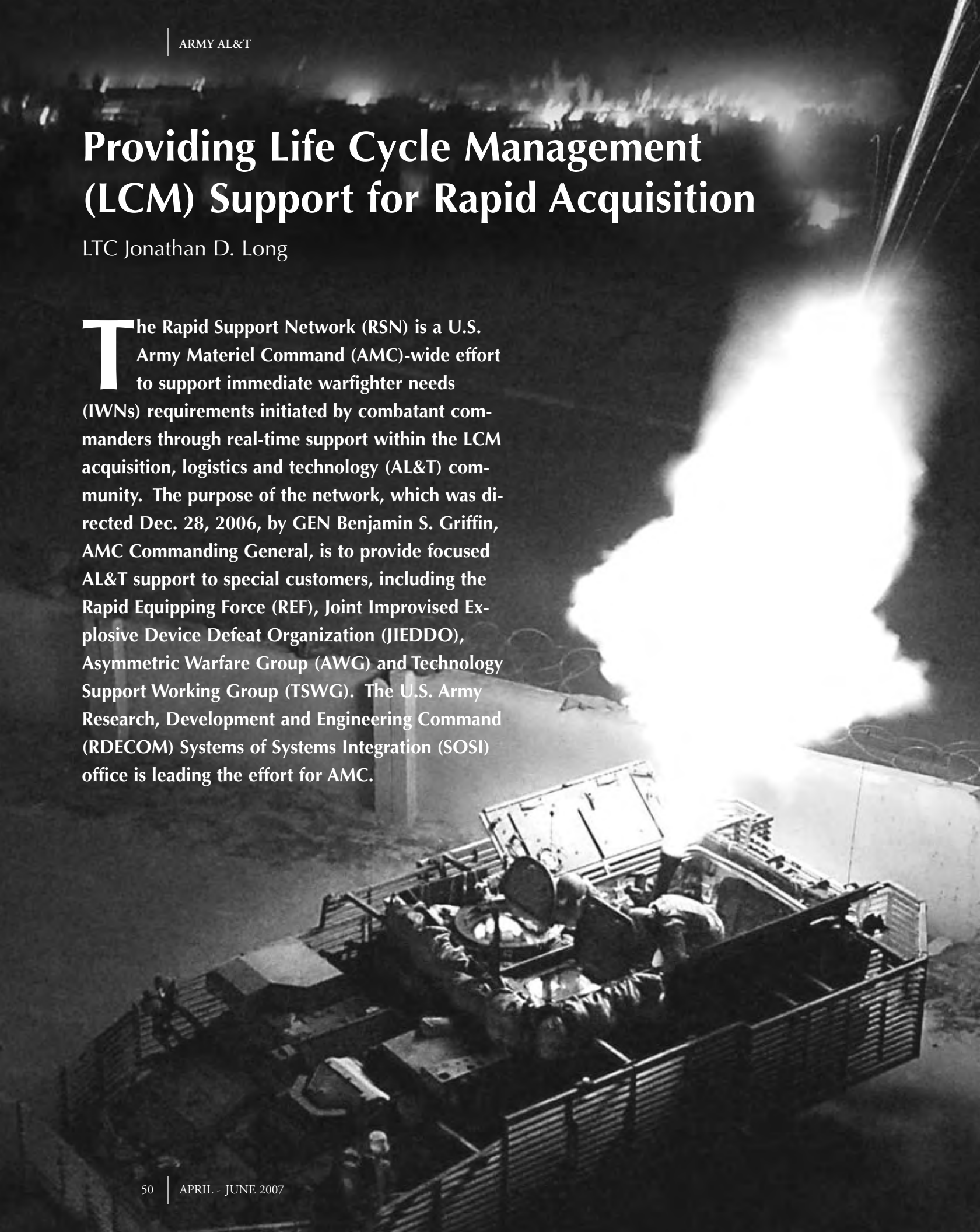
KEN DEYLAMI is the Program Manager, ITCs, in the 3IA Directorate, RDECOM SOSI. Prior to this position, he spent 7 years providing engineering support to the U.S. Army weapon systems, and 5 years providing service at the U.S. Army Tank Automotive Research, Development and Engineering Center's National Automotive Center in the advance technology platforms group, involved in technology search, evaluation and demonstration programs primarily for tactical wheeled vehicles. He holds a B.S in mechanical engineering from Oxford Grant University, U.K., and an M.S. in automobile engineering from Cranfield University, U.K.

Providing Life Cycle Management (LCM) Support for Rapid Acquisition

LTC Jonathan D. Long

The Rapid Support Network (RSN) is a U.S. Army Materiel Command (AMC)-wide effort to support immediate warfighter needs (IWNs) requirements initiated by combatant commanders through real-time support within the LCM acquisition, logistics and technology (AL&T) community. The purpose of the network, which was directed Dec. 28, 2006, by GEN Benjamin S. Griffin, AMC Commanding General, is to provide focused AL&T support to special customers, including the Rapid Equipping Force (REF), Joint Improvised Explosive Device Defeat Organization (JIEDDO), Asymmetric Warfare Group (AWG) and Technology Support Working Group (TSWG). The U.S. Army Research, Development and Engineering Command (RDECOM) Systems of Systems Integration (SOSI) office is leading the effort for AMC.



AMC's support for the program executive office/program management office (PEO/PMO) community is well organized and already established through the Life Cycle Management Commands (LCMCs). However, for a small group of high-profile customers, such as REF and JIEDDO, a gap in AMC's LCM support exists. First, these customers aren't assigned to a particular LCMC and, in fact, their actual needs cross multiple LCMCs. Second, they need rapid support and the RSN helps to fill that void.

The RSN is not an organization, but rather a much-needed process, leveraging existing AMC procedures and capabilities into an integrated and responsive network, focusing the AL&T community's robust capabilities to meet IWNs as illustrated by the figure on Page 52. Currently, special customers do not benefit from AMC for contracting, logistics and technology support to rapidly get warfighters what they need. The RSN will integrate and synchronize access to the LCMCs' extensive AL&T capabilities to support rapid customer fulfillment requirements, improving AMC's response to the warfighter from weeks and months to hours and days.

BG Genaro Dellarocco, Deputy Commanding General (DCG), RDECOM SOSI, describes the RSN as "harnessing the jet stream of AMC" because AMC already provides AL&T support for Army products through systems and processes that are already in place. Accordingly, the support provided by the RSN will streamline the rapid acquisition process and provide better documentation so rapid acquisition can be institutionalized within the larger Army acquisition model.

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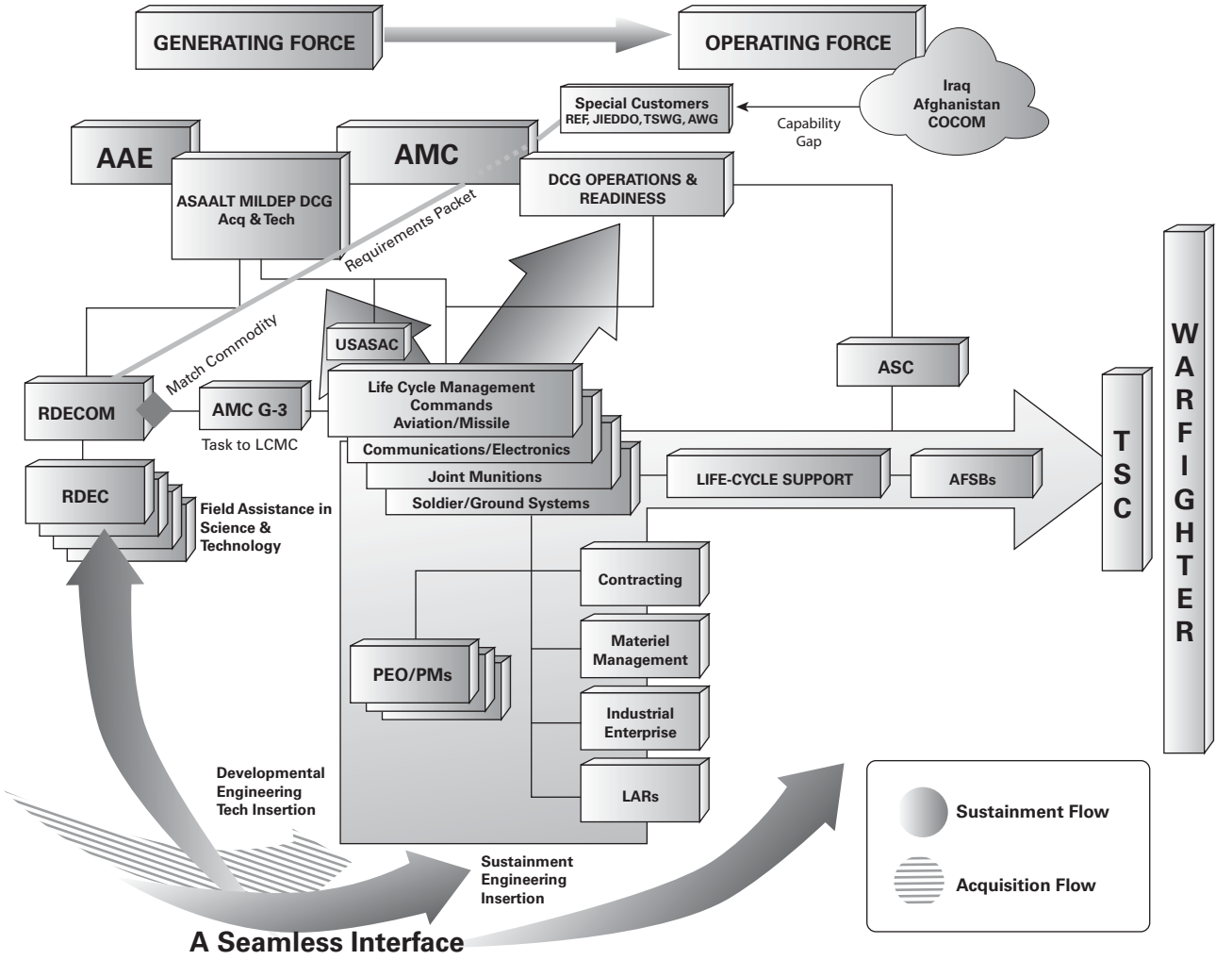
An integrated process team (IPT) was organized to establish the RSN's operational policies and procedures and to fine-tune the rapid acquisition support process. The IPT is co-chaired by the RDECOM SOSI and AMC G-3 (Current Operations). It consists of more than 40 members, including representatives from AMC, the LCMCs, RDECOM, REF, JIEDDO and the Assistant Secretary of the Army for Acquisition, Logistics and Technology (ASAALT). This team of experts has met weekly since December 2006 through teleconferences to discuss how to best implement the RSN and work process sub-teams. The IPT will continue to meet until the pilot program is launched.

Process and Goals

The RSN process, based on the existing AL&T network resident within the LCMCs, is designed to focus the capabilities of acquisition workforce experts to meet emergent needs. The RSN seeks to pull the LCMC capabilities forward in the acquisition timeline to support initial requirements development, ensuring that needs can be technically met and sustained once fielded.

The RSN is a process that leverages existing AMC logistics procedures and capabilities into a highly integrated and customer-responsive network addressing immediate Soldier battlefield requirements. Here, Soldiers from the 172nd Stryker Brigade Combat Team fire an illumination flare from their M1129 Stryker Mortar Carrier in an effort to expose terrorists planting roadside bombs near Mosul, Iraq, last summer. (U.S. Air Force (USAF) photo by TSGT Jeremy T. Lock.)



The RSN will support the rapid acquisition process to meet IWNs by helping special customers such as REF, JIEDDO, AWG and TSWG speed their requirements through the existing acquisition process. An incoming requirement passes through the RSN and into the proper LCMC for analysis and, ultimately, procurement and fielding.

Key

Acq & Tech	– Acquisition and Technology	MILDEP	– Military Deputy
ASC	– U.S. Army Sustainment Command	Opns	– Operations
COCOM	– Combatant Commander	TSC	– Theater Support Command
LAR	– Logistics Assistance Representatives	USASAC	– U.S. Army Security Assistance Command

To do this, the RSN will focus existing LCMC capabilities to develop new solutions for the complex challenges faced by Soldiers. The nature of the threat conditions change daily and so do the projects currently being worked by RSN special customers.

A primary reason AMC is undertaking this effort is to better support the rapid acquisition process. In the past, AMC's AL&T capabilities were not involved up front in the sustainment planning for the REF, JIEDDO, AWG or TSWG. These four customers are focused on fulfilling immediate requirements — those fulfilled in 180 days or less — and thus have been pulled ahead of the traditional materiel development and acquisition capabilities. Traditional Army acquisition programs, which follow the *DOD 5000* process, have been viewed as requiring too much time to meet IWNs.

The *DOD 5000*, *The Acquisition Process*, series is necessary for prudent planning for and sustainment of major weapons programs. However, *Operations Enduring* and *Iraqi Freedom (OEF/OIF)* have proved there is a need to address IWNs with acquisition programs that are more responsive. By focusing a network dedicated to supporting immediate requirements, the RSN initiative addresses a process gap in Army acquisition for IWNs.

The RSN is able to support the paradigm change of acquisition response time "from weeks and months to days

and hours" by progressing through the various traditional development phases simultaneously rather than sequentially. With the *DOD 5000* structure, each product idea must pass through a set milestone before it can move to the next phase with a normal time frame for meeting simplified requirements at 180-plus days. The RSN will help condense the initial materiel development process into 39 days by moving possible solutions through various acquisition phases concurrently. Decisions can be worked up front similar to milestones A, B and C in the first 39 days. For example, instead of spending 30-90 days looking at possible technical solutions to a problem, a "quick-look" technical solution is worked by the RDECOM Agile Development Center (ADC) within 72 hours. Developing an acquisition plan and contracting for the requirements would take an additional 19 days or less, rather than 6 months to 1 year.

RSN brings the Army one step closer to fulfilling the LCMC promise — to unite the Army AL&T functions of the PEO and AMC sustainment structures. Traditionally, AMC has been viewed as logistics and technology-focused and the PEOs as acquisition-focused. In fact, the technical expertise for all three functions (AL&T) resides within the LCMCs. For engineering support, the PEOs rely on the technological expertise of engineers within AMC's Armament Research, Development and Engineering Center organizations, as they depend on the LCMC Acquisition Centers for procurement. In terms of logistics support, most of the equipment the PEOs field is sustained by the LCMC sustainment centers. The core acquisition capabilities are AMC capabilities with the exception of formal product management, which is the Army Acquisition Executive's (AAE's) function. With these capabilities networked, rapid acquisition customers can outsource their AL&T processes to the RSN. The LCMC construct, through the RSN, will add more value to the Soldier and will support, not interfere with, the customer's requirements. To a great extent, the LCMCs are engaged in "RSN-like" processes today, but there's no overarching mechanism in place that can focus the best of each of these on a single IWN. The RSN pulls all efforts together into one process and then matches up a requirements need with the best LCMC organization to develop and execute it.

The RSN will add value Armywide by focusing sub-processes within a single LCMC to lean the rapid acquisition process overall, making it a great candidate for the Six Sigma approach.

The RSN will add value Armywide by focusing sub-processes within a single LCMC to lean the rapid acquisition process overall, making it a great candidate for the Six Sigma approach. Currently, rapid acquisition is handled on a case-by-case basis, which includes learning curves for each acquisition. By placing the acquisition within a single LCMC, each product will be procured by an organization that is already acquiring, sustaining and managing that commodity, thereby minimizing the learning curve associated with a new industry or industry business practices. This familiarity with a given commodity will reduce the time required for that acquisition, increasing overall effectiveness and efficiency.

Filling the Gaps

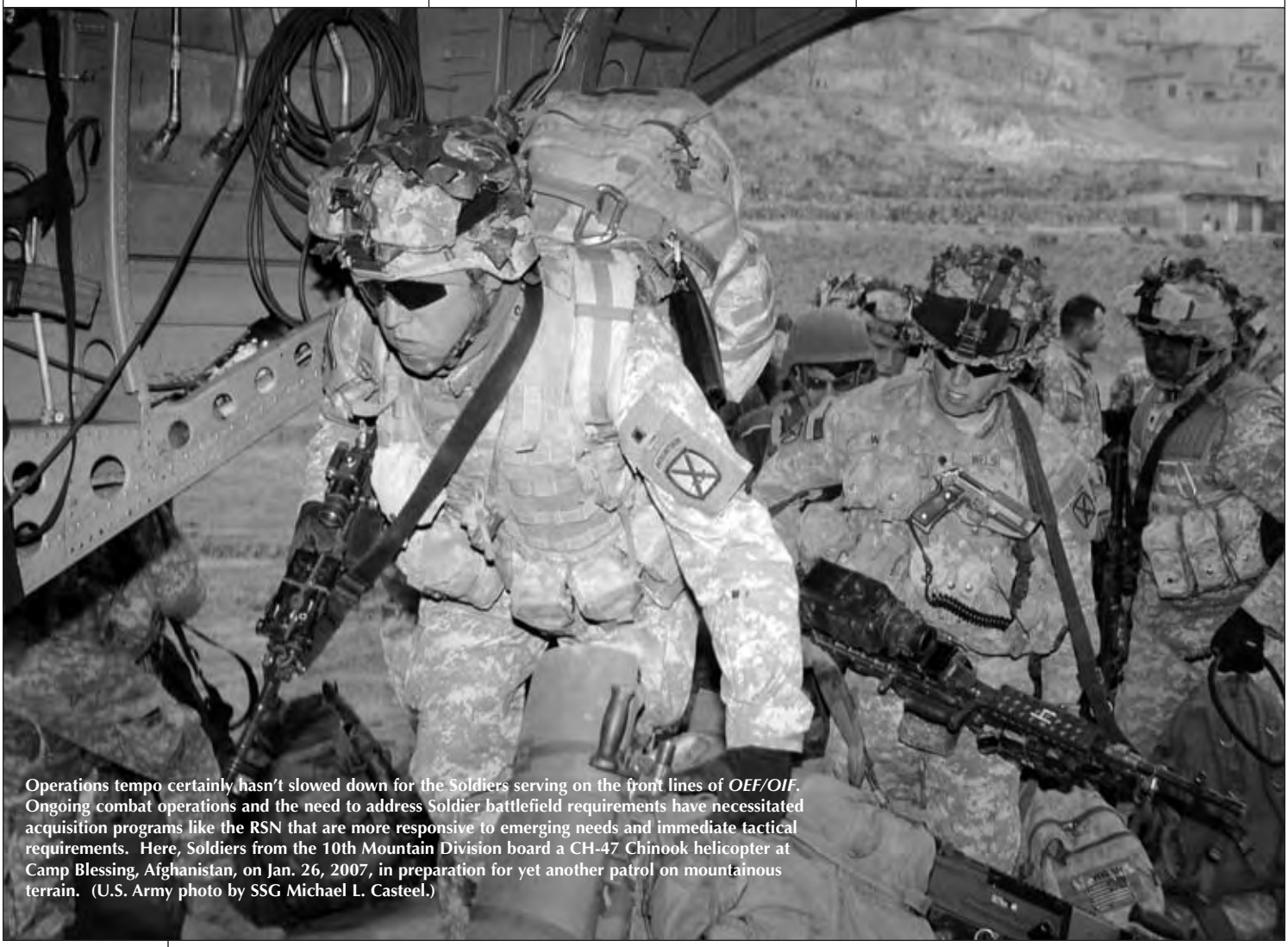
In reviewing the current rapid fielding methods, several potential areas for improvement were identified. The Army Field Support Brigade (AFSB), which is ultimately responsible for supporting and sustaining the product once in theater, is often not involved in the rapid acquisition process. In many cases, AFSBs don't find out about products until they show up in the field and need to be fixed. Additionally, PEO/PM involvement should happen up front. A match between the requirement and the program that can meet and ultimately serve as the

The RSN will pull LCMC capabilities forward to support initial development, ensuring that Soldier requirements can be met technically and are sustainable in operational environments. Here, two M1A2 Abrams tanks from the 5th Cavalry Regiment provide overwatch security for Soldiers from the 2nd Brigade Combat Team, 1st Cavalry Division, during a search and seizure mission in the Al Doura district of Baghdad, Iraq, March 2007. (U.S. Army photo by CPL Alexis Harrison.)

life cycle manager for the product would result in a better overall acquisition process if coordinated prior to actual product acquisition. The PEOs/PMs must be aware of the procurement process from the start. After all, they may have to manage the product once it's fielded and has proven to be a candidate for broader fielding.

Another potential area for improvement involves current rapid acquisition projects that have not been procured through the LCMC most familiar with a given item. By going through the established acquisition center, the learning curve for procurement is minimized. A huge misperception is that the current acquisition centers should be bypassed if you want to quickly field products. This is simply not true, and the RSN concept will prove that when used to its fullest extent. The procurement process, worked through an LCMC Acquisition Center, yields the best solution for our Soldiers and can do so in the shortest amount of time with an expected decrease in total project cost. A rapid acquisition requirement will be sent via the RSN into an LCMC in an accelerated time frame. The expectation is that within 72 hours, the RSN, working with the ADC, will have an initial assessment in terms of feasibility and the time it will take to field the requirement back to its customer. From there, developing a materiel solution begins, and the experts in the LCMCs assume responsibility for supporting their customer's requirements.

Finally, AMC needs to be involved in sustainment solutions up front — ones that are workable long after the REF fielding teams are gone. That's where follow-up and final recommendations come into play. Currently, a unit is issued an IWN product — fire-resistant gloves, for example — and they use the gloves, and they're great, allowing Soldiers to do their jobs and remain safe. But what happens when the unit's tour of duty is over? The Soldiers go home and take with them product knowledge and the final recommendation — that all units in a particular situation should be issued fire-resistant gloves. A final recommendation and an action plan must be formalized about that unit's experience so that other Army units can benefit from the collective experience as well.



Operations tempo certainly hasn't slowed down for the Soldiers serving on the front lines of *OEF/OIF*. Ongoing combat operations and the need to address Soldier battlefield requirements have necessitated acquisition programs like the RSN that are more responsive to emerging needs and immediate tactical requirements. Here, Soldiers from the 10th Mountain Division board a CH-47 Chinook helicopter at Camp Blessing, Afghanistan, on Jan. 26, 2007, in preparation for yet another patrol on mountainous terrain. (U.S. Army photo by SSG Michael L. Casteel.)

By focusing a network dedicated to supporting IWNs, the RSN bridges a process gap in Army acquisition for supporting U.S. and coalition forces on the battlefield. Here, a U.S. Soldier, embedded with the Multi-Iraqi Transitional Team, 4th Battalion, 2nd Brigade, 5th Iraqi Army Division, tries to positively identify an insurgent before shooting during an operation in Buhriz, Iraq, as his Iraqi counterpart looks on. (USAF photo by SSGT Stacy L. Pearsall.)

Challenges and Benefits

One of the most significant challenges has been getting all parties within the RSN to agree on a common language to describe the processes being executed. The LCMCs each have differing ways of describing similar processes and procedures, and the development of a common language ensures that everyone understands what is being discussed and why. This is a challenge that we are resolving, because the RSN is using existing processes and procedures, not developing something completely new.

The RSN will, ultimately, support Soldiers with new and better equipment more quickly and efficiently, resulting in Soldier systems that are more survivable and lethal than ever before.

From a benefits standpoint, one of the greatest RSN successes has been the sincere desire of everyone involved to support the network and see it succeed. The RSN will, ultimately, support Soldiers with new and better equipment more quickly and efficiently, resulting in Soldier systems that are more survivable and lethal than ever before.

Another benefit to those working the RSN process has been their involvement in developing the network's solutions. The RSN processes were developed and vetted at the level of those who will be involved in executing them with positive results. Each LCMC has described how the process will be conducted, and the best practices are being culled from each for a set of common processes that will be used throughout the RSN and weapons and communication systems LCM.

For those in the field, the RSN's establishment will result in a more synchronized sustainment capability for those products that Soldiers need quickly and, in some cases, a better materiel solution to requirements because of a wider range of experts involved in their development. Beyond the short-term benefits to the field, the RSN will also help the Army with long-term planning, as the outcomes of each fielded product will be captured and studied. Those products that successfully meet Soldier requirements can be considered through the Capabilities Developed for Rapid Development for fielding to all units. In addition, the institution of a common language and processes for the RSN could provide an evolutionary model for rapid acquisition in future Army regulatory guidance, policies and procedures.

Looking Forward

The RSN is already being put to the test. A pilot program was launched during the first quarter of 2007. The pilot program is actually processing incoming REF and JIEDDO requirements and running them through the RSN to see if it can meet expected time frames. Through AMC's creation of a strong acquisition support network, which can rapidly field and sustain the products our Soldiers in the field need most, we are one step closer to being Army Strong.

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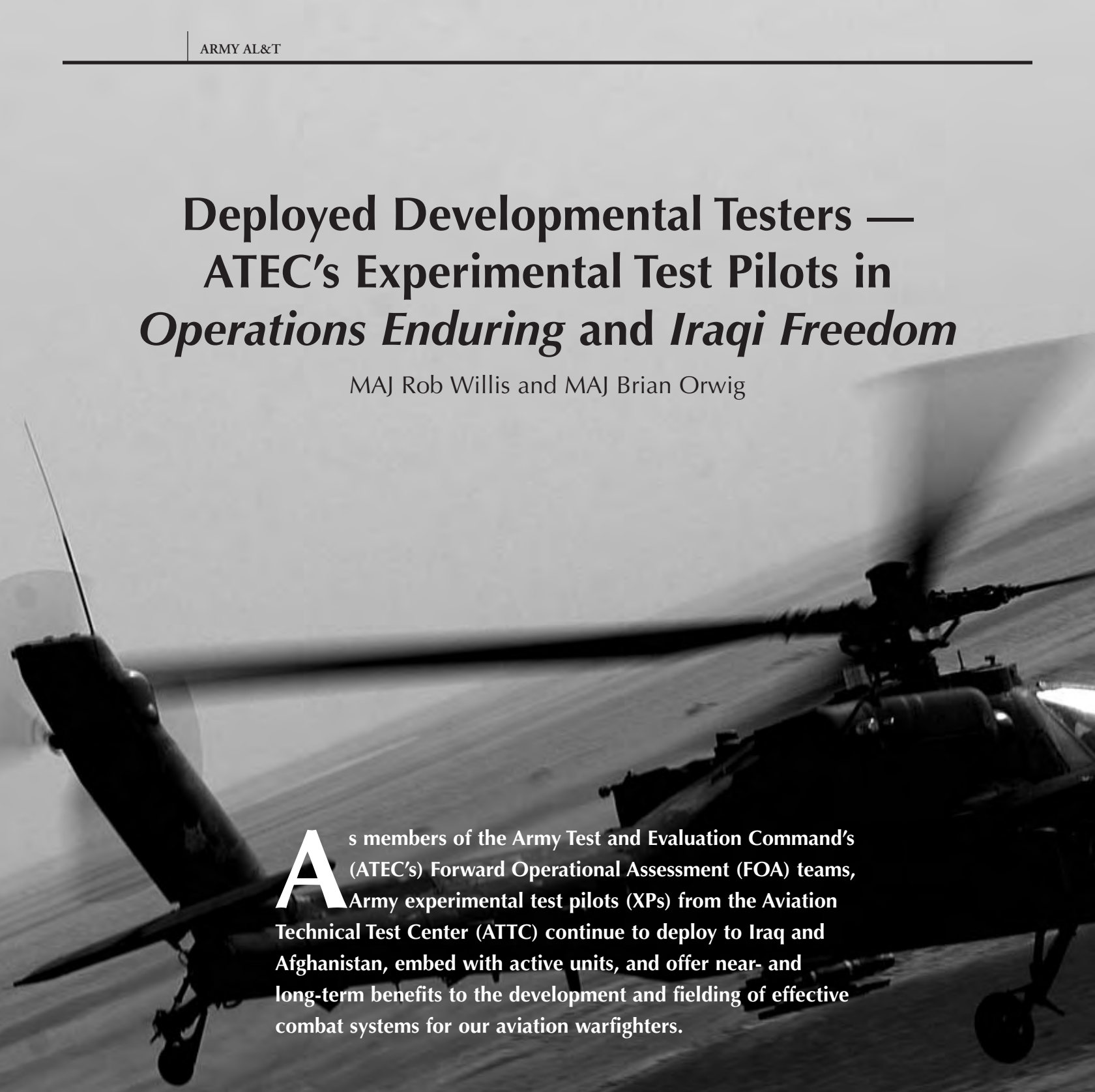
Deployed Developmental Testers — ATEC's Experimental Test Pilots in *Operations Enduring* and *Iraqi Freedom*

MAJ Rob Willis and MAJ Brian Orwig



As members of the Army Test and Evaluation Command's (ATEC's) Forward Operational Assessment (FOA) teams, Army experimental test pilots (XPs) from the Aviation Technical Test Center (ATTC) continue to deploy to Iraq and Afghanistan, embed with active units, and offer near- and long-term benefits to the development and fielding of effective combat systems for our aviation warfighters.

XPs have flown up to 350 combat hours as embedded pilots-in-command and air mission commanders during 6-month deployments to Iraq and Afghanistan. Here, pilots from the 101st Combat Aviation Brigade provide air support during Task Force No Mercy last July over Tal Afar, Iraq. (U.S. Air Force photo by SSGT Jacob N. Bailey, 1st Combat Camera Squadron.)

Although some XPs have prior backgrounds as maintenance test pilots, instructor pilots, safety officers and armament officers, the job is not about maintenance or logistics — it's about mission. And despite the advanced engineering degrees held by most, a hangar full of protractor-wielding Microsoft® Excel wizards isn't sufficient to ensure that a new flight control system, weapon or software version will be suitable for use in a multi-mission combat environment.

A typical aviation test team includes flight test engineers, instrumentation technicians, program management (PM) personnel, manufacturer representatives and many others. It is critical that somebody in this group understand the warfighter's perspective — the end user who will ultimately employ the system going head-to-head with the enemy. There is simply nothing that can supplant recent firsthand combat experience and extended face-to-face living with an operational unit. ATTC is now entering its sixth FOA deployment cycle with its ninth and tenth deployed XP.

ATTC deploys its testers as ATEC FOA team members, who rotate every 6 months. FOA team members represent all branches, and collect feedback on newly fielded systems, from improvised explosive device-sniffing robots to the Command Post of the Future. However, ATTC XPs are the only members so far on the FOA Team who are both embedded data collectors and *embedded operators*, flying and fighting with the host unit. This participation in the FOA mission highlights ATTC's greatest resource — the unique skills and capabilities of its people.

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Direct Support in Theater

The FOA XPs provide significant direct support benefits to their hosting units, addressing a myriad of rapid fielding initiatives and aviation airworthiness issues. The deployed XP provides the hosting combat aviation brigade an organic force modernization officer "with teeth." He is an "in-person" liaison representing both the testing and acquisition communities, facilitating communications with PM offices, the Aviation Engineering Directorate (AED) and equipment manufacturers. When an AH-64D Apache helicopter unit arrived in theater with a unit-purchased gun-mounted laser pointer in early 2005, the embedded XP coordinated with PM Longbow Apache and AED to have the system formally tested and certified, quickening its integration into the fight. When a 701D engine hot-start anomaly surfaced with deployed UH-60L Black Hawks, an embedded XP staffed the approval of a new engine starting procedure, and then provided instruction to all affected Black Hawk units in theater.

Many deployed aviators will attest that training on newly fielded systems coincided with numerous simultaneous predeployment activities. In past cases, including the UH-60 Black Hawk and CH-47 Chinook Common Missile Warning System (CMWS), Blue Force Tracking, and the Lot 8 and Lot 9.1B Longbow Apache helicopters, fielding and training was somewhat hastily conducted immediately prior to the units loading aircraft onto ships. Embedded XPs who had been directly involved in the testing of such systems can aid in the understanding of new functionalities and the

An embedded XP was instrumental in developing new engine starting procedures for UH-60L Black Hawks after 701D engine hot-start anomalies surfaced in theater. Here, UH-60 Black Hawk crews from 2nd Squadron, 6th Cavalry Regiment, benefit from the new procedures as they lift off from Forward Operating Base McHenry, Iraq, last November. (U.S. Army photo by SFC Michael T. Guillory, 982nd Signal Co. (Combat Camera).)

XPs who were directly involved in testing of the CH-47 Chinook CMWS were instrumental in training deployed aircrews on systems' functionalities and in developing corresponding TTPs while deployed in theater. Here, 10th Mountain Division (Light) Soldiers load equipment/supplies into a CH-47 Chinook helicopter following a search and seizure mission in the mountainous region near Landikheyl, Afghanistan, last November. (U.S. Army photo by CPL Bertha A. Flores, 55th Signal Co. (Combat Camera).)

in-theater development of tactics, techniques and procedures (TTPs). The first combat deployment of the much-anticipated Modernized Target Acquisition and Designation System is currently underway, and ATTC has an XP embedded with the only unit employing it. In these ways, recent, robust flight-test experience can augment the New Equipment Training process.

With in-theater operations tempo doubling or tripling normal garrison annual flying hours, brigade and battalion commanders also seem to welcome the free pilot labor, especially given that the additional aviators, usually majors and chief warrant officers, have typically completed 2,000-3,000 hours of pilots-in-command (PC), instructor pilots and/or maintenance test pilots. XPs have returned from 6-month deployments having contributed up to 350 combat hours as PC and air mission commanders. Although they integrate into the host unit's Aircrew Training Program to fly those hours in their primary aircraft, the XPs are cross-qualified in numerous rotary- and fixed-wing aircraft, and are indeed at the service of all battalion commanders for many other critical functions.

CONUS-Based Global War On Terrorism (GWOT) Test Support

Since January 2005, eight ATTC XPs have supported six divisions/task forces and embedded to fly UH-60L, AH-64D and OH-58D Kiowa helicopters in Iraq, as well as UH-60L and AH-64A helicopters in Afghanistan. This broad experience base with regard to systems, missions and environments is invaluable to feedback into ongoing GWOT test and development programs. Upon returning to ATTC, the XPs reintegrate into their "real jobs," performing test planning, executing and reporting, but with a broader perspective on the results' operational relevance.

The enhancement to mission-focused testing in support of GWOT is arguably most significant in the attack-reconnaissance mission, where the field manuals have practically been rewritten. As today's attack pilot veterans will confirm, typical missions don't include handfuls of helicopters hovering abreast while targeting tanks at 5 kilometers. Instead, teams of two aircraft constantly move and communicate with ground forces in urban terrain, and aircrews are challenged to employ targeting sensors and weapons at much

closer ranges and higher velocities than before. Firsthand experience with these TTPs enables the XP and test team to craft more relevant test matrices.

Getting the developmental test right is especially crucial in evaluating new systems that don't have dedicated operational testing (OT) events programmed. New tactical lasers, engine barrier filters, heat-seeking missile defense systems and other survivability modifications are all examples of recent GWOT requirements without OT events. During initial testing of the AH-64D Apache CMWS, the use of representative mission profiles in the testing matrix revealed alarming and previously unknown system limitations. A portion of the system was subsequently redesigned and is being retrofitted for deployed units. In a separate survivability test program, in-house combat experience and a continued close relationship with the tactical community led to the tweaking of the test matrix to reflect current TTPs in support of the maiden deployment.

XPs represent a low-supply, high-demand resource in the test community, providing host units with direct acquisition support while facilitating ongoing development of GWOT programs and transformation efforts.

Supporting Army Transformation

Incorporating recent combat experience into Army transformation programs is crucial for the future success of many systems. Final designs of many transformational systems are most able to be influenced during the developmental stages of the acquisition life cycle. Experiences and insights from FOA deployments have already proven invaluable in the development and test planning stages of Apache Block III crewstation design, unmanned aerial system control and integration, digital communications developments and the UH-60M Black Hawk upgrade program. Not surprisingly, the ATTC commander assigned a redeployed OH-58D Kiowa Warrior XP as the upcoming test director for the YRH-70A Armed Reconnaissance Helicopter, which is currently undergoing system evaluations and developmental testing.

XPs represent a low-supply, high-demand resource in the test community, and there is a near-term opportunity cost in pulling them out of their day job to deploy for six months. But in doing so, they contribute to ATEC's critical FOA mission, providing host units with direct acquisition support while facilitating ongoing development of GWOT programs and transformation efforts. This initiative is already helping to ensure that new aircraft, weapons and systems are better tailored to meet combatant commanders' and warfighters' collective needs in today's and tomorrow's fight.

An AH-64 Apache helicopter ATTC XP crew conducts mission-focused CMWS flare separation testing in September 2005. (ATTC photo by Paul Reynolds.)

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Training the 21st-Century Joint Force

Ben Ennis

The Interservice/Industry Training, Simulation and Education Conference (I/ITSEC) is billed as the world's largest gathering of military, industry and academia focused on training and simulations. "Training transformation continues to be influenced by technology advancement while responding to the requirements of combat and security operations on a broad front," related RADM Fredrick L. Lewis, U.S. Navy (USN) (Ret.), President, National Training and Simulation Association. Lewis feels that modeling and simulation (M&S) plays a vital role in preparing trainees to perform their best in challenging, real-world circumstances. Likewise, he views M&S as more than a desirable asset and, in many cases, indispensable to national preparedness and national security.

Soldiers from the U.S. Army's B Troop, 3rd Squadron, 71st Cavalry Regiment (Recon) (3-71st Cav), 10th Mountain Division (Light), participate in combat training at the Joint Readiness Training Center (JRTC), Fort Polk, LA. The training at JRTC simulates/replicates combat situations the Soldiers will face once deployed. The 3-71st Cav will finish their 16-month rotation to Afghanistan in June 2007. (U.S. Army photo by MSGT Johan Charles Van Boers.)

The recent I/ITSEC theme focused on "Training the 21st-Century Joint Force." Lewis moderated an I/ITSEC-sponsored Joint general/flag officer panel. The panel was chaired by Dr. Paul W. Mayberry, Deputy Under Secretary of Defense (DUSD) (Readiness). Other panel members included VADM James K. Moran, Commander, Naval Education and Training Command (NETC); LTG Thomas Metz, Deputy Commanding General/Chief of Staff (DCG/CoS), U.S. Army Training and Doctrine Command (TRADOC); MG Jason Kamiya, Commander, Joint Warfighting Center and U.S. Joint Forces (USJFCOM) Director of Training; BG Douglas Stone, CG, Marine Air Ground Task Force Training Command (MAGTFTC); BG S. Taco Gilbert III, Director, Air Force Smart Operations (AFSO) 21, Office of the Secretary of the Air Force (OSAF); and RDML Cynthia A. Coogan, U.S. Coast Guard (USCG), Director of Reserve and Training. The panel addressed service and organization matters of specific concern while examining training policy influences and how they felt M&S should transform to help solve their respective training challenges. A summary of panel members' training transformation comments and M&S implications follows.

DUSD (Readiness)

Mayberry praised the ingenuity, creativity and products that private industry brings to the training challenges DOD is trying to resolve. According to Mayberry, DOD wants to focus on transforming the Joint force to be a more capable, integrated operation. Overall, he feels the major training transformation challenges and opportunities require that DOD build and share industry successes, establish

An MQ-1 Predator student pilot and student sensor operator pilot "fly" a Predator Unmanned Aerial System during a training session inside a Ground Control Station cell. (USAF photo by TSGT Kevin J. Gruenwald.)

standards and close the military services gaps and seams that require creative thinking and ideas. "In the Joint arena, we need to make training transformation a reality. This requires appropriate interchanges between various services and the interchanges needed to become routine," Mayberry remarked. The challenge is compounded because the acquisition process is too long and the requirements process is not well understood. "As we look out to the future, we continue to face these types of irregular warfare scenarios in which U.S. forces are currently fighting which will include security, stability, transition and reconstruction operations (SSTRO), in the traditional 'stable' of major combat operations," he added. "Certainly we, as an armed force, make tremendous contributions to those SSTRO areas, but it would be much more effective within the context of bringing all of our national and coalition powers to bear," Mayberry concluded.

In the Joint arena, we need to make training transformation a reality. This requires appropriate interchanges between various services and the interchanges needed to become routine.

Commander NETC

Moran gave his perspective of how things are changing in the USN and what that means in terms of challenges for training Sailors. The new age Sailor is called the "Sea Warrior." The Sea Warrior is matched with the position and trained to fit the position at a certain cost.

A major Navy training challenge is that the number of ships is increasing and manpower is decreasing as the Navy moves toward the total combat ship. The total combat ship will be modular, stealthy and optimally manned. Moran, using the Littoral Combat Ship as an example, described the new modular ship. "She is optimally manned. She has a core crew of 75. She is modular, which means that you're going to put a weapon system on her and then take it off," he explained. "You're going to put a sensor platform on her and then take it off. So how do you man that ship and how do you train the crew? We realized the old manning module would not work for the modular ship, so we're building what we call 'hybrid Sailors' who will have skill sets drawn from multiple ratings. The train-to-qualify process is huge for us," Moran continued.

He contends that some skill sets, such as computer analysts, will be the same for all services, so the training and M&S effort should be the same for all services. In fact, Moran proposed that the services bundle the training and build simulators that support all services at a significant cost savings to DOD.

DCG/CoS TRADOC

The Army is building a brigade-based Army. Metz feels this is a great strategy, but he is concerned that the Army may be trailing in a training strategy to support the new brigade combat teams (BCTs). As part of this "train up," the Army needs to learn how to grow brigade commanders. "I am not worried about the individual Soldier," Metz commented. "I am concerned about the leader of the

Soldier. How does the leader really learn how to use all of these pieces of equipment together so that they get more than the sum of the individual pieces of equipment? At the brigade level and above, it's too expensive to mobilize to train the leaders. We need to teach leaders to draw as much as possible from the systems they use. Simulation can certainly help train future Army leaders," Metz continued.

Metz firmly believes that a good way to promote M&S is to reward leaders for using the systems. Building on these technological capabilities, Metz explained the bandwidth/combat power relationship and how M&S technology can increase combat power exponentially. "I sincerely believe we can bring M&S into the combat zone to train troops," Metz suggested. "As a commander in Iraq, I stressed that once troops rested they needed to be retrained to keep their combat skills sharp. The M&S community can help us do that. Simulation will help maintain high intensity capability and share experiences from combat."

Likewise, Metz strongly believes that the Joint Task Force Commands can greatly benefit from simulation to help what he refers to as the "human dimension." "From the corps commander, to the multinational commander to corporal — our successes rest in the human dimension," Metz added. "How do you model culture?"

> We must realize the environment is much more than the military. We need to model political, military, economic, social, infrastructure and information factors in support of effects.

USJFCOM Director of Training

Kamiya echoed Metz's comments related to addressing the human dimensions that our military faces. He feels M&S systems are good at enabling training, but we need M&S to replicate the effects of all elements of national policy such as diplomacy and economics. "We must realize the environment is much more than the military," Kamiya emphasized. "We need to model political, military, economic,

The USN is moving toward the total combat ship that will be modular, stealthy and optimally manned. Realizing the old manning module would not work for the modular ship, the Navy is training "hybrid Sailors" who will have skill sets drawn from multiple ratings. Here, a Sailor signals the launch of an aircraft from the catapult on an aircraft carrier's flight deck. (USN photo by PO3 Rob Gaston.)

Paratroopers from the U.S. Army's 82nd Airborne Division, Fort Bragg, NC, are hooked up as they prepare for a nighttime static line jump from a USAF C-17 Globemaster III aircraft. The paratroopers and the aircraft were training as part of Exercise Joint Forcible Entry. (USAF photo by TSGT Jerry Morrison.)

social, infrastructure and information factors in support of effects. Solutions aren't necessarily found in the military ranks."

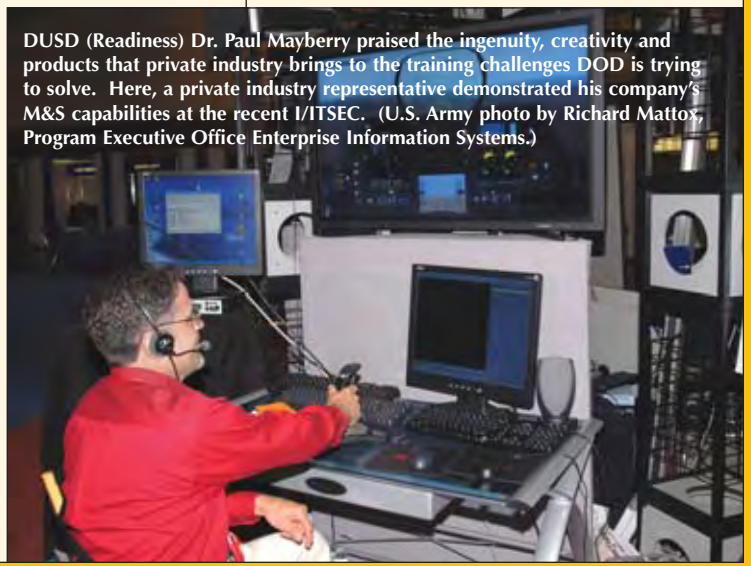
Kamiya wants the military services and private industry to consider the following challenges that M&S can have significant impact on:

- We need to ask the question, "Are we doing the right thing, not whether we're doing things right?" Where can industry help?
- We need a rapid database development accessible to the total force.
- We need help in expanding distributed learning capabilities.
- We need support in being a service provider for training the National Guard for homeland defense and civil support missions. We need to make it available in a seamless transparent way to our Reserve forces as well.

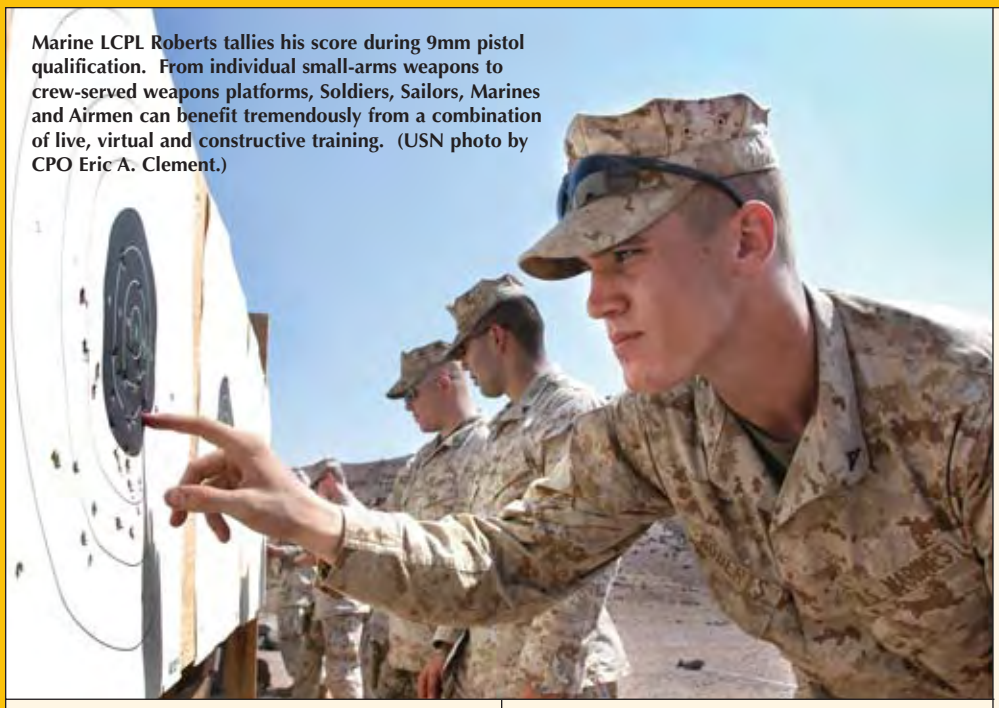
CG MAGTFTC

Stone's command trains all Marines who go into Afghanistan and Iraq. He believes innovative technology will, ultimately, help improve training. He said he has the ground and space to train but cannot adapt as fast as the enemy. "The enemy changes faster than we can adapt on the ground, therefore, we need simulation [to close the gap]," Stone pointed out. "The training needs to be live, virtual, constructive and interoperative, and it would be better if we could do more training at home station. We need simulation to help fight and win. The Marines are building the largest combined arms military operations on urban terrain facility in DOD, and we need to create all of this in simulation."

Stone gave a real-world example of how the Marines used simulation to



DUSD (Readiness) Dr. Paul Mayberry praised the ingenuity, creativity and products that private industry brings to the training challenges DOD is trying to solve. Here, a private industry representative demonstrated his company's M&S capabilities at the recent I/ITSEC. (U.S. Army photo by Richard Mattox, Program Executive Office Enterprise Information Systems.)



Marine LCPL Roberts tallies his score during 9mm pistol qualification. From individual small-arms weapons to crew-served weapons platforms, Soldiers, Sailors, Marines and Airmen can benefit tremendously from a combination of live, virtual and constructive training. (USN photo by CPO Eric A. Clement.)

solve a serious problem — how to prevent High Mobility Multipurpose Wheeled Vehicles (HMMWVs) from flipping over and being destroyed. The Joint Conflict and Tactical Simulation HMMWV Egress Assistance Trainer was used to simulate HMMWVs flipping over and give Marines confidence in exiting overturned vehicles. Stone feels industry can help by continuing similar production and technological innovations with a wartime mentality, and to help develop decision-making tools and unique methods to train from a strategic perspective the Marine's junior leaders of tomorrow. Once developed, all simulation tools need to be thoroughly integrated.

A USCG crewman salutes as he steps aboard the medium endurance cutter CGC Campbell (WMEC 909). The USCG is actively training crewmen using M&S. Simulation training is performance-based and has helped crewmen adjust to a wide range of homeland security missions. (USCG photo by PO3 Luke Pinneo.)

Director AFSO 21, OSAF

Gilbert refers to the current situation in the U.S. Air Force (USAF) as "The Burning Platform." According to Gilbert, resource constraints continue to mount, equipment continues to age, manpower costs are escalating and energy costs are rising dramatically. Therefore, the simulation heights for the USAF are continuing to be pushed. Gilbert is optimistic about where simulation will take his service in the future. "The USAF has created a marriage between process improvement and flight training, but we have only scratched the surface. I feel we are underutilizing the investment we have."

USCG Director of Reserve and Training

Coogan emphasized that the USCG wants to ensure the training provided is performance-based. Referring to all Coast Guardsmen as 'The Performer,' Coogan remarked, "The Performer is the center of our universe. We strive to equip people to ensure performance. The challenge is to reduce high-cost training. The deepwater systems platform is the USCG future. The challenge is using simulators to train the crew, and we are excited about receiving our first small-boat simulators," Coogan concluded.

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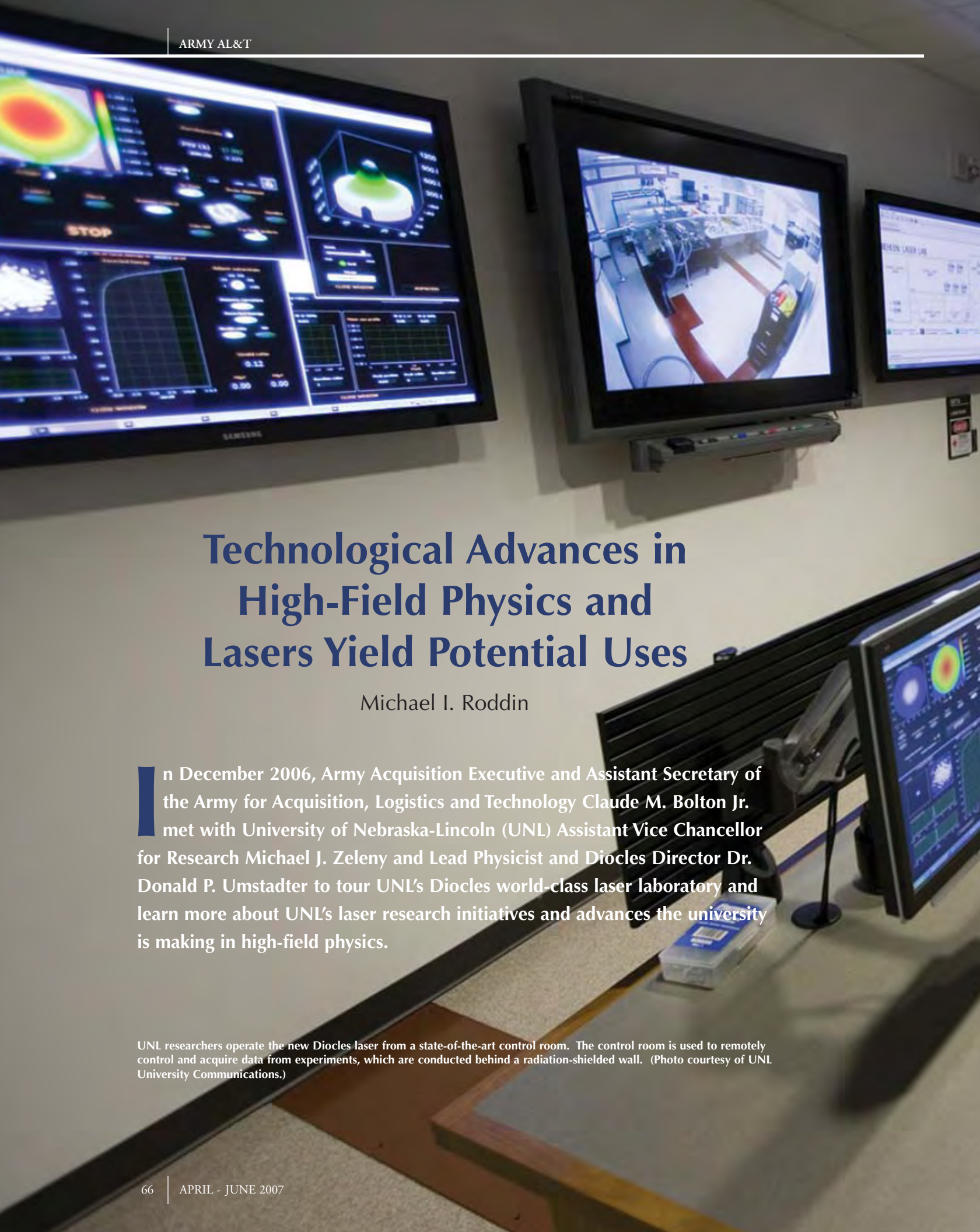


Technological Advances in High-Field Physics and Lasers Yield Potential Uses

Michael I. Roddin

In December 2006, Army Acquisition Executive and Assistant Secretary of the Army for Acquisition, Logistics and Technology Claude M. Bolton Jr. met with University of Nebraska-Lincoln (UNL) Assistant Vice Chancellor for Research Michael J. Zeleny and Lead Physicist and Diocles Director Dr. Donald P. Umstadter to tour UNL's Diocles world-class laser laboratory and learn more about UNL's laser research initiatives and advances the university is making in high-field physics.

UNL researchers operate the new Diocles laser from a state-of-the-art control room. The control room is used to remotely control and acquire data from experiments, which are conducted behind a radiation-shielded wall. (Photo courtesy of UNL University Communications.)

Unveiled in August 2006, Diocles is the latest in a new generation of compact lasers that help researchers produce very brief pulses of extremely intense light. Known as femtosecond optical pulses, they are employed through an ultra-high-intensity laser system that helps scientists study the interactions of light with matter at the highest attainable field strengths. UNL's Diocles has the highest combination of peak-power densities and repetition rates of any laser in the United States, delivering 100 Terawatts at 10 Hertz.

When focused, Diocles is capable of directly increasing an electron's mass relativistically by 20 times.

This latest advance in high-field physics and laser research enables UNL scientists to generate the same level of intense light (in the form of X-rays) in a room-sized configuration that formerly could only be produced by a huge synchrotron accelerator more than a mile in circumference. What does this mean in lay terms? UNL Diocles Director Umstadter says "We can create a tiny 'sun' in the laboratory at the focus of the laser." If this is reminiscent of the nexus where science and science fiction converge, you're not far off, especially if you are a Marvel® Comics Spiderman or Doc Ock fan and remember the 2004 Spiderman 2 movie.

High-Field Science

Physics, traditionally referred to as the science of matter and energy and of interactions between the two, attempts to measure the physical properties,

UNL Diocles Director Dr. Donald P. Umstadter (left) orients Army Acquisition Executive Claude M. Bolton Jr. to the university's ongoing high-field science and laser research prior to a Diocles lab demonstration. (Photo courtesy of UNL University Communications.)

interactions, processes or laws that scientists encounter as they study natural or material world phenomena. High-field science physics is based on the creation of extremely high peak-power levels by squeezing pulses with modest energy levels into ultra-short time frames. When focused, these pulses create electric field strengths rivaling those that bind the innermost electrons of an atom to its nucleus.

> This latest advance in high-field physics and laser research enables UNL scientists to generate the same level of intense light (in the form of X-rays) in a room-sized configuration that formerly could only be produced by a huge synchrotron accelerator more than a mile in circumference.

Umstadter and his research team are pioneering this relatively new physics research endeavor called high-field science. Their studies involve the nonlinear optics of ultra-high-intensity lasers interacting with plasmas, also known as ionized gas. The extreme light created by the new laser is enabling applied scientific exploration into applications for advanced radiation sources and particle accelerators.

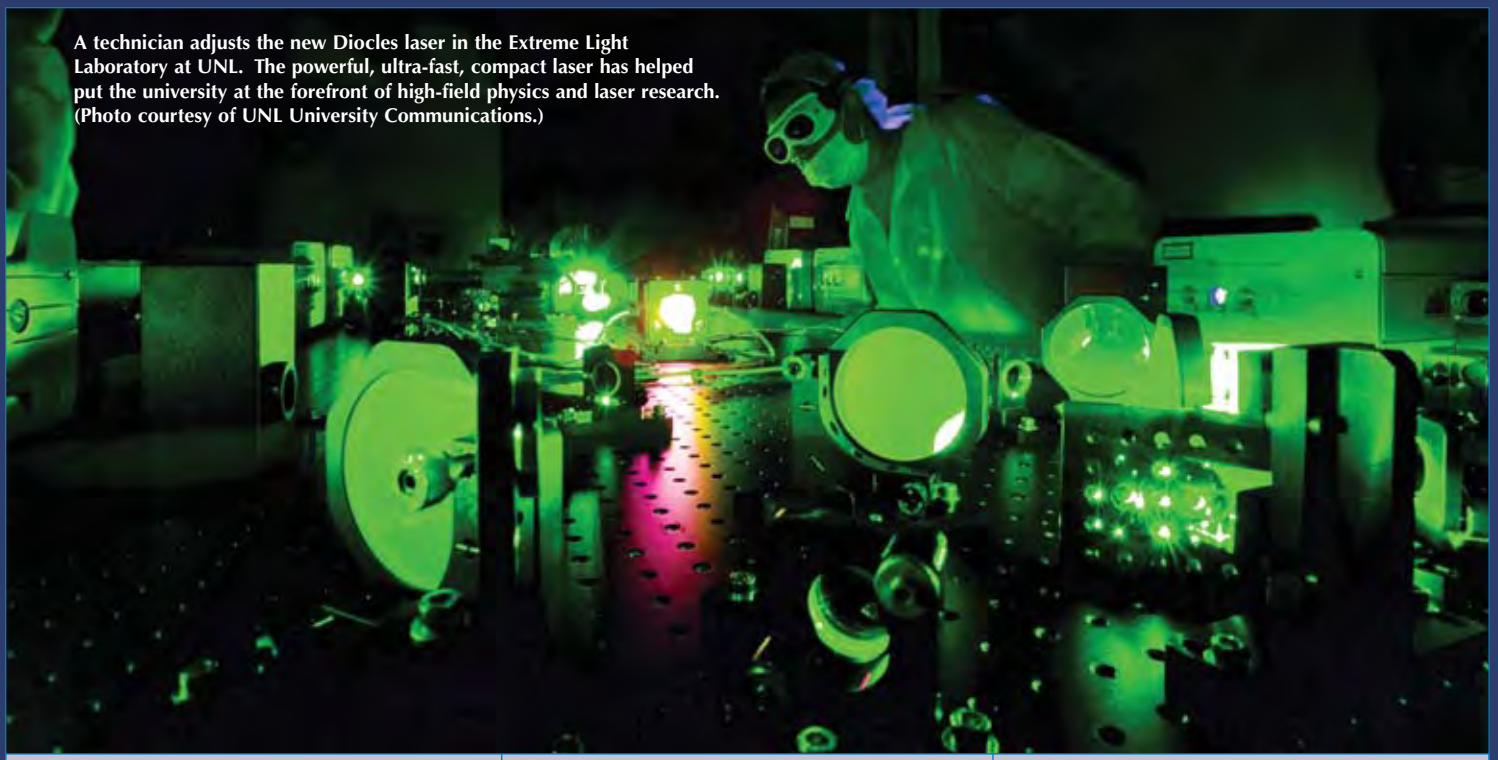
Moving forward, researchers don't know the depth yet of what can be discovered, because the interaction of light with electrons is highly nonlinear at high intensities and new physical regimes can only be entered at high photon energies. However, scientific expectations are high that the UNL laser research studies of electron correlations in atoms and molecules will unlock new knowledge that will lead to specific commercial and industrial applications in the very near future. Scientists contend that the understanding of electron correlations is vital to modern technology. Superconductors, quantum computers and novel nanomaterials are based on the unusual properties of electron correlations.

Diocles Laser Research

Named for inventor Diocles, who is credited with inventing the first parabolic reflector in 200 B.C., the laboratory uses this device as a focusing element to increase the intensity of light for experimentation purposes. As Umstadter explains the process, Diocles begins with a modest amount of energy from a short pulse, then stretches the pulse and sends it through a series of amplifiers and titanium sapphire crystals to pump up its power. What makes Diocles capable of delivering such high power is a compression stage, where the stretched, amplified pulse is compressed back into a very short, extremely powerful pulse. This process prevents damage to the amplifiers and allows the powerful light beam to hit a parabolic reflector that focuses its power to extreme intensities.

UNL officials purport that the focused Diocles laser light is the strongest produced on Earth, creating conditions only found in stars like the sun. Accordingly, any material subjected to such conditions becomes heated to extreme temperatures and pressures, and

UNL scientists use ultra-powerful light applications to perform a variety of functions. For instance, the Defense Advanced Research Projects Agency provides funding to UNL for developing radiation sources that can be used to diagnose cracks in turbine blades before they can lead to catastrophic jet engine failure. (Photo courtesy of UNL University Communications.)

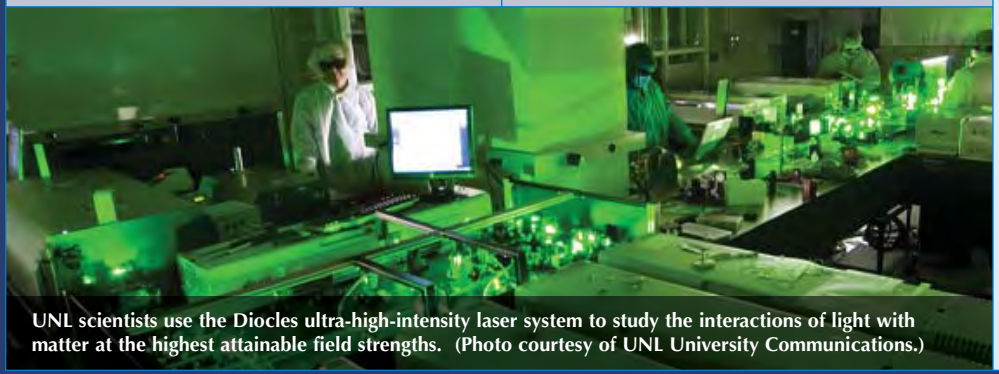


A technician adjusts the new Diocles laser in the Extreme Light Laboratory at UNL. The powerful, ultra-fast, compact laser has helped put the university at the forefront of high-field physics and laser research. (Photo courtesy of UNL University Communications.)

converts the material to the fourth state of matter — plasma. Umstadter's research team uses Diocles to study, under highly controlled conditions, the interactions of light with the hottest fire ever produced in a laboratory setting.

Umstadter is confident that the Diocles laser has the potential for reaching the highest light intensity ever produced by any laser in the world. He contends that Diocles' compact, ultra-fast, high-intensity laser can produce more power than 100,000 Hoover Dams in bursts lasting only 30 billionths of one millionth of a second. "When you focus the laser to its highest intensity, you are creating conditions that have never been produced on Earth," Umstadter remarked. "In fact, we can produce pressures that are greater than those at the core of the sun."

Umstadter and his research group are confident that such extreme conditions are likely to lead to new scientific discoveries and, eventually, to new technologies and applications in the science, medical, industrial/manufacturing, defense and security sectors. For example, Diocles produces gamma rays (X-rays) that can "see through" 4-inch-thick steel to detect bomb or nuclear material hidden in cargo containers, or help engineers pinpoint hairline fractures in jet turbine engines and bridge and building infrastructures. Because lasers are small and relatively inexpensive, the medical community could potentially use this laser technology as a proton source for cutting-edge cancer therapy. Obviously, the lessons learned from future UNL studies could benefit ongoing Department of the Army laser research studies and experimentation at the Army's labs. Ultimately, Umstadter hopes to discover what happens to matter when it interacts with light at its most intense state. The Diocles laser is the best way to produce such extreme light, and he hopes his team's research initiatives will raise high-field physics and laser research to the next level.



UNL scientists use the Diocles ultra-high-intensity laser system to study the interactions of light with matter at the highest attainable field strengths. (Photo courtesy of UNL University Communications.)

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The 25th Army Science Conference (ASC) — Charting the Future of S&T for the Soldier

Dr. John A. Parmentola and Robert Khan

The ASC, sponsored by the Assistant Secretary of the Army for Acquisition, Logistics and Technology (ASAALT), has been held every 2 years since it's inception in 1957. In his keynote address to attendees at the first ASC, U.S. Army Chief of Research and Development LTG James Gavin said, "I am delighted to see a meeting here. I would sooner see a meeting of the scientists than our top military people here because we want ideas, we need your assistance. We're dealing with an exceedingly difficult problem in a dynamic period of our Nation's history. We need your help in every way possible for you to give it to us."

The U.S. Army Research Laboratory's John Hopkins (left) talks about the PackBot fuel cell and battery with Claude M. Bolton Jr. (middle), AAE/ASAALT, and John J. Young (right), Director, Defense Research and Engineering, Office of the Secretary of Defense (OSD), at the 25th ASC.

* U.S. Army photos by Richard Mattox, Program Executive Office Enterprise Information Systems.

The 25th ASC was held in Orlando, FL, on Nov. 27-30, 2006. This prestigious event celebrated 50 years of Army sponsorship of innovative science and technology (S&T) for our Soldiers and marked a significant milestone for the Army S&T community. In his letter to 25th ASC attendees, U.S. Army Vice Chief of Staff GEN Richard A. Cody echoed Gavin's words from the first ASC. "Our emerging technological innovations must provide the strategic advantages our Soldiers need to always stay one step ahead in today's dangerous environment. The Army is looking to its scientists and engineers to continue to direct their talents and energies in support of the Soldier," wrote Cody.

The 25th ASC

The ASC follows in a long tradition of essential scientific activities that are needed to further scientific investigation and inquiry. The ASC focuses entirely on research that is relevant to the Army and its mission. It brings Army scientists and engineers together with those from academia, industry, other government agencies and our foreign partners who are focused on Army issues. It is a unique forum, where scientists and engineers concerned with addressing Army challenges from anywhere in the world, can openly and freely discuss the latest advances in research covering 16 disciplines relevant to the Army mission. The conference also:

- Addresses the latest ideas being proposed by world leaders in their research fields.
- Initiates new partnerships and collaborations through the exchange of ideas.
- Allows attendees to acquire new knowledge through dialogue and discussion.
- Enables young Army researchers to grow personally and professionally by engaging world leaders in their fields of research relevant to the Army.
- Enables scientists and engineers to present their latest research results to the world community working on Army problems.

The major product that results from this forum is a peer-reviewed *Conference Proceedings*, which contains more than 80 seminal papers of high quality and relevance to the Army mission. These 80 papers were selected from a peer review of more than 900 submittals. The *Conference Proceedings* package is distributed to major libraries worldwide and serves as an official reference for those who contributed original research papers to this prestigious and highly

Dr. John Parmentola, Director of Research and Laboratory Management, Office of the Deputy Assistant Secretary of the Army for Research and Technology, was master of ceremonies for the 25th ASC in Orlando.

relevant publication. In addition, there are collaborations, partnerships, new ideas and the expansion of human networks to further advance Army S&T. The ASC communicates the Army vision to a very broad world community as well as to Congress, which ultimately decides on the Army S&T budget annually. There is no other opportunity for Congress or, for that matter, anyone else to experience the breadth and depth of the Army's S&T program other than through the ASC. In this sense, the ASC is critical to the Army so long as S&T is required to fulfill the Army's mission now and in the future.

Since its inception, the ASC has grown from a small gathering of Army scientists and engineers to an international event attended by more than 1,600 people from 30 different nations. Authors of the most outstanding technical papers presented at the conference receive special recognition and awards. In addition, an *International Collaboration Award* was inaugurated at the 25th ASC to recognize contributions from the world community that have significant potential for benefiting our Soldiers.

Theme and Exhibits

The theme for the 25th ASC, *Transformational Army Science & Technology — Charting the Future of S&T for the Soldier*, emphasized the S&T community's importance in providing leading-edge capabilities for Soldiers now and in the future. An acknowledgement of the past, recognition of the impressive accomplishments of the present and enthusiasm for the future was evident throughout the conference. More than 70 exhibitors from the Army, industry, academia and international partners presented major innovations at the S&T showcase that featured S&T advancements that are having, or will have, impacts on warfighting capabilities.

At various locations throughout the S&T showcase were focus areas devoted to key capabilities that enable the Army to carry out its mission to shoot, move, communicate, sense, protect and train. The technologies and systems displayed within these focus areas date back from the first ASC in 1957, to the modern day systems used in Iraq and to products being developed for the Future Combat Systems (FCS) and Future Force. As an example of the dramatic advancements that have occurred over this period, visitors were able to compare a Sherman Tank, a current-day Stryker and an Unmanned Ground Combat Vehicle with FCS application.

John J. Young, Director, Defense Research and Engineering, OSD, addresses the 25th ASC's participants about the government's refined contract award processes.

Speakers

The 25th ASC also featured 24 speeches and presentations by DOD and Army leadership, international defense S&T community leaders, Army and U.S. Marine Corps (USMC) warfighters and eminent scientists — including seven Nobel Prize winners, strategic thinkers and futurists, and those promoting education in mathematics, science and engineering for our Nation's youth. You can see and hear the guest speakers' 25th ASC speeches and presentations by accessing the Defense Acquisition Web site at **http://view.dau.mil/ dauvideo/view/channel.jhtml?stationID=1994197044**.

In this article, we present highlights of some of the conference's presentations. Dr. John Parmentola, the Army's Director of Research and Laboratory Management and the ASC's lead organizer and moderator, introduced Army Acquisition Executive (AAE)/ASAALT Claude M. Bolton Jr., sponsor and host for the 25th ASC. Bolton welcomed the audience and spoke briefly about capabilities that the Army S&T community is working on in various technical areas. He noted that the greatest challenge facing the Army is recruiting and retaining qualified people. Bolton stated, "Everything we do in the Army starts with people, and we as a Nation are not producing enough qualified people to meet existing requirements." Professor Colin Gray, the Chair in International

Politics and Strategic Studies at the University of Reading in the United Kingdom (U.K.) and, at times, an advisor to the U.S. government, presented a strategic look at security threats in the 21st century. LTG Paul Van Riper (USMC, Ret.) eloquently and lucidly presented his views on future warfighting capabilities necessary to succeed in the future environment that Gray described.

Claude M. Bolton Jr., AAE/ASAALT and ASC host, addresses several of the Army's most notable S&T accomplishments, including the ongoing FCS program, the largest and most complex effort the Army has ever undertaken.

The Army has sponsored 30 eminent scientists who have won Nobel Prizes. Seven of the Army-sponsored Nobel Laureates accepted invitations to speak at the 25th ASC. (See related story titled *Wise and Witty – Seven Nobel Laureates Address 25th Army Science Conference* on Page 76 of this issue.)

Dr. Leroy Hood, President of the Institute for Systems Biology in Seattle, WA, gave the audience a fantastic glimpse into the future of medicine, where the analysis of a drop of blood taken from someone remotely and analyzed will enable a timely diagnosis of that person's state of health.

> Our emerging technological innovations must provide the strategic advantages our Soldiers need to always stay one step ahead in today's dangerous environment. The Army is looking to its scientists and engineers to continue to direct their talents and energies in support of the Soldier.

Awards

Authors of the most outstanding papers in each of 16 technical categories received *Best Paper Awards* at the closing banquet. Three of the 16 Best Papers were further selected as the highest quality research efforts presented at the conference. Author(s) of the overall best paper received the *Paul A. Siple Memorial Award*, while authors of the two next best papers received bronze medallions.

The *International Collaboration Award* was presented to those authors whose work was selected by a panel of scientific peers and deemed to be the most outstanding collaborative research effort between U.S. Army and foreign scientists that expanded and enhanced the Army's research and technology program while benefiting the scientific interests of the collaborating foreign scientists.

The list of oral paper presenters included seven Junior Science and Humanities Symposium winners from 2005 and 2006. Papers presented by these students will be included with 80 other papers from authors in government, academia, industry and foreign nations that will be published in the *25th ASC Proceedings*.

Additionally, a group of eCYBERMISSION winners from the local area toured the S&T Showcase. Winners of the *2005* and *2006 Research and Development Awards* were also recognized at the conference.

Best Paper Awards

International Collaboration Award winners were: Dr. Dirk R. Klose, Dr. Israel Mayk, Anthony Tom, Andrew Chan, Mike Mai, Gunther Kainz, Joseph Hnat and Bernard Gore (Software Design) from the U.S.; Heinz-Bernd Lotz, Alfred Pfaendner and Hans-Peter Menzler from Germany; Cyrus Aiken, David Bryant and LTC James Derosenroll from Canada; Herve LeGoeff, Lionel Khimeche and LTC Patrick Bezombes from France; LTC Dror Schwartz, LTC Amir Ziv and LTC Ehud Kauf from Israel, for their paper titled *Simulation and C2 Information Systems Connectivity Experimentation (SINCE) Project*.

The 25th ASC *Paul A. Siple Memorial Award* winners were: Dr. Dattatraya Dandekar, Dr. James W. McCauley and W.H. Green from the U.S. Army Research Laboratory (ARL); Dr. Neil K. Bourne from the University of

GEN Benjamin S. Griffin, U.S. Army Materiel Command (AMC) Commanding General, discusses AMC's numerous S&T contributions to both the Army and the Joint community.

Dr. Thomas Killion, Deputy Assistant Secretary of the Army for Research and Technology and the Army's Chief Scientist, highlighted some of the latest technologies Army S&T is working on, including avatars that allow human to virtual human interaction.

Manchester, U.K.; Dr. Mingwei Chen from Johns Hopkins University and Tohoku University of Sendai, Japan, for their paper titled *Global Mechanical Response and its Relation to Deformation and Failure Modes at Various Length Scales under Shock Impact in Alumina AD995 Armor*. This paper was also selected as the best paper in the Advanced Materials and Manufacturing Technology technical category.

The first bronze medallion was awarded to Dr. Matthew Spenko of Stanford University, Dr. Karl Iagnemma of the Massachusetts Institute of Technology (MIT) and Dr. Jim Overholt of the U.S. Army Tank Automotive Research, Development and Engineering Center (TARDEC), for their paper on *High Speed Hazard Avoidance for Unmanned Ground Vehicles in Emergency Situations*. This paper was selected the best paper in the Unmanned Systems technical category.

The second bronze medallion went to Dr. Bradley W. Schilling, Dr. Stephen Chinn, Dr. Lew Goldberg, Dr. Alan D. Hays and Dr. C. Ward Trussell from the U.S. Army Communications-Electronics Research, Development and Engineering Center (CERDEC), for their paper titled *End-Pumped Monoblock Laser for Eyesafe Targeting Systems*. This paper was selected the best paper in the Sensors and Information Systems technical category.

Best paper awardees in the 13 other technical categories were:

- Dr. Kamal Sarabandi from the University of Michigan and George Palafox of CERDEC, for their paper *Reducing Antenna Visual Signature Using Meta-Materials*, in the Information Technology/Command, Control, Communications, Computer, Intelligence, Surveillance and Reconnaissance category.

Dr. Roger Lough, Chief Defence Scientist, Defence Science and Technology Organisation, Department of Defence, Australia, explained that his country's S&T endeavors include quantitative analysis, strategic analysis, advanced engineering and support.

- Dr. Raul Radovitzky, Dr. Zisu Zhao and Dr. Ludovic Noels of MIT; and Dr. Sean Mauch of the California Institute of Technology, for their paper titled *Lagrangian Simulation of Penetration Environments via Mesh Healing and Adaptive Optimization*, in the Advanced High Performance Computing in Physical Sciences and Engineering category.
- Professor Michael Hinton, Dr. T. Andrews, Dr. Philip Church, Dr. Ian Cullis, Dr. Steven Gilbert, Dr. Michael Hamblin and Dr. David Porter of QinetiQ Co.; Dr. B. Proud of Cambridge University; and Dr. A. Pullen of the Imperial College, all in the U.K., for their paper titled *Penetrating Buildings in Urban Operations - Towards Weapons Design by Simulation*, in the Lethality Technologies category.
- Dr. Parimal Patel, Gary Gilde and Dr. Alex Hsieh of ARL for their paper titled *Improved Low-Cost Multi-hit Transparent Armor*, in the Force Protection/Survivability category.
- Dr. Peter Schihl, Dr. Walter Bryzik, Laura Hoogterp, Harold Pangilinan and Ernest Schwarz of TARDEC for their paper titled *Modeling JP-8 Fuel Effects on Diesel Combustion Systems*, in the Power and Energy category.
- Susan Robinson, Antonio Roque, Dr. David Traum and Ashish Vaswani of the University of Southern California (USC) Institute for Creative Technologies; Charles Hernandez of ARL; and Bill Millspaugh of Tec-Masters Inc., for their paper titled *Evaluation of a Spoken Dialogue System for Virtual Reality Call*

U.K. Ministry of Defence Director General (Research & Technology) Phil Sutton addresses the 25th ASC concerning potential security threats and what the scientific community is doing to abate them.

Retired USMC LTG Paul Van Riper strongly advised the S&T community to study the new counterinsurgency field manual about to be issued to find ways it can support warfighters and defeat worldwide terrorism.

for Fire Training, in the Immersive Technology category.

- Dr. Peter Tikuisis of Defence Research and Development Canada for his paper titled *Target Detection, Identification, and Marksmanship Under Various Types of Physiological Strain*, in the Behavioral Sciences and Human Performance category.
- Dr. Xiugong Gao and Dr. Prabhati Ray of the Walter Reed Army Institute of Research, Dr. Radharaman Ray of the U.S. Army Medical Research Institute of Chemical Defense, and Dr. Peter Barker and Dr. Yan Xiao of the National Institute of Standards and Technology, for their paper titled *Anti-Cytotoxic and Anti-inflammatory Effects of the Macrolide Antibiotic Roxithromycin in Sulfur Mustard-Exposed Human Airway Epithelial Cells*, in the Biomedical Technologies category.
- Dr. Kevin O'Connell and Dr. Evan Skowronski of the U.S. Army Edgewood Chemical Biological Center, Jonathan Leshin and Dr. Kenneth L. Dretchen of Georgetown University and Dr. Andrea Weeks of George Mason University, for their paper titled *Discovery and Characterization of Novel Signatures from the Ricinus Communis (castor bean) Genome*, in the Biotechnology category.
- Dr. Shubhra Gangopadhyay, Steven Apperson, Dr. Keshab Gangopadhyay, S. Subramanian, Dr. Shameem Hasan and Dr. Rajesh Shende of the University of Missouri-Columbia; and Dr. Deepak Kapoor, Steve Nicolich and Paul Redner of the U.S. Army Armament Research, Development and Engineering Center (ARDEC), for their paper titled *Novel Nanostructured Energetic Materials*, in the Nanotechnology category.
- Dr. Manijeh Razeghi, H. Lim, Dr. Alan A. Quivy, M. Taguchi, S. Tsao and W. Zhang of Northwestern University's Center for Quantum Devices, for their paper titled *Infrared Imaging With Self-Assembled InGaAs Quantum Dot Infrared Photodetectors*, in the Microelectronics and Photonics Technology category.

According to Dr. Colin Gray, Chair, International Politics and Strategic Studies, the University of Reading, U.K., the security threats we face in the 21st century are a return of a great power conflict, climate change, uneven development in the world, overpopulation, resource shortages, nuclear wars and terrorism.

- Dr. Mohammad Qasim and Dr. Leonid Gorb of ARDEC; Dr. Jerzy Leszczynski of Jackson State University's Computational Center for Molecular Structure and Interactions; and Particia Honea of the University of Mississippi Medical School, for their paper titled *Molecular Structure Determines Chemical Reactivities and, thus, Transformation Pathways*, in the Environmental and Engineering Geosciences category.
- Dr. Latha Kant, Dr. Farooq Anjum and Dr. Kenneth Young of Telcordia Technologies, for their paper titled *Design & Analysis of Scalable Network-Centric Warfare Mechanisms*, in the Advanced Modeling and Simulation category.

Conference survey results and numerous remarks by attendees indicated that an overwhelming majority found that the information and opportunities presented during the conference were very beneficial and that the 25th ASC was the best ever. The conference enabled the Army S&T community to engage a very broad audience on the S&T challenges underpinning Army transformation to the Future Force. Many presentations were once-in-a-lifetime opportunities to hear extraordinary individuals expound on their own research and unique insights into the future of S&T. The collaborations and partnerships formed and information exchanged at the conference will undoubtedly reap numerous and unimaginable dividends in the future.

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ROBERT KHAN is a Senior Program Management Analyst with Dynetics Inc. He has a B.S. in civil engineering and construction technology from Temple University and an M.S. in systems management from USC.

Dr. Leo Esaki, the 1973 Nobel Prize winner in physics, shares his inspiration with ASC attendees. (U.S. Army photo by Richard Mattox, Program Executive Office Enterprise Information Systems (PEO EIS).) Depicted in the inset photo, Dr. Leo Esaki (right) carries one of the first Sony tape recorders to a 1958 European electronics conference. At left is Dr. William B. Shockley, 1956 Nobel Prize winner in physics. (Photo courtesy of Dr. Leo Esaki.)

Wise and Witty — Seven Nobel Laureates Address 25th Army Science Conference (ASC)

Meg Williams

The U.S. Army celebrated its past scientific accomplishments, showcased current experiments and research, and welcomed current and future scientists to the 25th ASC, Nov. 27-30, 2006, in Orlando, FL. It was a rare treat and great honor for the more than 1,600 participants to hear speeches from seven Nobel Laureates who earned their prizes while they worked on Army projects. After they finished speaking, many people in the audience brought their programs to be autographed and had their pictures taken with the great scientific minds of the past 50 years:

- Dr. Charles H. Townes, 1964 Nobel Prize in physics for the invention of the laser and maser.
- Dr. Leon Cooper, 1972 Nobel Prize in physics for his studies on the theory of superconductivity.
- Dr. Leo Esaki, 1973 Nobel Prize in physics for electron tunneling in solids.
- Dr. Leon M. Lederman, 1988 Nobel Prize in physics for the neutrino beam method and discovery of the muon neutrino.
- Dr. Robert F. Curl, 1996 Nobel Prize in chemistry for the discovery of fullerenes.
- Dr. David M. Lee, 1996 Nobel Prize in physics for discovering superfluidity in helium-3.
- Dr. John B. Fenn, 2002 Nobel Prize in chemistry for identification methods and structure analyses of biological macromolecules.

The laureates brought slides and viewgraphs and told the stories of their famous discoveries. It was like having a front-row seat to the seminal science lectures of the past half century — it was sublime. To see the laureates' presentations, go to **www.asc2006.com**. To watch their filmed speeches, go to

the Defense Acquisition University's Web site at **http://view.dau.mil/dauvideo/view/channel.jhtml?stationID=1994197044**.

Dr. John Parmentola, Director of Research and Laboratory Management, Office of the Deputy Assistant Secretary of the Army for Research and Technology, said that the U.S. Army has sponsored and supported 30 Nobel Prize winners over the years. "We find through our experiences and inquiries a profound intelligence in the natural world, which is much greater than our own," Parmentola said. "There are rare moments in human history where the very few have had the fortune and talent to touch this intelligence with their minds, albeit for a brief moment. They are the rare ones who at that rare moment are the first to understand something that no human has understood before."

"Through this process we call research, these remarkable individuals bring certainty to an uncertain world," Parmentola continued, "and, as a result, their profound discoveries lead to further discoveries and numerous innovations to help improve the human condition and give us all hope that we can achieve a better world for all mankind."

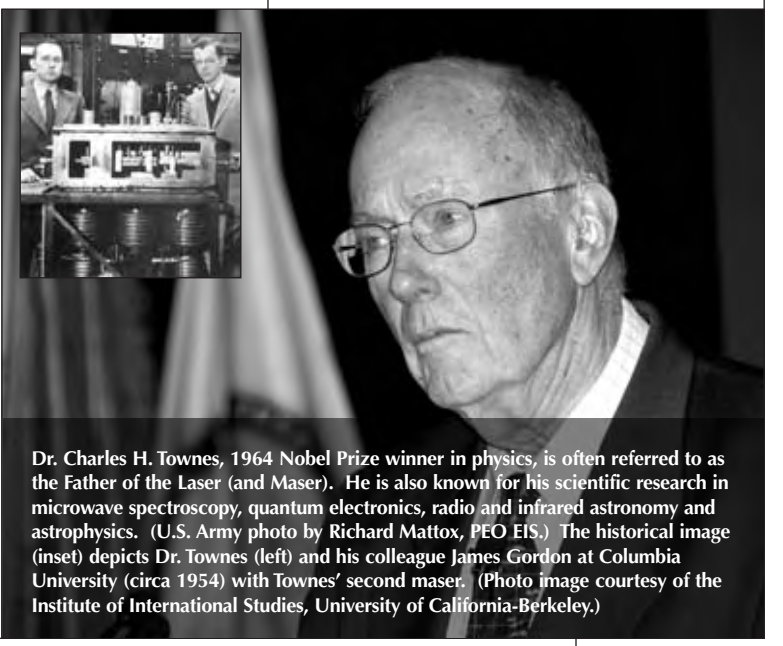
The seven Army-sponsored Nobel laureates spoke of the "creative failures" that propelled them to their winning discoveries. They all also pointed out that such discoveries are never found by only one person, but rather teams of researchers; and they delved into the mindset it takes to press toward a goal. Following are some of their nonscientific stories that the Army Acquisition, Logistics and Technology Workforce can apply to its daily work ethic.

Experts Are Not Always Right

Esaki, one of the participants in the quantum revolution, said his success in discovering the Esaki Tunnel Diode, the first quantum electron device, in 1947 could be credited to his willingness to move to new environments and question authority figures during his younger years. It was very common for Japanese workers to stay with one company for their entire careers. Esaki did not follow that path, moving from a small Japanese company to Sony to the IBM Watson Research Center in the United States. He presented his "Five Don'ts" for anyone interested in realizing his or her creative potential. "Who knows," Esaki said, "it may even help you win a Nobel Prize."

- Don't allow yourself to be trapped by past experiences. If you allow yourself to get caught up in social convention or circumstances, you will not notice the opportunity for a dramatic leap forward when it presents itself. We have a "judicious mind" and a "creative mind." More important is the creative mind. We work from the age of 20 to 70. We use our creative mind until we are 45. The crossing point is 45. Then he turned to the crowd and winked, "If you are older than 45, don't believe my theory."
- Don't allow yourself to be overly attached to any authority in your field or you risk losing sight of yourself.
- Don't hold on to what you don't need. We have easy access to an enormous amount of information. In terms of memory, the human brain has not changed much since ancient times. Constantly input and delete information and only save the truly vital and relevant information.
- Don't avoid confrontation. At times it's necessary to put yourself first and defend your own position. Fighting is sometimes unavoidable for the sake of self-defense.
- Don't forget your spirit of childhood curiosity. It is a vital component for imagination.

Esaki displayed his playful spirit when he showed a photograph of himself and another Nobel Laureate, Dr. William B. Shockley, taken at a 1958 European electronics conference (Page 76). Working for Sony at the time, Esaki took the latest Sony development, a tape recorder — a very large device in its first incarnation. The first stop before arriving in Europe was New Delhi, and he demonstrated the recorder for the customs officers. "It was the first time they had seen such a thing and they wanted to buy it," Esaki recounted. "Someone asked if it recorded English. 'No,' I told him, 'it's still in development stage and it records only Japanese.'"



Dr. Charles H. Townes, 1964 Nobel Prize winner in physics, is often referred to as the Father of the Laser (and Maser). He is also known for his scientific research in microwave spectroscopy, quantum electronics, radio and infrared astronomy and astrophysics. (U.S. Army photo by Richard Mattox, PEO EIS.) The historical image (inset) depicts Dr. Townes (left) and his colleague James Gordon at Columbia University (circa 1954) with Townes' second maser. (Photo image courtesy of the Institute of International Studies, University of California-Berkeley.)

Dr. David M. Lee, 1996 Nobel Prize winner in physics for his collaborative work on low-temperature helium-3, was one of the ASC's distinguished presenters. (U.S. Army photo by Richard Mattox, PEO EIS.)

Keep an Open Mind

Townes, the inventor of the laser, echoed Esaki's advice to stay true to your own ideas. "We have to be willing to differ with senior people in our field," he advised. "We have to be willing to differ with the majority. We have to be willing to explore new ideas. I had convinced myself that the maser had to work. I had the idea in 1951 and we first got it working in 1954."

As they outlined how they had come to their important discoveries, many of the seven Nobel Laureates emphasized how important it is to have interactions between different scientific and engineering fields, people, industries and universities. "It is important for us to be open-minded and explore those things that we don't know are going to pay off," Townes continued. "Once I had the idea for the laser, I could see applications for communications, precise measurements, cutting and burning. But I never dreamed the laser would be useful to medicine. I'm emotionally very moved when someone tells me that laser surgery saved their eye or reattached their retina. I never dreamed that would happen."

Lee, who devoted his career to low-temperature physics, noted that he was influenced by the work of biology researchers: "I like to think of science as a worldwide web — everybody helping everybody else," Lee said. "We compete — but we also pull each other up by our collective bootstraps. One of the most exciting things about our business is that we have these interactions that are so meaningful."

Don't Lose Your Sense of Humor

Not only did these men unravel mysteries of the natural world, but they also could throw down a one-liner. Take Lederman, the Rodney Dangerfield of theoretical physicists. After

Dr. Leon M. Lederman, 1988 Nobel Prize winner in physics for his work on neutrinos, is also credited with helping the Army develop Doppler radar. (U.S. Army photo by Richard Mattox, PEO EIS.)

Parmentola recounted Lederman's many accomplishments during his introduction, Lederman quipped, "I like introductions like that. Sometimes there is a negative aspect to fame and recognition. I was on a crowded train coming out of Chicago when it stopped at the local mental hospital. A nurse and a bunch of patients were going on an outing and they all scrambled onto the train. The nurse was making sure everyone was there and was doing a head count, 'One, two, three, four,' then she looked at me and said, 'Who are you?' I said I was Leon Lederman, Nobel Prize winner. She said, 'Yeah right, five, six…'"

Lederman spent 3 years in the Army Signal Corps during World War II. While in the military, Lederman helped develop Doppler radar. "And it was to my chagrin many years later that I got a speeding ticket from a police officer using Doppler radar," he said. "And the police officer was using it all wrong. Any kid knows that the Doppler radar direction has to be roughly parallel to your speed. It doesn't have to be exactly parallel, but if it is 90 degrees away, you have no velocity component, and the policeman had no velocity component. I explained that clearly to the judge — who nevertheless asked me to pay my fine. After that, I decided that all judges should have a 5th grade physics education."

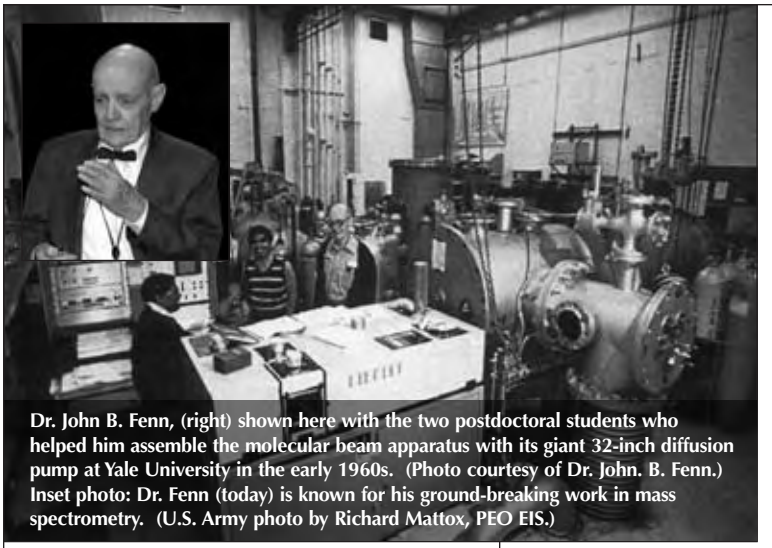
Tell Your Wife That Diamonds Are Not Forever

"Carbon is really remarkable in the variety of manifestations that it has," said the man who discovered the buckminsterfullerene, Curl. "Graphite is used in pencils and as a lubricant; while the diamond, of course, is ornamental and is also used in cutting and as a coating material. Graphite is the most stable, diamond is not as stable as graphite, so diamonds are not actually forever, but it takes longer than most people care about for a transformation to take place."

Dr. Robert F. Curl, 1996 Nobel Prize winner in chemistry, discovered the buckminsterfullerene, also known as "Bucky Balls," a stable molecule made of pure carbon. (U.S. Army photo by Richard Mattox, PEO EIS.)

Age 85 Is the New 45

No doubt Fenn would disagree with Esaki's assertion that our judicious mind takes over at age 45. Fenn joined Yale University faculty in 1962. In 1987, when he reached the mandatory retirement age, he fought age



Dr. John B. Fenn, (right) shown here with the two postdoctoral students who helped him assemble the molecular beam apparatus with its giant 32-inch diffusion pump at Yale University in the early 1960s. (Photo courtesy of Dr. John. B. Fenn.) Inset photo: Dr. Fenn (today) is known for his ground-breaking work in mass spectrometry. (U.S. Army photo by Richard Mattox, PEO EIS.)

discrimination and a university-mandated move to a smaller laboratory space. He remained at Yale and was 70 years old when he began work on what would become his Nobel Prize-winning discovery. When Fenn won the Nobel Prize in 2002 for his work in mass spectrometry, he was 85.

Fenn studied combustion and set about to study chemical reactions in flames the same way physicists studied nuclear reactions. In other words, bang two molecules together and make them react.

"To do that," Fenn explained, "we needed to somehow get a lot of kinetic energy and high velocity into fuel molecules and oxygen molecules. I decided we wanted to build a molecular beam apparatus with a lot of pumping speed and see if we could get a collision between two different reactants. Now, this was a very naïve idea. I sent a proposal for this idea to the National Science Foundation and they funded us. When one of my postdoctorate students got one look at a couple of 32-inch diffusion pumps — nothing would do until we could get those pumps. I was scared to death, but it turned out to be the smartest thing we ever did because having a lot of pumping speed meant that we could cover up a lot of errors. Furthermore, once we started getting results and people came to the lab, they took one look at the apparatus and said, 'Very nice, but not for us.' So we had the field to ourselves for a very long time."

Continue to Invest in Research

"I think it's just wonderful how much the Armed Services have contributed to basic science and exploration," Townes told the ASC audience. "Unfortunately, our industry no longer does that. Industry just can't put money into exploration that may not pay off for another 10 years. However, as a country we must, and as a people, we must. Just look at the laser. It cost $30,000 to produce the first laser and the payoff every year is probably tens of billions of dollars. It's been said that all of the research done is less than one week's worth of investments in applications. Science pays off. We've got to remember that and devote our energies and our finances to doing it."

Dr. Leon Cooper, 1972 Nobel Prize winner in physics, emphasized the importance of balancing present operational needs against investments for future scientific discoveries. (U.S. Army photo by Richard Mattox, PEO EIS.)

Cooper seconded Townes. "It is the unexpected dividend of profound fundamental research that gives us payoffs in totally unexpected directions," he said. "Consider the technology we take for granted for civilian and military use — things like communications, computers, electronics, medical imaging and laser surgery would not have existed without the fundamental science of Maxwell, Einstein, Lorentz, Kamerlingh Onnes, Schrodinger, Heisenberg, Dirac and many others working on problems that were so esoteric that no practical person would have funded them. It's almost impossible to predict what technologies will flow from fundamental science. From the work of Charlie Townes, who was studying radiology, we have laser surgery and compact discs."

"At a time when funding is limited," Cooper continued, "those of you who are responsible for dispensing funds find it difficult to think of the future with all the current needs that have to be satisfied. This troubles me. It's just a way of saying you're eating your seed corn. You have to balance the immense needs of the present against the needs of the future. I would like to think that when you celebrate the 50th anniversary of the ASC, you will find people like myself who can proudly say that our work was supported by the Army Research Office. It's not an easy job and I wish you good luck."

MEG WILLIAMS provides contract support to the U.S. Army Acquisition Support Center through BRTRC Technology Marketing Group. She has a B.A. in English from the University of Michigan and an M.S. in marketing from Johns Hopkins University.

Force XXI Battle Command Brigade and Below (FBCB2) Past, Present and Future

MAJ Shane Robb

In the mid-1990s, when FBCB2 was first fielded, it was still an emerging technology with plenty of room for improvement. It is now undergoing major system redesigns to capitalize on new technologies and incorporate important lessons learned. FBCB2 is fast becoming a Joint program with a new version of software called FBCB2-Joint Capabilities Release (JCR). FBCB2-JCR will vastly improve the system, overcoming many of the previous version's shortfalls. FBCB2-JCR will provide the foundation necessary for the U.S. Army and U.S. Marine Corps (USMC) to converge fully on a single common FBCB2-based system for platform battle command called Joint Battle Command-Platform (JBC-P). JBC-P will meet Joint command and control (C2) and situational awareness (SA) requirements and will include new hardware, dismounted solutions and beacon capabilities. As FBCB2 evolves into FBCB2-JCR and later JBC-P, it will improve and become more user-friendly and capable for the Soldiers who employ it.

Radio transmissions via SINCGARS allow unit commanders to track subordinate platoons on FBCB2 through representative icons on their digital map displays. Here, SGT Rafael Perez from Apache Co., 1-23 Infantry Regiment, 3rd Stryker Brigade Combat Team, 2nd Infantry Division, talks on the radio and pulls security at a courtyard in Ghazaliya, Iraq, during a combined cordon and search with the Iraqi army on March 24, 2007. (U.S. Army photo by SGT Tierney Nowland.)

When FBCB2 was fielded, CPT Michael D. Acord, Commander, Bravo Co., 2nd Battalion, 8th Infantry Regiment, 4th Infantry Division (4ID), heralded it for the capabilities it provided. "I realized its full potential during a night mechanized infantry attack. If you have never been on such an attack, let me paint you a picture. Imagine yourself on top of a loud vehicle moving toward your objective. You navigate using a map and small flashlight. Radios blare in your head. You barely know where you are, much less where your three platoons and associated infantry squads are located," Acord related. "FBCB2 mitigates those conditions. With FBCB2, I could 'see' the locations of all three platoons represented by their icons on my digital map. These icons were real-time position updates being transmitted via radios [Single Channel Ground and Airborne Radio System (SINCGARS) and Enhanced Position Location and Reporting System]. When we made contact, the platoons sent spot reports that posted as icons directly on my map. This aided me in confirming my read of the enemy. The lit map provided a clear picture of the terrain. Line-of-sight analysis allowed me to determine the intervisibility lines and where we would likely make contact with the enemy," he concluded.

Improved Friendly Force Identification

FBCB2 has improved unit SA exponentially. Commanders and leaders have more efficient and effective C2 of their units, and FBCB2 enables them to adapt more quickly than the enemy. In short, it enables battle command. Equally important, FBCB2 has served as an input for combat identification (CID) to inform "engage/don't engage" decisions. Numerous reports from *Operations Enduring* and *Iraqi Freedom* (*OEF/OIF*) indicate that many lives on the battlefield were saved using FBCB2 to help prevent fratricide incidents. (*Editor's Note:* For more information on CID, see the article on Page 34, January-March 2007 *Army AL&T* Magazine or go to **http://asc.army.mil/docs/pubs/alt/current/issue/articles/34_A_Holistic_Approach_to_Combat_Identification _200701.pdf**.)

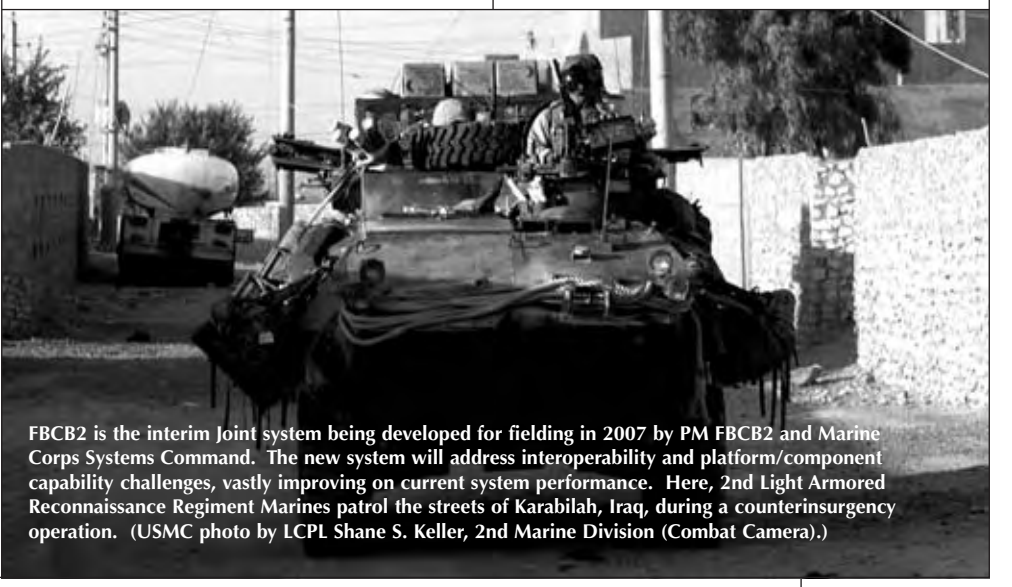
FBCB2 serves as the C2/SA link between platforms and the C2/SA systems located in the operations centers at all levels. On April 7, 2003, during *OIF*, for example, senior leaders at the Pentagon were able to watch in near real-time the 2nd Brigade Combat Team, 3ID, advance as they drove into Baghdad. Never before had such an accurate picture of reality on the ground been available at all levels of command simultaneously. Its significance is summed up by this statement from 3ID's *OIF* After Action Report written in May 2003. "The single most successful C2 system fielded for *OIF* was the FBCB2-Blue Force Tracking (BFT) system. It is important to mention that the FBCB2 system used during this operation was not fielded to facilitate division C2, but rather to facilitate tracking of friendly forces at echelons above division. Even so, BFT gave commanders situational understanding that was unprecedented in any other conflict in history."

> When the system is turned on, the nearest TSG will detect it and begin to act as its server. The vehicle's FBCB2-JCR will transition from TSG to TSG as it moves across the battlefield, providing uninterrupted connectivity.

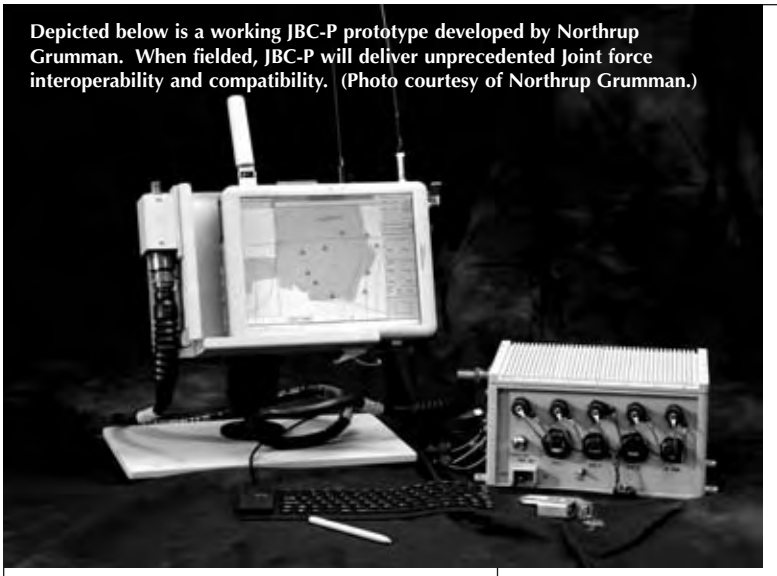
Current System Limitations

Although FBCB2 performed admirably, it has its limitations. A significant limitation learned during recent operations was that many of the numerous, service-specific C2/SA systems are not interoperable. This lack of platform-level interoperability prevents the sharing of vital friendly, enemy and other survivability information, and increases the risk of interservice fratricide.

The Joint Requirements Oversight Council (JROC) recognized the capability gap that incompatible service-specific C2/SA systems presented and, after an exhaustive study, issued *JROC Memorandum (JROCM) 163-04*, which directed that the USMC adopt FBCB2 for both platform and dismounted applications.



FBCB2 is the interim Joint system being developed for fielding in 2007 by PM FBCB2 and Marine Corps Systems Command. The new system will address interoperability and platform/component capability challenges, vastly improving on current system performance. Here, 2nd Light Armored Reconnaissance Regiment Marines patrol the streets of Karabilah, Iraq, during a counterinsurgency operation. (USMC photo by LCPL Shane S. Keller, 2nd Marine Division (Combat Camera).)



Depicted below is a working JBC-P prototype developed by Northrup Grumman. When fielded, JBC-P will deliver unprecedented Joint force interoperability and compatibility. (Photo courtesy of Northrup Grumman.)

As a result of that directive, the Program Manager (PM) FBCB2 began developing an interim Joint system (FBCB2-JCR). In parallel, the U.S. Army Training and Doctrine Command Capability Manager (TCM) for Platform Battle Command and CID began the extensive process of documenting the Joint C2/SA requirements for a new JBC-P system that would meet U.S. Army, USMC, special operations forces and aviation community requirements as well as those of the other various components within the Joint force.

FBCB2-JCR is the interim Joint system under development by PM FBCB2 and Marine Corps Systems Command. Testing began in March 2007 and will address many interoperability gaps identified during *OEF/OIF* combat operations.

Capabilities-Based Improvements

There are three primary development efforts that are part of FBCB2-JCR: network, database and software. FBCB2-JCR will redesign the terrestrial network making it area-based versus hierarchically based. The system will work similar to a cell phone network. With this architecture, platoon leaders are not limited to specific servers within the unit. Rather, their systems will automatically connect to any Tactical Services Gateway (TSG) — similar to a mobile cell phone tower — on the battlefield. When the system is turned on, the nearest TSG will detect it and begin to act as its server. The vehicle's FBCB2-JCR will transition from TSG to TSG as it moves across the battlefield, providing uninterrupted connectivity.

FBCB2-JCR will greatly improve the database process by initially loading only a small, unit-sized and much simplified database on each hard drive. The system would then "learn" the rest of the database as it receives information from other users on the net. FBCB2-JCR will eliminate the need to create a massive database that must be updated and manually copied onto every hard drive.

FBCB2-JCR will rewrite the FBCB2 software making it more modular and reusable. This supports creation of other battle command products that could reuse the core components of FBCB2-JCR software, and add new software components for new product-specific functionality.

Perhaps the most important improvement of all is interoperability. FBCB2-JCR will be fielded to both the Army and USMC during 2007, and will increase compatibility with other C2/SA systems across the Joint force. The Movement Tracking System has incorporated JCR software and will be almost fully interoperable with FBCB2-JCR. This will improve the Common Operational Picture (COP) at all levels, help to reduce the risk of fratricide and better enable real-time battle command.

Family-of-Systems (FoS)

JCR will be followed by a completely new FBCB2 variation called JBC-P. JBC-P greatly improves on FBCB2 and is the Army's and USMC's solution to comply with *JROCM 163-04* and fully converge on an integrated platform level C2/SA system. JBC-P is an FoS that can share C2/SA across the Joint operational environment from various platforms with disparate missions and requirements. The JBC-P product line will consist of the following FoS:

- *JBC-P Full.* This will be the standard computer, screen and software. It will include integrated Global Positioning Systems and will be the same size or smaller than the current FBCB2 V4s. Users will be able to

FBCB2-BFT was the most successful battle command system fielded during *OEF/OIF*. The system provides an unprecedented capability to track friendly forces at echelons above division. Here, Soldiers from 1st Battalion, 68th Armored Regiment, 3rd Heavy Brigade Combat Team, 4th Infantry Division, set up a perimeter after drawing enemy fire during a population patrol operation near Forward Operating Base Warhorse, Iraq, last September. (U.S. Air Force photo by TSGT Michelle A. Desrochers, 4th Combat Camera Squadron.)

remove the screen from its mount and move it to different locations within or around the platform — up to 15 feet away. Select leaders' vehicles will also receive a dismountable personal digital assistant-like product that can dock with the full capability, but when dismounted, can continue to receive and send C2/SA information while the users are a short distance from their platform (up to 300 meters).

- *JBC-P Partial.* The partial capability describes those systems that require a level of interoperability with JBC-P but may not use the same hardware or software to achieve that interoperability. An example of a partial capability system is that designated for rotary-wing aircraft. The aircraft must be able to share C2/SA, but the cockpit environment requires different hardware and simplified user interfaces. Partial also includes a stand-alone hand-held product that will provide C2/SA to dismounted infantry, special operations forces, reconnaissance units and other users who require a man-portable JBC-P version with integrated communications. This capability will integrate dismounted forces into the COP for the first time.
- *JBC-P Beacon.* This is a 1-way beaconing device to populate the COP with Blue (friendly force) position location information tracks for CID purposes. Beacons will be less expensive than Full versions of JBC-P and will be fielded in enough quantities to ensure at least one for every two platforms is sending position reports to the COP. Beacons will also aid in CID with a primary objective of informing "engage/don't engage" decisions and preventing fratricide.

JBC-P will enable warfighters to download and send digital pictures. They will have a free draw "John Madden" type capability and will have enhanced collaboration tools such as chat. Vectors projected on the screen will indicate direction of main gun engagements. JBC-P will highlight and display friendly units in different user selectable colors and sizes on their user-defined COP display. It will store messages that are sent but not received and then resend or forward them when the addressee reenters the net. JBC-P will be able to display "snail trails" or retrace the movement of icons back through time. In short, JBC-P will provide numerous new capabilities that greatly increase the SA of Joint leaders and commanders, and significantly enhance their ability to provide effective C2.

FBCB2 has provided unprecedented SA to all levels of command providing enhanced battle command when and where it was needed most. Next generation JBC-P will build on system success and provide even better situational understanding in the very near future. Here, SPC Jeremy Turner, C Troop, 8th Squadron, 10th Cavalry Regiment, 4th Brigade, 4ID, provides security during a presence patrol in Ameriya, Iraq, last November. (U.S. Army photo by SGT Martin K. Newton, 982nd Signal Co. (Combat Camera).)

The capabilities envisioned for JBC-P are coming soon to the Joint force. The evolution of FBCB2 to FBCB2-JCR and then to JBC-P is scheduled to correlate with the Army's Software Blocking (SWB) schedule. The current version of FBCB2 (V6.5) correlates with SWB 2. FBCB2-JCR will be fielded in conjunction with SWB 3 and JBC-P (Version 1) will be fielded in conjunction with SWB 4.

Since FBCB2's emergence onto the battlefield, commanders and leaders who have used it in combat recognized its significance and have used it to great effect. FBCB2 has provided unprecedented SA to all levels of command, and it has provided an enhanced means of enabling battle command for commanders and leaders. As FBCB2 evolves into FBCB2-JCR and later JBC-P, it will only improve, becoming more user-friendly and capable. With an increase in interoperable C2/SA systems' quantity, leaders and commanders will have a more accurate Joint battlefield picture. JBC-P will further improve situational understanding and decision making, and will assist Joint leaders by making it easier to mass both effects and forces at a critical point in an operation. Most importantly, JBC-P will help keep our Joint warfighters alive by increasing combat effectiveness and ensuring fratricide prevention.

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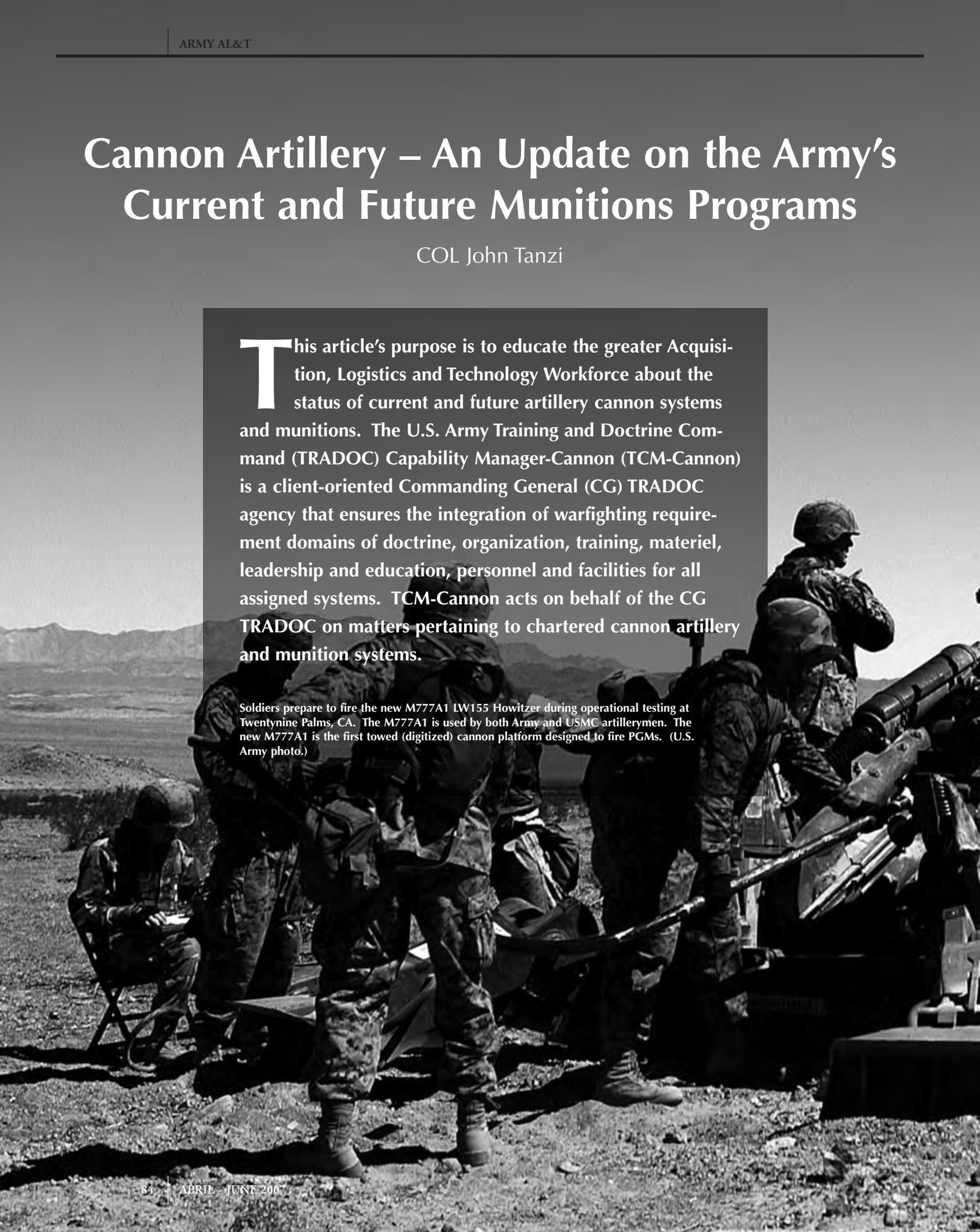
Cannon Artillery – An Update on the Army's Current and Future Munitions Programs

COL John Tanzi

This article's purpose is to educate the greater Acquisition, Logistics and Technology Workforce about the status of current and future artillery cannon systems and munitions. The U.S. Army Training and Doctrine Command (TRADOC) Capability Manager-Cannon (TCM-Cannon) is a client-oriented Commanding General (CG) TRADOC agency that ensures the integration of warfighting requirement domains of doctrine, organization, training, materiel, leadership and education, personnel and facilities for all assigned systems. TCM-Cannon acts on behalf of the CG TRADOC on matters pertaining to chartered cannon artillery and munition systems.



Soldiers prepare to fire the new M777A1 LW155 Howitzer during operational testing at Twentynine Palms, CA. The M777A1 is used by both Army and USMC artillerymen. The new M777A1 is the first towed (digitized) cannon platform designed to fire PGMs. (U.S. Army photo.)

TCM-Cannon strives to provide reliable cannon platforms and munitions. Their primary objective is to ensure that the managed systems meet user requirements, are affordable for the Army and are delivered to Soldiers in a timely manner. Current managed programs follow.

Current Cannon Systems

M119A1/2 105mm Towed Howitzer

Status: FY05 Congressional Supplemental funding was received in June 2005. Efforts continue to stretch available M119A1/2 assets to meet Modular Force needs. As units move from reconstitution to reset, to the Modular Force structure or to a deployed status, their priority continues to increase. Assets are being allocated in accordance with this guidance. U.S. Army National Guard (ARNG) units are currently converting to the Modular Force. Some units are scheduled to convert from the M109A6 Paladin 155mm Self-Propelled Howitzer, M198 155mm Towed Howitzer or M270 Multiple Launch Rocket System before new production M119A2 Howitzers are available. Fort Sill, OK, and the U.S. Army Armament Research, Development and Engineering Center recently began concept exploration to digitize the M119A2 fleet with Towed Artillery Digitization. This will improve the systems' ability to meet Modular Force concepts and pave the way for the use of near and precision guided munitions.

M109A6 Paladin 155mm Self-Propelled Howitzer

Status: As units modularize out through 2008, all M109A5 Howitzers will be replaced with M109A6 Paladins/M992A2 Field Artillery Ammunition Support Vehicles (FAASVs). The Paladin is expected to be in the Army's inventory until 2050. Therefore, a national recapitalization program is being implemented for the Paladin/FAASV. This program allows the Paladin/FAASV to be upgraded with the newest technologies, including Modular Artillery Charge System (MACS), Excalibur ammunition racks and the Paladin Digital Fire Control System, which allows the platform to fire Precision Guided Munitions (PGMs) and inductively set fuzes.

M198 155mm Towed Howitzer

Status: The M198 recently finished undergoing a breech modification to enable the system to fire our newest propellant, the MACS.

M102 105mm Towed Howitzer

Status: Currently there are 171 howitzers still in service in the ARNG. The M119A2 will replace this system over the next few years.

Future Cannon Systems

M777/M777A1 Lightweight 155mm Howitzer (LW155)

System: The LW155 will eventually replace all M198 Towed Howitzers in Stryker Brigade Combat Teams (SBCTs). This system will provide location, directional reference and digital communications with the Fire Direction Center. The M777 will provide close and deep fire support, counterfire and interdiction fires to support operations in both the Army and U.S. Marine Corps (USMC), and be rapidly deployable to any region and operable under any climatic conditions. The M777 will be the first towed (digitized) cannon platform designed to fire PGMs.

Status: Currently, there are 94 M777s being produced for the USMC. The Army has finalized fielding to the Army Field Artillery and Ordnance Schools. The Army finalized fielding to the SBCTs during the first quarter of FY07.

Non-Line-of-Sight Cannon (NLOS-C)

System: This system is a variant in the Future Combat Systems (FCS) Family-of-Systems. The NLOS-C uses a common chassis within the FCS Family of Vehicles and has similar interoperability, mobility and survivability characteristics. This program leverages the work done on the Crusader Program and will have similar advanced capabilities on its platform. The NLOS-C provides networked, extended range targeting and precision attack of point and area targets with a suite of munitions that include special purpose capabilities. The NLOS-C provides

Soldiers from A Battery, 3rd Battalion, 29th Field Artillery Regiment, 3rd BCT, 4th Infantry Division (4ID), fire their M109A6 Paladin 155mm Self-Propelled Howitzer during an operational mission in support of *Operation Iraqi Freedom* (*OIF*). (U.S. Army photo by SGT Jack Morse, 982nd Signal Co. (Combat Camera).)

sustained fires for close support and destructive fires for tactical standoff engagement. The system's primary purpose is to provide responsive fires in support of combat battalions and their subordinate units in concert with LOS, Beyond-LOS and NLOS external and Joint capabilities. The system provides flexible support through its ability to change effects round by round and mission by mission. These capabilities, combined with rapid response to calls for fire and rate of fire, provide a variety of effects on demand to the battlefield commander.

Status: The new fielding schedule is still being drafted, but overview briefings show the first initial operating capability will be in 2014, with full operational capability by 2017. The program will deliver 8 NLOS-Cs to the Army by 2008, and will field 18 platforms from 2010-2012. The test platform fired more than 2,000 rounds from January 2003 to March 2006. The program is also reviewing bids for its Large Caliber Ammunition Resupply requirements as the system will be resupplied without the crew handling the projectiles. This will be a monumental achievement in the artillery community as currently all ammunition is fed manually into current platforms. Live fire testing of this system was conducted at Yuma Proving Ground (YPG), AZ, in November 2006.

An M109A6 Paladin from the 3rd Battalion, 16th Field Artillery Regiment, 4ID, fires a high-explosive round downrange in support of coalition force maneuver units operating in Diyala Province during *OIF*. (U.S. Army photo by SSG William L. Davis, 982nd Signal Co. (Combat Camera).)

Munitions

XM982 Excalibur

System: Excalibur is an extended range projectile that attacks high-payoff and dangerous targets in all weather and all terrain types to support the close fight, while minimizing collateral damage through concentrated lethality and increased precision. The Excalibur is Global Positioning System (GPS)-guided, making it the Field Artillery's fire-and-forget munition of choice. It provides the capability to attack personnel and soft skin vehicles, as well as reinforced bunkers at ranges exceeding current 155mm munitions capabilities.

Status: Advanced Early Fielding was approved by the Army Resource and Requirements Board in March 2005. Acceleration of Advanced Field Artillery Tactical Data System (AFATDS) software and a Portable Fuze Setter is also required. Successful firing of multiple inert and live projectiles at YPG has validated a Circular Error Probable (CEP) of less than 10 meters at all ranges. Excalibur's maneuverability was also demonstrated by conducting a 15-degree offset shot and having the projectile impact approximately 7 meters from the target. A Front End Demonstration was conducted June 13-16, 2005, in conjunction with the Fire Support Test Directorate, to validate AFATDS software and Excalibur tactics, techniques and procedures (TTPs). Some minor deficiencies were found with the AFATDS software and revisions to the TTPs were suggested. Software issues were submitted to Raytheon and Program Manager AFATDS.

An M777 Howitzer provides close and deep fire support. This howitzer is used by both Army and USMC artillerymen and will become the first towed cannon platform to fire PGMs. (U.S. Army photo.)

MACS

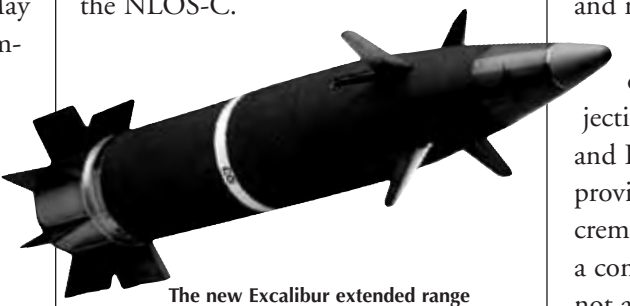
System: MACS uses a "build-a-charge" concept in which increments are identical to all others in the same lot designation, eliminating the need to dispose of unused increments. Unused increments are retained for future use. MACS consists of two propelling charges, the M231 and the M232, and associated packaging. It is compatible with all current and planned 155mm field artillery weapon systems.

Status: MACS is materiel released. The Project Manager Combat Ammunition

Systems (PM CAS) began working to reformulate MACS to optimize MACS for the 39 caliber systems. The M232A1 was type classified 24 in May 2005 and materiel released in November 2006, but will not be released to cannon units until the AFATDS Block II software is released. The reformulated MACS will increase tube wear life and reduce blast-over pressure.

Multi-Option Fuze Artillery (MOFA) and the Portable Inductive Artillery Fuze Setter (PIAFS)

System: The M782 MOFA fuze is an inductively set fuze used with bursting projectiles. It has four functions: point detonating, delay, time and proximity. Due to its multiple options, the burden of tracking multiple fuzes in the logistics train is simplified. MOFA replaces eight fuzes currently in the inventory. The inductively set fuze can be set with the PIAFS and is also compatible with automated ammunition handling equipment for the NLOS-C.



The new Excalibur extended range projectile will provide artillerymen with increased precision and concentrated lethality. (U.S. Army photo.)

Status: MOFA is currently in the production, fielding, deployment and operational support phase of the Life Cycle System Management Model. MOFA was type classified in September 1999 and was materiel released in November 2005. This fuze is for War Reserve only and will not be used for training.

Advanced Cannon Artillery Ammunition Program (ACAAP)

System: ACAAP is a product improvement program based on replenishing our current stockpile of 105mm and 155mm cannon artillery ammunition. The entire ACAAP suite of munitions has ballistic similitude or one set of firing tables for all projectile types. Additionally, ACAAP will provide the artillery cannoneer the ability to change all rounds from Boat Tail to Base Bleed in the field.

Status: A Capability Production Document (CPD) for the 105mm Preformed Fragment projectile is currently being staffed. CPDs are currently being developed for the 105mm and 155mm family of munitions.

Projectile Guidance Kit (PGK)

System: PGK is a low-cost, fuze-sized module intended to replace a "NATO standard" fuze on conventional 105mm and 155mm ammunition. GPS provides location and time during flight while an Inertial Navigation System (INS) determines trajectory and makes continuous corrections en route to the target. PGK reduces delivery errors by improving projectile accuracy with the aid of GPS and INS. PGK is being designed to provide approximately 30 meters (Increment 1) CEP at all ranges. PGK is a complementary system to Excalibur, not a competitor. PGK provides more efficient suppression versus Excalibur's point precision.

Status: Currently, the Army is leveraging Navy Guidance Integrated Fuze technology. The munitions industry is aggressively investing research and development dollars to design this system. The Army continues to monitor the Navy's Pathfinder Program as a developmental risk mitigator. On Feb. 23, 2006, TRADOC approved the PGK Capability Development Document and forwarded it to HQDA for approval. PM CAS received five proposals from a request for proposal and are presently conducting the technical evaluations to determine which contractors to select for the technology development phase.

For more information on cannon platforms and munitions systems, visit the Fires Knowledge Network Web site at **https://www.us.army.mil/suite/portal/index.jsp**.

Here, an NLOS-C test platform fires a round last year at a test range at YPG. Likewise, successful firing of Excalibur at YPG has resulted in a CEP of less than 10 meters at all ranges. (Photo courtesy of the YPG Public Affairs Office.)

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AAE/ASAALT and PEO Aviation Discuss the Army Aviation Modernization Plan at AUSA ILW Symposium

Robert E. Coultas

More than 300 attendees converged in Arlington, VA, to get an update on Army aviation at the 2007 Association of the United States Army (AUSA) Institute of Land Warfare (ILW) Aviation Symposium and Exhibition, Jan. 17-19, 2007. Co-sponsored by the Army Aviation Association of America, the theme for this professional development forum was "Sustaining Army Aviation and Transforming for the Future." Speakers included Army Acquisition Executive (AAE)/Assistant Secretary of the Army for Acquisition, Logistics and Technology (ASAALT) Claude M. Bolton Jr.; Program Executive Officer (PEO) Aviation Paul Bogosian; PEO product managers; Army commanders; current and former aviators; and aviation professionals from private industry.

The Chinook helicopter has been a mainstay in the Army's arsenal since the Vietnam era, and new variations will keep it in service for at least another 20 years. Here, paratroopers from the 3rd Battalion, 187th Infantry Regiment, 101st Airborne Division, and Iraqi troops from the 4th Iraqi Division, board a CH-47 helicopter after participating in *Operation Vegas* in the Samarra, Iraq, area last year. (U.S. Army photo by Jeremy L. Wood.)

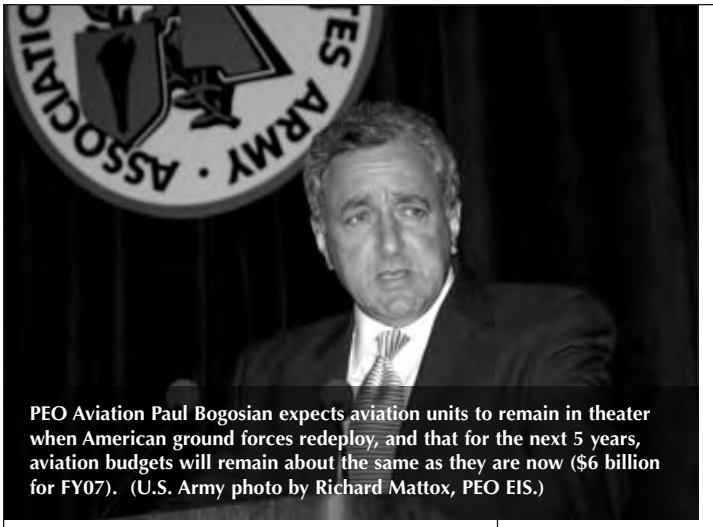
During the opening remarks, Bolton described the Army Aviation Modernization Plan's (AAMP's) status. "Things are going relatively well and consistently in what we said we were going to do. We have the same story year after year, meaning we are on track with what we are supposed to be doing," he reported. "After the Comanche program's termination, we made promises to ourselves, industry, the SECDEF [Secretary of Defense], the President of the United States and to Congress, most importantly, that if we were allowed to take the money that we were going to spend on the Comanche program, we would modernize Army aviation; and that's what we've been doing." Bolton said he learned a valuable lesson during the Light Utility Cargo Program testing about commercial-off-the-shelf (COTS) purchases. "We discovered that in DOD, let alone the Army, we have no policy for buying COTS for our testing, resource or requirements communities. So, MG [James] Myles, [Commander, U.S. Army Test and Evaluation Command], myself and others are going to take this opportunity to spend a little bit of money and figure out what we really must do to buy COTS products, and then put policies in place so that the next time we purchase a COTS, the process is a bit easier. We are also going to offer those policies to our overseas colleagues and perhaps they will use them as well. We are not delaying the program; we are on schedule to deliver that capability to Soldiers."

Bolton added that although the AAMP has been a challenge, it is going relatively well. "It's not easy. A lot of hard work has gone into this across the entire community — government, contractors and Congress have to keep this on track because we have the responsibility to get the capability to our warfighters as quickly as possible."

New Challenges

Bolton used a football analogy to describe future challenges. "For the past 50 years, we've won our conference and the National Title every year. That's not bad — it's a great track

During his opening remarks, AAE/ASAALT Claude M. Bolton Jr. gave his assessment of the AAMP and challenges that lay ahead for Army aviation. (U.S. Army photo by Richard Mattox, PEO Enterprise Information Systems (EIS).)



PEO Aviation Paul Bogosian expects aviation units to remain in theater when American ground forces redeploy, and that for the next 5 years, aviation budgets will remain about the same as they are now ($6 billion for FY07). (U.S. Army photo by Richard Mattox, PEO EIS.)

record. But, now we are moving into a different conference with team names like interoperable, system-of-systems, lean and coalition. If we engage the new competition with the old strategy we have been using to train our people, 'only quarterbacks need to show up for practice this year,' how many games do you think we will win? In other programs, I've had to terminate contracts or delay things, and when I 'peel back the onion' to take a look at these things, I find it's not because of bad people or malice, but that we have not trained or educated those folks. Congress has realized that and has already passed a law this year that we [the Army] are going to do something in the requirements area, so I believe they will have other things for us. But the Army is not waiting. We are working on how we can provide training and education for this group so that they can meet future challenges," Bolton explained.

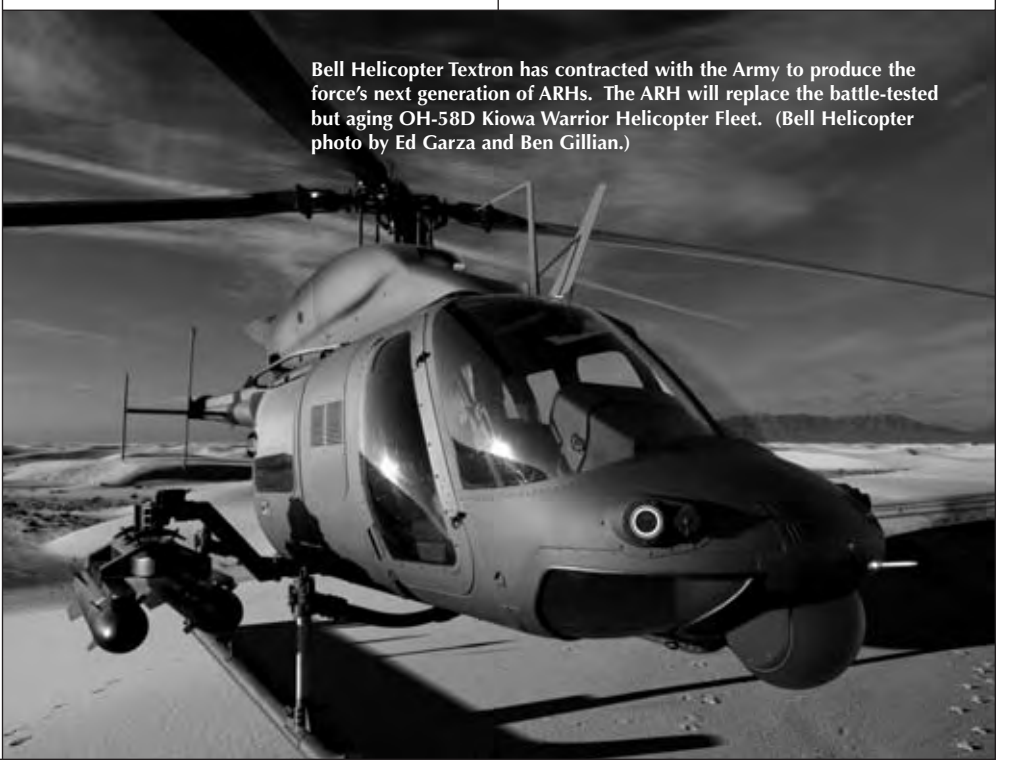
Who Makes it Happen?

Bolton explained that people are the Army's most precious asset and are responsible for the current state of the AAMP. "Without your brain power, ingenuity, insights and energy, none of the charts I put up today would be a reality. Taking $15 billion and spreading it across a group of programs is one thing — it's another thing to bring it home in terms of reality. The bottom line is that we are trying to provide a capability in real time to our warriors, because they are at war and they need it. What I need from each of you is your continued support, energy and effort to make all of this possible. We have the world's best Army and the world's best aviation, which is a tribute to the people. People are central to everything we do in the Army. Institutions do not transform and make all this happen. Platforms and organizations do not defend a nation the last time I checked — people do that and will continue to do that," Bolton predicted.

PEO Aviation Update

During his presentation, Bogosian indicated that he expects aviation units to remain in theater when American ground forces redeploy, and that for the next 5 years, aviation budgets will remain approximately what they are now ($6 billion for FY07). "We are bringing effect to the fight. We're getting products to warfighters and fulfilling our requirements as material developers to field and develop capability. It's a very robust budget and, as a community, we should be very pleased with it. It's a direct effort of the [aviation] community at large ensuring that we put programs that have substance into effect. We executed those programs and convinced the leadership that we are able and will be able to get warfighting capability to the aviation warriors as quickly as possible."

Bogosian said that one of the unforeseen consequences of the Comanche Armed Reconnaissance Helicopter (ARH) Program's termination was the scaling back of the service's investment, with only $99 million of the Army's $6 billion aviation FY07 budget set aside for science and technology (S&T). "One of the glaring omissions that came from the Comanche termination was the fact that we did not drive any portion of that

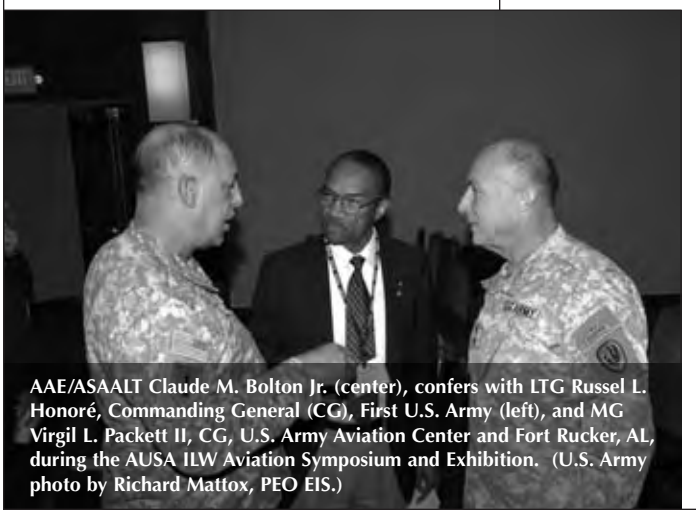


Bell Helicopter Textron has contracted with the Army to produce the force's next generation of ARHs. The ARH will replace the battle-tested but aging OH-58D Kiowa Warrior Helicopter Fleet. (Bell Helicopter photo by Ed Garza and Ben Gillian.)

"Army aviation is demonstrating its power, versatility and adaptability in very important confrontations in Afghanistan and Iraq," remarked former Army Chief of Staff and AUSA President GEN Gordon R. Sullivan (U.S. Army, Ret.). "Without Army aviation, the Army would not be as strong and adaptable as it is today." Here, pilots from 1st Battalion, 101st Aviation Brigade, 101st Airborne Division, provide air support over Tal Afar, Iraq, from their AH-64D Longbow Apache helicopter. (U.S. Air Force photo by SSGT Jacob N. Bailey, 1st Combat Camera Squadron.)

investment into aviation S&T. When you consider the oddity of that, in the sense that the Comanche was the great technology driver for Army aviation, when we terminated it and directed the dollars into near-term capability, we abandoned a substantial portion of how we were going to lay out S&T for the future. I have taken this on personally and will continue to do so to ensure that we pay the appropriate attention to reviving our S&T accounts. It's not so much the degree of investment that's a concern — it's how we are driving that investment and how we are focusing it. In 2026, are we going to be facing major upgrades on our platforms? Are we going to bring these platforms in for upgrades to insert new technology? Probably not," Bogosian remarked. He also mentioned that he and others in the aviation community are working on the "the vertical lift requirement" that the Army needs.

Bogosian also discussed Lean Six Sigma (LSS) initiatives and said they "seem to have staying power," but he wants aviation to "have the flexibility to take on new missions" and not become locked into process over product. "LSS evaluations are essential responsibilities. We must ensure that we ask ourselves the right questions — how do we maintain effective operations, and how do we ensure that in the end it's not the process we're managing, but the product that we're managing? That will be the focus that we will continue to have in PEOs."



AAE/ASAALT Claude M. Bolton Jr. (center), confers with LTG Russel L. Honoré, Commanding General (CG), First U.S. Army (left), and MG Virgil L. Packett II, CG, U.S. Army Aviation Center and Fort Rucker, AL, during the AUSA ILW Aviation Symposium and Exhibition. (U.S. Army photo by Richard Mattox, PEO EIS.)

Bogosian predicted that condition-based maintenance will be expanded throughout Army aviation. "We have to put sensors on those aircraft and take advantage of the insights those sensors are providing for maintainers. It means managing the data is the smart thing for the maintainer in evaluating the results." Bogosian indicated that integration will remain a challenge and that it will be time-consuming and costly to insert technologies into the common operating environment and battle command. "It is going to take a long time to field a Future Combat Systems Army and also support the modular brigades of today," he said, adding that airspace management will remain an issue in the future as more manned and unmanned aerial systems come into play.

Recalling what Army aviation did 10 to 15 years ago, Bogosian remarked, "It must have been right. When you look at how these aircraft are performing in combat, and then when you look at the things we are bringing forward, specifically unmanned systems, you see how quickly we can respond and how adaptive a community we are. Let's continue to pursue our virtues. Let's sustain this partnership. Let's reinforce the fact that when the Army gives us a mission, we can execute it and get the best return for our investment and continue to see to the future. Army aviation will be around a long time and the Army and the Nation will be better for it," he concluded.

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From the Acquisition Support Center Director

The Honorable Kenneth J. Kreig, Under Secretary of Defense for Acquisition, Technology and Logistics (USD(AT&L), has set a goal for the DOD acquisition workforce to become a "high performing, agile and ethical workforce." Our intent is to meet or exceed this expectation for our own Army Acquisition, Logistics and Technology (AL&T) Workforce. In April 2006, Army Acquisition Executive and Assistant Secretary of the Army for Acquisition and Technology (ASAALT) Claude M. Bolton Jr. approved the Army Acquisition Human Capital Strategic Plan (HCSP) to provide the direction to transform the Army AL&T community into a more diverse and versatile workforce, better postured to support the Army's mission. It also establishes a forecasting framework to assess the "health" of Army acquisition and provides important human capital insights to our acquisition leaders.

The ASAALT Balanced Scorecard™

The Balanced Scorecard is a strategic road map used to accomplish the AL&T mission. It's comprised of five overarching strategic objectives (end results) including completely aligning with the USD(AT&L's) goal of shaping a high-performing, agile and ethical workforce. It also explains the ways and means this goal is to be achieved:

- Promote Army Acquisition Corps (AAC) leadership development.
- Promote workforce professional development.
- Match the workforce to the work requirement.
- Promote a professional military acquisition corps.
- Resource the acquisition workforce.

We are aligning and integrating our goals with the DOD human capital indicatives with our HCSP by creating a more flexible acquisition professional through the ASAALT Competitive Development Group Program. This plan creates leaders with a broader perspective through diverse experiences and advanced leader development training. We are establishing a comprehensive, data-driven workforce analysis and decision-making capability by using Lean Six Sigma, the National Security Personnel System and Balanced Scorecard to ensure the use of measurable desired outcomes to guide progress in our programs.

The U.S. Army Acquisition Support Center (USAASC) objective to maximize the Army acquisition automation tools to enhance career planning and development has some promising innovations to streamline our career management process. One example is a certification process that automates coursework completion and continuous learning point posting, has Acquisition Career Record Brief edit capability and features virtual *Defense Acquisition Workforce Improvement Act* (*DAWIA*) certification.

We are targeting promotion of professional development for military and civilian personnel by matching the workforce to the Army's needs by creating a supervisor outreach program to assist acquisition supervisors in guiding the professional development of their people. Also, we are constantly communicating our message to the AL&T Workforce through *Army AL&T* Magazine, *Army AL&T Online Monthly* and the newly reconstructed USAASC Web site. Additionally, LTG N. Ross Thompson, Military Deputy to the ASAALT and Director for Acquisition Career Management, and his predecessors have traveled to our acquisition communities to keep an open dialogue with the workforce.

Various Army initiatives and routines readily support the USD(AT&L) goals, including the Army Acquisition Career/Leader Development Program. This program has three progressive developmental levels for employees to move forward throughout their career and develop competitive qualifications as well as functional leadership competencies:

- Technical foundation is the base for development that is accomplished by achieving Level III certification and acquiring a thorough understanding of the technical aspects of their respective acquisition career fields (ACFs).
- In the broadening experience stage, employees strive to develop multifunctional knowledge and awareness and to obtain Level II certification in an additional ACF.
- Once assigned to positions at the strategic leadership level, success is dependent on acquired skills.

To ensure that the proper training is available for developing tomorrow's strategic leaders, adequate resources are required.

Resource Management Challenges

AAC education is funded through Operations and Maintenance Appropriation (VAQN) —"Funds Education, Training, Experience and Assignments Necessary for Career Progression

for Military and Civilian Members of the AAC." The FY07 HQDA Critical President's Budget (PB) is $6.109 million. The current PB funding position is $4.803 million. The final VAQN is $4.74 million and is based on the final funding letter dated Nov. 13, 2006. This brings a year of execution challenges including:

- Incremental funding that causes timing issues with conducting boards and class registration.
- Vice Chief of Staff of the Army (VCSA) Operations and Maintenance Army restrictions to travel, conferences and training reduces effectiveness, and VCSA memo restricting hiring to current Army civilians unless a waiver is approved to hire from outside the federal government.
- Requirements growth creates shortfalls for functional area (FA) courses.

AAC funds for education, training, experience and assignments are essential for career progression for military and civilian AAC members per *DAWIA Title 10, U.S.C., Chapter 87*. This includes advanced degrees, leadership training, operational experience and developmental rotation broadening assignments from accession through all stages of career progression leading to the most senior acquisition positions. Funding provides a framework for the AAC's continuing educational and professional development requirements per *DAWIA* and the USD(AT&L) policy on continuous learning for the Defense Acquisition Workforce.

Army Acquisition Certification Status

The first indicator on the "health" of the AL&T Workforce's professional development is certification for the work being done. Based on our data as of Dec. 31, 2006, the distribution of the Army military and civilian acquisition personnel by acquisition position category for those certified for current position requirements, is only 38 percent of the total Army acquisition workforce meeting position requirements for certification. Based on available service data from early FY06, the Army lags the other services in this area.

The systems planning, research, development and engineering and contracting career fields are nearly 50 percent of the acquisition workforce and 62 percent of the required certifications. Business, cost estimating, financial management and life-cycle logistics have relatively major densities in the workforce and comparatively low certification levels. We have instituted a Supervisor Outreach Program to educate and enable acquisition supervisors on acquisition career development requirements and have personally engaged the senior leaders in the Army acquisition community to support and enforce acquisition professional development. We fully expect marked improvement in all areas this year and for many years to come.

Certification Training

The Army needs to make a stronger commitment to certification training to ensure our workforce's continued professional development. At the beginning of each fiscal year, the Army communicates its training needs to the Defense Acquisition University (DAU). The Army submitted its FY08 request to DAU the first quarter of FY07. In FY08, the Army is requesting nearly 11,000 resident quotas. If recent past performance is any indication, the Army will use all of the quotas it's allocated. The Army Quota Managers take every opportunity to place students seeking training into classes.

Theoretically, DAU resident quotas are a finite resource. In truth, DAU is adept at adding capacity to accommodate service needs during the academic year. In FY06, DAU added approximately 1,720 resident quotas. The Army was able to make good use of all available quotas, above and beyond the allocation, and continued to fill necessary resident courses as long as the Army could afford the inevitable temporary duty (TDY) costs. Approximately 40 percent of Army resident quotas are filled by students who must travel.

Budget challenges aside, the Army continued to send acquisition workforce members to certification training, and we will continue to do so. Routinely, program executive offices (PEOs) and other commands pay the TDY cost associated with certification training when the DAU training budget is constrained. In fact, to ensure there are ample DAU funds in FY07, the Army is allocating its managed DAU dollars only to priority 1 students. The commands of priority 2 students and above pay their own way. This may change if more training dollars become available, but this prudent policy is in line with the other services' practices and helps to ensure we don't have to turn away critical priority 1 students.

DAU allocated an additional $200,000 to the Army for DAU training in 2006. But even then, USAASC contributed an additional $360,000 to meet workforce training demands. Aside from the funding that PEOs, other commands and USAASC contribute, the Army also funds and provides DAU training through the Army Logistics Management College, Huntsville, AL, to its newly assessed acquisition personnel at the Basic Qualification Course (BQC). Students receive a Level II education in program management and contracting. The FY06 BQC cost the Army $2,342,042 with more than half that cost coming from

TDY costs. This proved to be an acceptable manner in which to conduct the necessary training required for certification, but we are always looking for alternate forms of education that lead to employee certification but at lower overall cost to the government.

In addition to DAU training, the Army has developed and initiated many additional programs to develop an agile and ethical acquisition workforce including FA51, CP-14 Senior Leadership Development and Career Program 40 courses.

Preferred Outcomes

The following is the Balanced Scorecard's desired end state:

- To promote professional development and ensure that educational and developmental opportunities are the right ones for the acquisition workforce.
- To provide training and education that actually enhances professional development.
- To increase employees' job satisfaction, build a better "bench" and get the right people in the right job at the right time.
- To retain a skilled and experienced workforce through our Senior Service Schools and provide proper placement after graduation.

By following these criteria, the Army will create agile, multifunctional acquisition professionals prepared to successfully lead and manage complex acquisition organizations and project management challenges in constrained resource environments.

For more HCSP information, contact David Duda at (703) 805-1243/DSN 655-1243 or **david.duda@asc.belvoir.army.mil**.

Craig A. Spisak
Director, U.S. Army
Acquisition Support Center

Practical Project Management: What is the Program's Technology Management Plan?

COL John D. Burke

A Milestone B or C decision or, best of all, a full rate production go-ahead is quite an accomplishment for a project manager (PM). Once a PM has achieved one of these peak events, the inevitable "good idea" factory will go into full steam. These good ideas could include new engines, new software, sensors, payloads, commonality with other platforms, simulations, models, logistics monitoring devices, maintenance improvement equipment and human factor engineering. Of course, most of these come with limited funding and the expectation that the host platform will help fund the technology transition.

How does a PM manage technology to take advantage of candidate program improvements while preserving the program's approved cost, schedule and performance goals? The PM has to be in front of the technology curve and determined not to react and induce program disruption. Successful technology planning depends on *anticipation, feasibility, best-value evaluation* and *timing*.

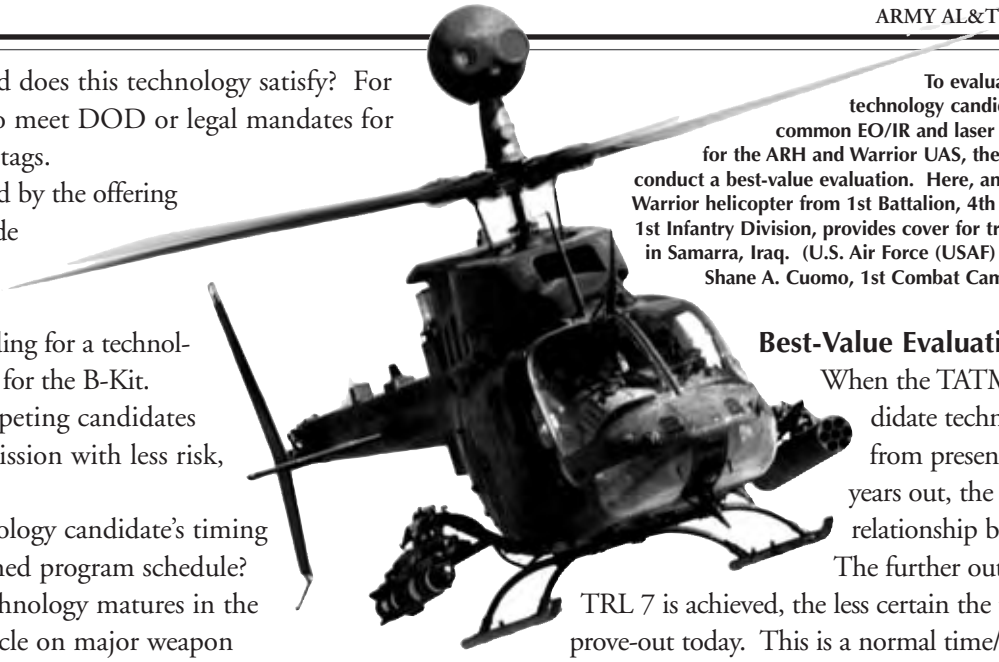
Anticipation

A technique to catalogue and index the various candidate technologies is the Technology Assessment Transition Management (TATM) process. This model was used in the Unmanned Aircraft Systems (UAS) Project Management Office (PMO), then expanded to Program Executive Office (PEO) Aviation and eventually to PM Joint Robotics Office (Unmanned Ground Vehicles). The TATM is based on the Defense Acquisition University method that will assist a project office upon request. TATM Proof of Concept can be found online at **https://acc.dau.mil/CommunityBrowser.aspx?id=142628**.

The PM or PEO can use the TATM to identify the core program with each of the sources, maturity and eventual cut-in of various technologies. Candidates can come in response to safety or obsolescence, from planned product improvements or from other federal agency research and development (R&D) and industry internal R&D investments. The value of a single "horseblanket" depiction of all the technology candidates shows the time-to-event alignment of new technologies in context of the core program.

When technology candidates are proposed for inclusion into your program, the top level questions should be:

- What identified need does this technology satisfy? For example, the need to meet DOD or legal mandates for smart identification tags.
- Is the proposal funded by the offering organization to include transition and engineering support? Often the funding for a technology candidate is only for the B-Kit.
- Are there other competing candidates that can meet the mission with less risk, cost or complexity?
- How does the technology candidate's timing relate to the established program schedule? For example, if a technology matures in the middle of a block cycle on major weapon systems with block upgrades programmed 3-5 years in advance, then the next opportunity may be 5-7 years later.
- Who is the champion of the initiative?



To evaluate potential technology candidates for a common EO/IR and laser designation sensor for the ARH and Warrior UAS, the PM used TATM to conduct a best-value evaluation. Here, an OH-58D Kiowa Warrior helicopter from 1st Battalion, 4th Cavalry Regiment, 1st Infantry Division, provides cover for troops on the ground in Samarra, Iraq. (U.S. Air Force (USAF) photo by SSGT Shane A. Cuomo, 1st Combat Camera Squadron.)

Feasibility

The Technical Readiness Level (TRL) is one means to apply a standard against the candidate technology. TRL of 1-4 typically means the technology is undergoing basic engineering and scientific principles to prove-out in a prototype at the lab. TRL of 5-7 represents the levels of maturity where serious consideration for inclusion on the platform should occur. An excellent TRL paper is located at **http://www.acq.osd.mil/dpap/Docs/AQ201S1v10Complete.pdf**. [Note: Use upper case letters where shown.]

The PM has to establish a screening process for the individual technology candidate such as an improved electro-optic (EO) and infrared (IR) sensor fusion software. What is the maturity of the individual software? Has the design been vetted with the platform and other intra-system components? How will we test and evaluate on an individual basis and then on a system level? How should fleetwide dissemination of the software and training of users and maintainers be accomplished?

Feasibility criteria for a PM boils down to a go/no-go criteria. Is the proposal in the program office's best interest, and are resources available to form a technology insertion team — usually an ad-hoc team — to evaluate the technology for more development? The PM must remember that each of these technologies has constituent interests from industry, other federal agencies and even Congress. Thus, the criteria and means to adapt technologies should be consistent and clear to all concerned, as you will be asked to defend your decisions later on.

Best-Value Evaluation

When the TATM list of all candidate technologies is shown from present to 3, 5 and 10 years out, the maturity-to-time relationship becomes evident. The further out technology TRL 7 is achieved, the less certain the technology will prove-out today. This is a normal time/value relationship that can be normalized in terms of risk and economics.

To evaluate a candidate technology like multi-spectral fusion, the PM team should use the existing cost of the EO/IR sensor on the system today as a base case. Similar to discounting a financial note due in 5 years, create the high and low spread of cost and complexity of the future capability against today's sensor. If the payoff is below the cut-line then the candidate technology should be rejected. An alternative is developing a plan to decrease either the maturity or cost risk and rerun the analysis.

The process described above was used to develop the Army approach for a common EO/IR and laser designation sensor used for the Armed Reconnaissance Helicopter (ARH) and the Warrior UAS system. The multidisciplined team met over the course of 12 months with periodic reviews with the Army Vice Chief of Staff and the Army Acquisition Executive. We reduced the cost and performance variance of a common sensor to an acceptable trade-off when compared to the existing strategy of pursuing two separate sensors for two separate platforms.

Timing

Trying to synchronize the weapon system platform, sub-systems and then technology candidates is a time-intensive task. Each element has multiple organizational, financial and technical aspects. When multiplied across a complex weapon system, PMs can find themselves in situations where only the most intensely marketed technology candidates are brought forward.

The program budget build or Program Objective Memorandum (POM) process begins in the fall of the year for the budget year 2-7 years out. PMs will begin their program

POM submission in October 2007 for the FYs 10-15 POM period. When the POM submission timeline and the TATM spreadsheets are overlaid, PMs can easily see when to include technology transitions in the POM submission. This kind of overlay is essential to show a cohesive adaptation of technology into the base program.

Organizing for Technology Transition

The aviation community established a general officer board with the commanding generals of the U.S. Army Aviation Center and the U.S. Army Aviation and Missile Command, with PEO Aviation and the Director of the Aviation and Missile Command Research and Development Engineering Center as the signatories. This group meets twice a year to review and prioritize the Aviation Science and Technology and R&D initiatives and candidates.

The PM is responsible for signing technology transfer agreements (TTAs) for initiatives coming out of the Army R&D command or the Defense Advanced Research Projects Agency with their counterpart in these commands. The inherent power of signing or not signing these TTAs is the credibility given to the R&D proposal showing the target host platform is committed to transitioning the technology.

Our author points out, "successful technology planning depends on anticipation, feasibility, best-value evaluation and timing." The UAS PMO used these techniques and the TATM process on several very successful product launches. Here, CPL Jerry Rogers, 1st Battalion, 13th Armor Regiment, 3rd Brigade, 1st Armored Division, assembles a Raven UAS near Taji, Iraq. The Raven is being used to track potential insurgent forces operating in the vicinity. (USAF photo by TSGT Russell E. Cooley IV, 1st Combat Camera Squadron.)

The PM has to determine which part of the office will be responsible for technology transition. Depending on the interest and disposition of the PM and Deputy Project Manager (DPM), either the DPM or Engineering Division Chief is the responsible official. As a PM, I decided to lead the technology assessment team consisting of key leadership within the PMO. A PM should expect that one or two seasoned engineers with multidisciplinary experience are needed in an acquisition category (ACAT) I or basket project office to manage the TATM process, answer queries about new technology and conduct program level assessments of new ideas.

Managing the Process

Managing technology insertion is a necessary function for successful programs. A PM has to anticipate, assess for feasibility and value and then time the insertion to gain maximum performance at the least disruption and cost. ACAT I and basket project offices have to set aside managerial and engineering time and resources to set up a disciplined and repetitive process. That process succeeds with defined criteria on how technology candidates will be assessed, prioritized and included in the base program plan.

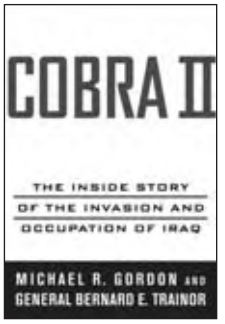
A successful PM will establish the required oversight, understand the various interests and accept the intensity of organizations and people who want to help improve the base program through technology insertion. Success is a positive response to the rhetorical question "Am I managing the program's technology or is it managing me?"

COL John D. Burke is the Deputy Director, U.S. Army Aviation, HQDA G-3/-5/-7. He concurrently serves as the Director for Unmanned Systems Integration. He has nearly 20 years of project and product management experience in Army programs.

Worth Reading

Cobra II: The Inside Story of the Invasion and Occupation of Iraq

Michael R. Gordon and GEN Bernard E. Trainor
Pantheon, 2006



Reviewed by Scott Curthoys, a retired U.S. Army Military Intelligence and Foreign Area Officer. He is currently working as a Counterintelligence Analyst contracted to a federal agency.

Bookstore shelves are groaning under the weight of books on the war in Iraq. Some are well written and provide the reader with an understanding of a very complex puzzle; others have been written merely as a vehicle for the author to espouse his or her own political views on the reasons the U.S. went to war. Whatever the author's motivation, the sheer number of books is reflective of the significance that the conflict in Iraq, and its aftermath, has for this country.

Despite the emotions surrounding the attacks of Sept. 11, the U.S. invasion of Iraq may rank as the defining moment of the first half of the 21st century. If the United States succeeds in installing representative democracy in a region unfamiliar with the concept, it would deprive those who advocate terrorism of some of the long-standing grievances that fuel their cause. On the other hand, if the current attempt at building a new Iraqi nation fails, and this is not a slight possibility, then the United States and its allies face a far more perilous course in protecting themselves from those who practice terror in the name of their god. Moreover, the seeds of a failure in Iraq were likely sown prior to the first shot of the war being fired.

In their book, *Cobra II*, authors Michael R. Gordon and GEN Bernard E. Trainor (U.S. Marine Corps., Ret.) provide a clear and riveting look at the military planning that went into the invasion of Iraq. Moreover, they give the reader a deep look into the lack of planning concerning postwar Iraq. The disconnect between planning for the invasion and not planning for the occupation, the failure to follow up a successful campaign with a workable plan to secure Iraq, is the most prominent thread running through the book.

This disdain for the "mushy" aspects of a military campaign should not be a surprise for those familiar with President Bush. As far back as Oct. 11, 2000, during a debate with his opponent, then candidate George W. Bush dismissed the concept of using troops for nation-building. "I think our troops ought to be used to fight and win war," Bush stated. What is absent from this thinking, of course, is an understanding that war does not end with a referee's whistle; it often transforms into something that requires different objectives and resources.

What is evident in *Cobra II* is that the chaos of postwar Iraq is not just the result of circumstances, but can be traced to decisions made by the military and the civilian administration prior to and during combat.

Then Secretary of Defense Donald Rumsfeld exercised far more influence in the planning process for the invasion than his "it's not my plan" public pronouncements indicate. The authors discuss, in great detail, Rumsfeld's interest in the invasion plan. Specifically, they cite his constant pressure to limit the size of the invasion force, his alterations to the time-phased force and deployment list, and the fact that he did not direct U.S. Central Command (CENTCOM) to designate a headquarters to secure postwar Iraq. Coupled with this almost unprecedented interference in what was normally considered "general's business" was an increasingly dysfunctional military structure. This was characterized by a marginalized Joint Chiefs of Staff, a CENTCOM staff in Tampa that required near constant care and feeding by subordinate headquarters in theater, and a Defense Secretary that took umbrage at the suggestion of one of his generals that the occupation of Iraq would require several hundred thousand troops.

This last point is indicative of why the failure to secure postwar Iraq could have been avoided. Rumsfeld's concept of a transformed military — to essentially do more with less — did succeed during the march to Baghdad. In moving up and down the military structure from platoon battles to the decisions of battlefield generals, this book chronicles the

impact of American technology. Improved reconnaissance and surveillance tools, precision guided munitions and a high degree of cooperation between the services allowed the United States to invade with a small force and move rapidly toward its objectives. However, this reliance on a small, fast-moving force had two consequences that, the authors indicate, were ignored during planning.

The first is that a small force would not have a sufficient number of troops on the ground to occupy Iraq. Even with the forlorn hope that the Iraqis would police themselves, the United States did not even have enough occupying forces to secure all of the suspected weapons of mass destruction sites prior to inspection. The second is the appearance of the Fedayeen on the battlefield.

Cobra II lays bare the misperceptions that guided the planning and strategy of both sides. Saddam Hussein was convinced that the principal threat to his regime was from internal unrest. He did not consider invasion by the United States to be a big threat, as even Iran ranked higher as a challenge. As a result of this perception, Saddam established the Fedayeen, ostensibly to combat an internal uprising until the Republican Guards arrived. The United States misread the foe and focused on destroying the Republican Guards as the main objective — completely missing the significance of the initial appearance of Fedayeen on the battlefield. As the authors point out, the first Marine casualty was killed by a man in civilian clothing riding in a pickup truck. The troops engaged in combat quickly adapted and began engaging the Fedayeen. However, the significance and impact of these irregulars was not realized at CENTCOM, as was evident when the CENTCOM Commander considered relieving the V Corps Commander, U.S. Army LTG William "Scott" Wallace, when he stated that U.S. forces had not planned for irregulars on the battlefield. U.S. Army GEN Tommy R. Franks (now retired) was focused on a rapid advance to Baghdad while his field commanders were trying to reduce the effects of the Fedayeen on their logistics.

The strength of *Cobra II* lies in the fact that it is not the history of a single battle, the story of a highly decorated unit or the biography of a single general at war. Instead, it is a comprehensive and dispassionate examination of 18 months of planning and the resulting invasion — explained with clarity by authors who understand the military and its unique culture.

Contracting Community Highlights

This issue's feature article highlights how the Army's use of an innovative strategic sourcing effort led to the award of contracts that will yield a savings of millions from cell phone and wireless communication acquisitions. These savings were made possible by the teaming of the Information, Technology, E-Commerce and Commercial Contracting Center acquisition workforce and its customers.

In addition to the feature story and the regular *DAR* Council Corner article, I introduce to you Karen Moser, the new Deputy Assistant Secretary of the Army (Policy and Procurement) (DASA(P&P)) Competition Manager and Ombudsman. In the article, Moser, who comes to us from the U.S. Army Materiel Command, covers stewardship, personal objectives and measuring success. Moser's extensive acquisition experience will be an asset as she reinvigorates the DASA(P&P) Ombudsman and Competition Advocate programs.

Also featured is the U.S. Army's Program Executive Office for Simulation, Training and Instrumentation contracting for robotics on the battlefield, and some insights and experiences faced by civilians supporting contingency and exercise support contract operations. I would like to send my thanks to the military and civilian personnel in these positions, who demonstrate every day a unique courage and professionalism in supporting our warfighters.

We appreciate support from the field in providing material for publication, and we hope you are finding the submissions informative and interesting. For more information, contact Emily Clarke at (703) 696-1675/DSN 426-1675 or **emily.clarke@hqda.army.mil**.

Ms. Tina Ballard
Deputy Assistant Secretary of the Army
(Policy and Procurement)

Army Contracting Saves Millions on Wireless Services and Devices

The U.S. Army is expecting to shave nearly $4 million from its cell phone and wireless e-mail bills this year without reducing service, thanks to an innovative strategic sourcing effort that is restructuring how the Army purchases wireless services and devices.

The Army Contracting Agency (ACA), in a Joint effort with the U.S. Air Force (USAF) Information Technology Commodity Council and the Defense Telephone Service-Washington (DTS-W), recently launched a comprehensive strategic sourcing initiative to leverage the military's buying power and optimize purchasing of wireless devices and services. The end result is newly negotiated blanket purchase agreements (BPAs) with the four major wireless providers — Cingular (now AT&T), Verizon, Sprint and T-Mobile — as well as a number of smaller, regional providers. These new agreements consolidate numerous older contracts and provide the greatest level of discounts to date for Army users, while enhancing overall service levels.

Benefits extend beyond the Army, as the new contracts have been made available for use by all DOD personnel. The Army and USAF alone expect to save an estimated 20 to 30 percent of the roughly $50 to $100 million the two spend annually on wireless devices and services.

In the past 5 years, the use of cell phones and wireless e-mail devices such as the BlackBerry® have grown tremendously. With increased competition and technological advances, the industry itself has undergone significant change. In the past 2 years, the number of national wireless providers has been cut in half because of mergers, while smaller, pay-as-you-go providers have emerged as potential consumer vendors.

Within the Army, change in wireless usage has been equally fast paced. Cell phones and BlackBerry devices have become invaluable tools for busy Army personnel on the go. In many instances, cell phones are replacing pagers and land mobile radios. Minutes of usage have continued to increase steadily, while the wireless use price per minute has dropped an estimated 40 percent over the last 3 years.

Despite the increased usage among Army personnel and the rapidly evolving wireless marketplace, the Army wasn't taking advantage of the opportunities to optimize its wireless buying. Army wireless users were scattered across multiple service contracts representing a broad range of pricing plans, many of them sub-optimal. Additionally, many users were on plans that were not sized correctly. They either had too few minutes, resulting in overage charges, or had too many minutes, resulting in wasted minutes and higher pricing.

The Army's wireless strategic sourcing was initiated in 2006 in response to a DOD-wide strategic sourcing effort that identified wireless services and devices as primary candidates to generate savings. In a Joint effort with the USAF and DTS-W, the Army launched a team to develop an acquisition strategy to maximize savings in wireless purchases. The Army, DTS-W and the USAF worked to develop the acquisition strategy as well as the final BPAs to negotiate with suppliers.

Bryon Young, newly appointed ACA Director, sponsored the initiative and was instrumental in providing guidance and support to the team as well as coordinating efforts with the USAF. "This was an important effort, not only because we expected we could achieve substantial savings, but also because we wanted to demonstrate we could successfully satisfy cross-service requirements using the strategic sourcing process," he explained.

Critical to the initiative's success was the formation of a cross-functional sourcing team of wireless experts and acquisition professionals from across the Army. Led by Robin Baldwin, who at the time was Chief, Acquisition Support Branch for the Information, Technology, E-Commerce and Commercial Contracting Center (ITEC4), the core team included representatives from the ACA, Army Office of Small and Disadvantaged Business Utilization, ITEC4 and Army Program Executive Office for Enterprise Information Systems. As recommendations were developed, a broader stakeholder group was engaged to provide feedback and guidance. Supporting Baldwin

throughout the effort were Linda Van Collie, ITEC4-West Contracting Officer, and Calvin Knight, Network Enterprise Technology Command/9th Army Signal Command Chief, Base Communications Division.

"The effort was a great success — the Army/USAF/DTS-W/wireless industry partnership was exceptional," said Baldwin. "We armed ourselves with information on how industry buys wireless hand-held products. Being the wireless hand-held industry's biggest individual customer is not enough to bring about great terms, conditions and pricing. It is knowing the recent terms and conditions negotiated by large businesses that counts. Knowing the benchmarks and concentration of Army and USAF wireless hand-held spending brought about a great outcome for DOD. Strategic sourcing is all about being educated consumers, and we were!" he exclaimed.

Continuing their analysis of Army wireless spending, the team identified numerous duplicative and uncoordinated contracts with the Army's four primary suppliers. In these contracts, they found many pricing plans and price points that were not competitive with current market rates — legacy rates from older plans or independently negotiated plans by individual Army organizations.

The team also examined user requirements by analyzing usage data and gathering qualitative feedback through user interviews. The team determined that many users were purchasing more minutes than they were actually using. A significant portion of wireless minutes that the Army purchased were going unused.

Finally, the team researched wireless industry trends as well as best practices of other government agencies and commercial firms for controlling wireless costs and developing optimal supplier agreements. This research pointed to three key strategies for improving the Army's wireless sourcing:

- *Enterprise Agreements.* Negotiating agreements at the enterprise level allows an organization with the Army's size and scope (and DOD more broadly) to take advantage of volume-based discounts and reduce administrative costs associated with managing multiple contracts.
- *Rationalize Existing Contracts.* Performing a comprehensive review of existing contracts allows an organization to eliminate older, sub-optimal contracts while identifying the best contracts to serve as benchmarks for negotiating future contracts.
- *Practice Demand Management.* Taking a critical view of user needs and usage allows organizations to match users to the most appropriate plans.

Overall, the team's market analysis suggested significant savings could be achieved with the successful implem entation of these three strategies.

In March 2006, the Army signed its first BPA with Verizon Wireless. Over the next several months, additional BPAs were signed with Sprint, Cingular and T-Mobile, as well as selected smaller providers. The new BPAs replace all existing wireless agreements and all new wireless purchases are being made through these contract vehicles. Army personnel are transitioning to the new plans as their current service contracts expire.

"This is an important savings opportunity," Young remarked. "We have to ensure that all organizations understand the terms of these new agreements and adopt them as soon as practical." Each BPA covers the range of wireless devices identified by the strategic sourcing team as being required by Army personnel. This includes cell phones, wireless e-mail devices (such as the BlackBerry) and wireless broadband devices (modem cards), as well as wireless accessories.

Administration of the new agreements is being performed at the Army ITEC4-West at Fort Huachuca, AZ. However, BPA ordering is decentralized, allowing local contracting offices to place orders and administer them for their customers. To view detailed terms and conditions for the BPAs, go to **http://www.itec4.army.mil**.

Currently, the Army is transitioning existing users over to the new BPAs. Based on initial analysis, the BPAs have been a tremendous success in moving users to improved pricing plans that are better aligned with actual usage. Total savings will increase as more users transition to the existing BPAs.

For more information about wireless strategic sourcing, contact James Kuhl at (520) 538-8244 or **james.kuhl@us.army.mil**. For information about Army strategic sourcing, contact COL Tony Incorvati at (703) 325-3309 or **anthony.incorvati@us.army.mil**.

DASA(P&P) Welcomes New Competition Manager and Ombudsman

Deputy Assistant Secretary of the Army (Procurement and Policy) (DASA(P&P)) Tina Ballard welcomes Karen Moser as the new Competition Manager and Ombudsman for the Army acquisition community. Moser, on board since November 2006, is assigned to the new Business Operations and Enterprise Systems Directorate. Coming from the U.S. Army Materiel Command as a Senior Procurement Analyst, she also brings staff work experience in U.S. Air Force space systems contracting.

DASA(P&P) Tina Ballard presents the Achievement Medal for Civilian Service to Karen Moser, the new Competition Manager and Ombudsman for the Army acquisition community. (U.S. Army photo by MAJ Robert Dutchie.)

Moser began her federal career as a Procurement Agent Intern with the Defense Construction Supply Center, Columbus, OH. Shortly thereafter, she joined the base procurement office at the 2750th Air Base Wing, Wright-Patterson Air Force Base (WPAFB), OH, and later became a Procurement Analyst at the base's Acquisition Logistics Division. She then attained positions as a Contractor Negotiator and Procurement Analyst at the U.S. Aeronautical Systems Division at WPAFB.

The Ombudsman position has been unencumbered for some time. By definition, an ombudsman is chartered to function independently and charged with representing the interests of the public by investigating and addressing complaints or other issues. Moser, who is tasked by and reports to the DASA(P&P), said her objective is to provide oversight for the Army, review and respond to contractors' questions regarding terms and conditions of contracts and to investigate complaints. "I will regard the program as a success if all parties are satisfied that their concerns have been handled fairly, whether or not they like the answer," she said.

As the competition manager, Moser provides staff support to Ballard, who is also the Army Competition Advocate. She works closely with the Army's major commands' policy departments to maximize and enhance the government's ability to leverage the benefits of market-based competition to ensure each command receives the best available prices, quality and innovation from private industry as the government contracts for systems, products and services.

"In promoting competition in contracting, we face a particularly challenging environment," Moser explained. "Given the critical need for funding operations and providing contract support in Iraq and elsewhere in support of the global war on terrorism, these funding constraints and short-notice requirements have made advance planning more difficult and continue to consume a considerable amount of our contracting personnel's time and energy."

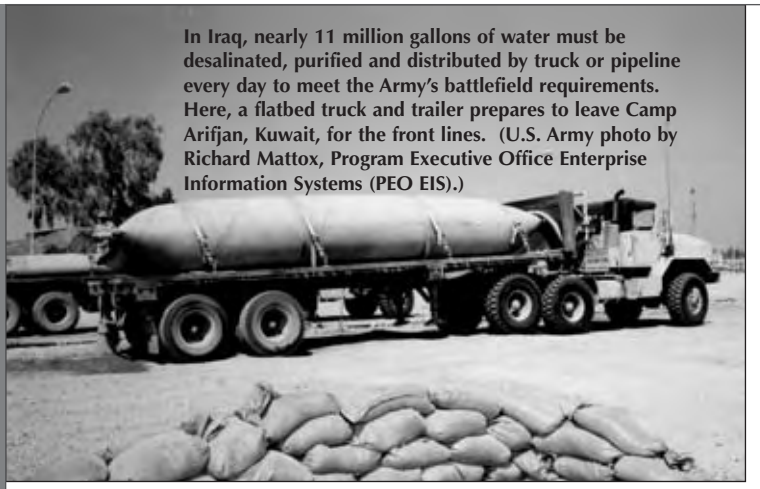
Moser said that as the contracting environment becomes more challenging, the need has never been greater to ensure that taxpayers get the most for their money. "Areas we expect to examine closely include services, which comprise a large and increasing share of our total contracting dollars, and software, where recent Government Accountability Office decisions serve as a reminder of the need for close scrutiny of our business arrangements. While we are moving into a difficult new environment, we are confident that our Army acquisition workforce will be up to the challenge and will align the Army staff to provide the best support possible," she proclaimed.

Karen Moser can be contacted at (703) 696-4458/DSN 426-4458 or **karen.moser@hqda.army.mil**.

Battlefield Contracting — A Personal View

Jake M. Adrian

Contracting on the battlefield is just that — contracting in an often dangerous and extremely diverse operational environment. Daily threats working and living at Camp Victory, Baghdad, Iraq, include random bullets coming in



In Iraq, nearly 11 million gallons of water must be desalinated, purified and distributed by truck or pipeline every day to meet the Army's battlefield requirements. Here, a flatbed truck and trailer prepares to leave Camp Arifjan, Kuwait, for the front lines. (U.S. Army photo by Richard Mattox, Program Executive Office Enterprise Information Systems (PEO EIS).)

over the wall and mortar and rocket attacks. Other threats involve attacks on the base life support supply chain, the oppressive summer heat and the muddy mess during the winter wet season. The old slogan, "It's not just a job, it's an adventure!" holds true every day — and then some!

On June 14, 2004, I started working for the U.S. Army Sustainment Command (ASC), a subordinate U.S. Army Materiel Command (AMC) organization. Hired as a contract specialist, my first 11 months were spent as a cost/price analyst for the Logistics Civil Augmentation Program (LOGCAP) III, a $22 billion program that was competitively awarded to Kellogg, Brown & Root Services Inc., in December 2001. LOGCAP III is the Army's largest contingency contract, supporting more than 100,000 troops spanning a theater of operations that includes Kuwait, Iraq, Afghanistan, the Republic of Georgia and Djibouti. My duties included task order proposal evaluation for allowability, allocability and cost, and direct negotiations for base life support, theater transportation mission, bulk fuel and the Army oil analysis program. I evaluated proposals and negotiated task orders covering portions of Iraq, Kuwait and Afghanistan. From my perspective, I was helping the customer and the taxpayers get the most "bang for their buck," and doing it from the comfort of Rock Island, IL, and Houston, TX.

In 2005, I was in various ammunition rotations learning about supply contracting and the ins and outs of the *Federal Acquisition*, *Defense Acquisition* and *Army Federal Acquisition Regulations*, and attending classes to become *Defense Acquisition Workforce Improvement Act* Levels I and II certified. In May 2006, I was assigned my permanent duty location at LOGCAP III, this time on the contracting side and, again, from the comfort of Rock Island.

In late August 2006, I "threw my name into the hat" to deploy to the LOGCAP forward office in Iraq. I wanted to do my part and go the extra mile for my country. I left Rock Island on Oct. 26, 2006, and spent a week at the CONUS replacement center. On Oct. 29, I sat down at my new desk in the AMC LOGCAP-Iraq office at Camp Victory.

My second week in country, our team traveled to Camp Anaconda, Balad, Iraq, for the main LOGCAP-Iraq task order post-award road show that includes the base life support, theater transportation mission and corps logistic support services' task orders covering the bulk of Iraq. Our road show included briefing customers on the LOGCAP contracting process, allowing customers to raise any concerns and bringing all the stakeholders together in one room. It was during these briefs, given by the LOGCAP-Iraq Deputy Program Director Jana Weston, that I realized what I thought I knew about LOGCAP was nothing compared to how it really works.

Contingency contracting, and specifically LOGCAP III, is a completely different "animal" when you are out in the field and in the thick of it. Things that seemed so simple or obvious to me back in my cozy cubicle took on a whole different meaning once I got to Iraq. You can talk about task order support, but you don't know what it really means until you see it and depend on it as our Soldiers do.

Back in Rock Island, water is drawn from the Mississippi River, cleaned and delivered through an elaborate network of pipes and, ultimately, pumped out of your faucet. You buy food at a grocery store or restaurant. Electricity happens when you flip a switch. In Iraq, approximately 11 million gallons of water per day must be desalinated, purified

U.S. Army mechanics from AMC Forward Combat Equipment Battalion, Camp Arifjan, make necessary adjustments to a newly installed M1A2 Abrams Main Battle Tank engine. LOGCAP ensures that Soldiers have the supplies, tools and space they need to perform their logistics support missions. (U.S. Army photo by Richard Mattox, PEO EIS.)

and distributed by truck. Food is delivered to the dining facility by armored trucks via military convoy, making it susceptible to improvised explosive devices and roadside attacks all the way from Kuwait to Camp Victory. For electricity you flip a switch, just as you do in the United States, but the electricity comes from gas-burning generators — gas which has to be delivered in the same manner as the food.

It was hard to understand the magnitude and challenges of contracting in a contingency environment from a cozy cubicle in Rock Island. Being out in the field has shown me the errors in my previous thinking. Working in a deployable environment has shown me why things were proposed the way they were. I learned why a piece of equipment I thought had no added value may actually be the difference between life and death for a Soldier on the battlefield.

Despite all the threats, hardships and inconveniences, contracting is a force multiplier and the mission must get accomplished. Contracting on the battlefield and the overseas assignments that go with it are filled with hardships. However, because of contracting services, warfighters are eating hot meals in an air-conditioned building, they are going back to a mattress and a bed, and their lives are made a little easier. This makes contracting on the battlefield worthwhile.

For more information, contact Jake Adrian at (312) 732-427-0566/DSN 987-0566, when prompted, enter 1, then 3009#, or **jake.adrian@us.army.mil**.

Editor's Note: For Army contracting professionals interested in volunteering for overseas duty, AMC/ASC is accepting nominations for its new Deployable Civilian Contracting Cadre (DCCC) pilot program. The DCCC is designed to establish a cadre of highly trained and experienced civilian contingency contracting officers. See our October-December 2006 issue, Pages 54-57, or go to **http://asc.army.mil/docs/pubs/alt/2006/4_OctNovDec/articles/54_AMC_Establishes_a_Deployable_Civilian_Contracting_Cadre_200604.pdf**, to learn more about the DCCC. If you are interested in volunteering for overseas contracting positions, contact LTC Robert Shelton, Army Contracting Command (ACA)-Northern Region, at (757) 788-3624/DSN 680 or **robert.shelton1@us.army.mil**. You may also contact LTC Robert Brinkman, ACA-The Americas, at (210) 295-6147/DSN 421 or **robert.brinkman@samhouston.army.mil**. For information about contingency contracting in Iraq, contact Carolyn Creamer at (703) 696-5030/DSN 426 or **carolyn.creamer@hqda.army.mil**.

JAKE M. ADRIAN is an ASC Contract Specialist at LOGCAP-Iraq.

Army Contracting in Saudi Arabia

Willie Travis and Steve Jaren

There are still places in the Kingdom of Saudi Arabia where you can imagine Lawrence of Arabia's experience riding his camel across the desert. These days, when you see the Saudi Arabian National Guard (SANG) riding their "camels," they are actually Light Armored Vehicles (LAVs), an earlier Stryker vehicle variant. Residents still ride real camels in Saudi, but SANG only rides them for ceremonial events. Contracting in Saudi doesn't involve camels, but it still provides interesting and challenging opportunities that sometimes make you feel like you're riding one of those humpbacked beasts.

Our Mission

The primary weapon system for SANG is the LAV. This program is managed by Program Manager (PM) LAV, Warren, MI. The Office of the Program Manager (OPM)-SANG Modernization Program coordinates fielding of these vehicles in country by providing training and logistics support to the Saudis under a separate service contract. Additionally, SANG provides other contracting support such as working construction efforts associated with the LAV program, transitioning other military systems to the LAVs and supporting equipment including various simulators.

The OPM exercises principal authority over the modernization effort's planning, direction, execution and control. This authority includes all SANG elements, missions, functions and requirements. OPM-SANG has provided training and support for some of these weapons and other security services for more than 34 years.

The OPM-SANG Acquisition Management Division (AMD) is involved in all phases of contracting, starting with pre-award functions and concluding with all aspects of post-award functions. SANG procurements include equipment, training and support services; large facilities construction; information technology equipment/services; medical equipment; and consumable supplies. OPM's contracting authority flows from the U.S. Army Materiel Command's Office of Command Contracting. OPM's Principal Assistant Responsible for Contracting is April Miller and the Contracting Activity Chief is Jeffrey Parsons.

The OPM-SANG AMD staff. Front row (left to right): Danyl Apilado, Alicia Arizo, Mary Ann Justiniani, Vanessa Siron, Wendy Takeguchi, Yolanda Lillard, Christine Moreno and Willie Travis. Second row (left to right): Kim Robinson, Loraine Montgomery, Richard Kim, Morris Francis and Ronald Johnson. Third row (left to right): Steve Jaren, Larry Smith, Mohammed Karar, Ann Marie White, Herman Goodwin, Joe Libbey and Ben Chaib. (U.S. Army photo courtesy of Willie Travis.)

Though OPM has a unique mission — because what we do falls under foreign military sales (FMS) — we still conduct our contracting per the same acquisition regulations and procedures that other Army contracting activities follow. Most of the support we provide is for the Riyadh area, but our responsibility covers the entire kingdom, ranging from Jeddah and Mecca on the west coast to Damam and Hofuf on the east coast. We work with numerous contracts including cost-reimbursable, cost-plus-fixed-fee, firm-fixed price and cost-plus-award-fee. We also award a large number of highly complex service and construction contracts. The current dollar amount of OPM contracts awarded and administered by AMD is more than $273 million.

Working and Living the Saudi Experience

Working at AMD affords the opportunity to meet and work with a diverse group of people from the U.S. and with various foreign nationals hailing from such countries as the Philippines and neighboring Arab countries. For some of our civilians, this is the first time they have worked with the U.S. military. Even though Arabic is the national language, in many cases English is the *lingua franca* for doing business in the kingdom. AMD personnel also work as "advisors" to various Saudi professionals by helping them develop professionally in the contracting field with technical assistance in developing contract vehicles, where SANG conducts both pre-award and post-award contract functions. Supporting both LAV and SANG health affairs is a robust construction program that is jointly managed by OPM and SANG, and ranges from the building of military ranges to the construction of multiple building complexes.

U.S. labor laws don't apply to service contracts in Saudi, but labor laws do exist. The Saudi labor law is a combination of our national and their local labor laws into a single document. The *Labor Law* — its formal title — currently has 245 articles, and in many respects, addresses many of the same areas covered under U.S. labor laws. *Section 2, Chapter VI* establishes the work day as no more than 8 hours in one day and the work week as no more than 48 hours. Because Saudi Arabia follows the Hijra (Islamic) calendar, Friday is "a day of the weekly rest for all workers." The *Labor Law* does have a few unique differences from U.S. labor laws. One concept under *Section 4, Chapter IV* discusses the calculations for an end-of-service reward based on the number of years a worker has been employed by a company. This is a monetary award (different from a pension) that employees are entitled to for meeting the conditions of their employment agreement.

AMD offices and living facilities are all on the same large compound that is known by the Arabic word "Eskan." This roughly translates as a large, sprawling facility containing a wide range of quality-of-life support including recreation and morale support activities. Because this is an overseas assignment, additional benefits are provided that would not

normally be found in a CONUS assignment. There is fully furnished housing and OPM provides employees their own vehicle. Additional leave is provided to make the time between visits with loved ones less difficult, and some airfare travel home is provided at no cost. During travel, there are numerous opportunities to spend time in Riyadh. There are also other recreational opportunities around the kingdom such as diving in the Red Sea or playing golf at the Professional Golfers' Association of America course in Riyadh. We take pride in keeping our contracting skills fined-tuned by ensuring that all of our people take Defense Acquisition University courses or equivalents, at least once a year, be it in CONUS or other worldwide sites. Our National Contract Management Association chapter also holds monthly meetings and separate one-day workshops such as our recent FMS seminar.

For more information about OPM-SANG and AMD, visit **https://www.opmsang.sppn.af.mil**. For information about working in a challenging and rewarding environment such as Saudi Arabia, visit the Army Civilian Personnel On-line Web site at **http://cpol.army.mil** for AMD employment opportunities.

Willie Travis is the OPM-SAND AMD Chief. He can be reached at (966) 498-2480, ext. 5334/DSN 318-252-3900, ext. 5334 or ***willie.travis@opm.sppn.af.mil****.*

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Mortuary Service Contract Saves Medical Treatment Facilities (MTFs) $80,000 Annually

In September 2006, the Europe Regional Contracting Office (ERCO) awarded a requirements contract for mortuary services for the 21st Theater Support Command, U.S. Army Mortuary Affairs Detachment, Landstuhl-Kirchberg Caserne, Germany. Prior to this contract, MTFs were incurring the cost of moving remains from the point of demise to final disposition. In addition, the local contracting offices responsible for nonmedical contracting support used the government purchase card to arrange for transportation and burial of the deceased.

Based on these costs, ERCO explored contracting options that would assist the detachment in accomplishing its mission, and awarded a single requirements contract that has reduced overall costs, streamlined the process and decreased administrative burden. The resulting award included a statement of work that clearly identified requirements and performance expectations. The contractor's area of responsibility requires the movement of human remains from an area covering the west and south of Germany including Heidelberg, Wuerzberg, Hannover and Giessen, as well as bordering countries such as Switzerland, Austria, The Czech Republic and France.

The local MTFs will experience an estimated aggregate cost savings of $80,000 annually. These savings are accompanied by a decrease in the MTFs' administrative burden as a result of having only one contract vehicle to monitor versus multiple purchases from multiple funeral homes at each location. Most importantly, this consolidated contract allows more suitability in managing the difficult task of providing disposition of remains on behalf of authorized members and dependents concerning mortuary affairs requirements.

Margaret Otto, Level III Contracting Officer/Specialist, developed this acquisition strategy and resulting contract. She has worked for ERCO for nearly 6 years and exemplifies the highest standards of contract administration. ERCO is collocated with the Landstuhl Regional Medical Center near Kaiserslautern, Germany, and is run by MAJ Kevin Butler and 12 staff members.

Army Members on *DAR* Committees and *FAR* Teams Recognized

There are more than 200 DOD civilians and service members who are part of the *Defense Acquisition Regulation* (*DAR*) Committees and *Federal Acquisition Regulation* (*FAR*) teams. There are about 50 Army personnel who serve on these committees and teams as permanent, rotational, supplemental advisors or ad hoc members from HQDA, the U.S. Army Materiel Command (AMC), U.S. Army Contracting Agency (ACA), U.S. Army Corps of Engineers (USACE) and Military Surface Deployment and Distribution Command (SDDC). The successful implementation of the statutes, executive orders, DOD policy and other regulatory directives in the *FAR* and the *DAR* supplements are very dependent on these volunteers who typically take this responsibility on as

an additional duty. As committee and team members, they bring subject matter expertise, general policy advice and working experience, and represent the Army and DOD in deliberations on issues presented in the *FAR* and *DFARS* cases. The committee and teamwork are of the utmost importance across the entire DOD acquisition community. The current Army representatives on *DAR* Committees and *FAR* teams are listed below:

DAR Committee Members

Construction/A-E/Bonds	Parag Rawal, USACE
Contract Administration	Jean Kampschroeder, HQ AMC
Contract Finance	Susan Orris, HQ AMC Wallace Riggins, HQDA
Contract Placement	Debra Parra, ACA-Information Technology E-Commerce and Commercial Contracting Center (ITEC4)
Contract Pricing	Mike Gallagher, HQ AMC rotational-Cost Accounting Standards David Harrington, HQ AMC rotational-Insurance and Pension Susan Orris, HQ AMC rotational-Pricing Vacant-rotational-Incentive Contracts
Contract Services	Bob Friedrich, HQDA Kathy Love, HQDA alternate
Cost Principles	Mike Gallagher, HQ AMC
Debarment, Suspensions and Business Ethics	Christine McCommas, HQDA
Emergency Procurement	Patricia Logsdon, ACA-The Americas Margaret Patterson, Counsel, HQDA Karl Ellcessor, Deputy Counsel, HQDA Alfred Moreau, Deputy Counsel, HQDA
Environmental	Dr. Tom Kennedy, National Guard Bureau (NGB)
Government Property	Ann Scotti, HQDA
International Acquisition	Steve Linke, HQDA Craig Hodge, Counsel, HQ AMC
Labor	Gregory Noonan, Chair, USACE Alfred Moreau, Deputy Counsel, HQDA
Patents Data and Copyrights	Alan Klein, HQDA Andrew Romero, AMC, U.S. Army Communications-Electronics Command
Quality Assurance	Douglas Waller, HQ AMC (temporary)
Small Business	Paul Gardner, Deputy Chair, HQDA Nancy Small, Alternate, HQDA
Streamlined Acquisitions/ Information Technology	Vera Davis, ACA-ITEC4 rotational Carmelia Rush, ACA-Contracting Center for Excellence, rotational-Simplified Acquisitions
Systems Acquisition/ Research and Development	Jean Kampschroeder, HQ AMC-rotational-Systems Acquisition Susan Boblitt, AMC Research, Development and Engineering Command Rotational-R&D
Taxes	Chair, Margaret Patterson, HQDA
Transportation	Frank Giordano, SDDC Rosemary Kemp, Alternate, SDDC
Utilities	Rafael Zayas, USACE Don Juhasz, HQDA

***FAR* Team Members**

Acquisition Strategy	Jean Kampschroeder, Permanent Member, HQ AMC
	Melissa Rider, Alternate, U.S. Army Intelligence and Security Command
Rotational Member Small Business	Paul Gardner, Deputy Small Business, HQDA
Acquisition Finance	
Rotational Members	
Cost Accounting Standards	Mike Gallagher, HQ AMC
Cost Principles	Mike Gallagher, HQ AMC
Insurance and Pension	Mike Gallagher, HQ AMC
Finance	Susan Orris, HQ AMC
Pricing	Susan Orris, HQ AMC
Acquisition Implementation	
Permanent Member	Tony Anakor, HQ AMC
Acquisition Law	
Rotational Members	
Debarment, Suspension and Ethics	Christine McCommas, Business HQDA
Labor DOD	Gregory Noonan, Chair, USACE
Taxes	Margaret Patterson, Chair, HQDA
Acquisition Technology	
Permanent Member	Stephanie Mullen, HQ ACA
Ad Hoc Member	
Construction/Architecture and Engineering	George Harris, NGB

Other recent committee and team members who deserve the Army's thanks and appreciation are as follows:

DAR Committees: Commercial Products/ Practices, Contract Administration, Systems Acquisition and Pricing; *FAR* Team: Acquisition Strategy	April Miller, HQ AMC
Construction Committee	Karen Thornton, USACE
Quality Assurance Committee	Diana Meyer, HQ AMC
Transportation Committee	Frank Galluzzo, SDDC
Acquisition Strategy Team	Tom Watchko, HQ ACA
Acquisition Strategy Team alternate	Kathy Love, HQ ACA

For more information, contact Barbara Binney, *DAR* Council Member, Office of the Deputy Assistant Secretary of the Army for Policy and Procurement, at (703) 604-7113.

Robots Take on Risky Job to Save Soldiers' Lives

Kristen Dooley

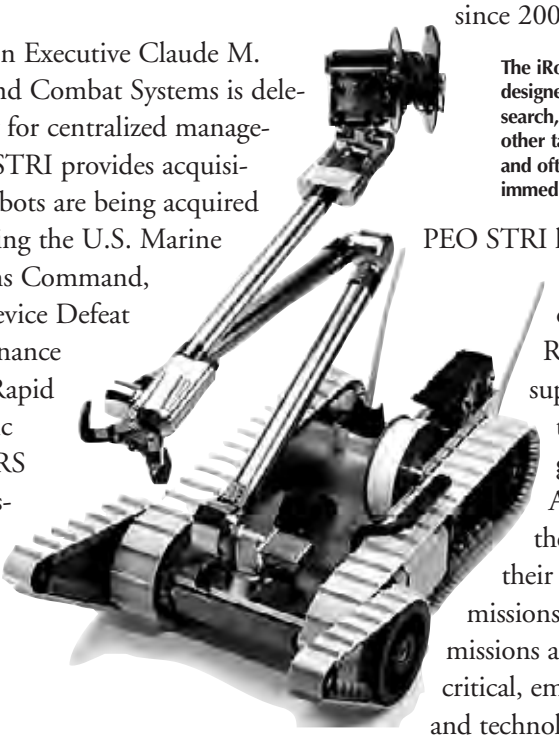
The U.S. Army's Program Executive Office for Simulation, Training and Instrumentation (PEO STRI) provides contract, logistic and engineering support for procuring and replacing robotic systems. In FY06, PEO STRI awarded $88 million in robotic systems contracts. Approximately 4,000 of these robots perform contingency operations in Southwest Asia (SWA) combat zones. These unmanned ground systems allow Soldiers to safely investigate potential improvised explosive devices and anti-personnel mines. "The robots perform missions that are inherently dangerous to the warfighter, such as explosive ordnance detection and disposal," said Glenn Daens, a PEO STRI Acquisition Logistician.

An EOD robotic Talon™ is gainfully employed, Jan. 6, 2007, by the 184th EOD Robotics Team stationed in Baghdad, Iraq. (U.S. Army photo by SPC Jonathan Montgomery.)

The robotic systems supporting contingency operations in SWA require human operation and associated equipment. However, much of the risk associated with investigating explosives is alleviated by the use of robots. "A good example of this is the utilization of robots in the Explosive Ordnance Disposal [EOD] mission. In the past, an EOD technician would suit up in heavy gear, probe suspicious items and disarm or dispose of the explosive," explained Daens. "EOD technicians can now perform this mission using a robot to identify explosive ordnance

using various sensors and, in some cases, can disarm the device or dispose of it by blowing it in place, all while maintaining a safe distance."

Chartered by Army Acquisition Executive Claude M. Bolton Jr., the PEO for Ground Combat Systems is delegated as the full-line authority for centralized management of projects, while PEO STRI provides acquisition support. Additionally, robots are being acquired for other organizations including the U.S. Marine Corps, U.S. Special Operations Command, Joint Improvised Explosive Device Defeat Organization, U.S. Navy Ordnance Disposal and the U.S. Army Rapid Equipping Force. The Robotic Systems Joint Project Office (RS JPO) repairs, supports and sustains all robotics systems. Their role has grown significantly to satisfy the needs of the warfighter in *Operations Enduring* and *Iraqi Freedom*.



The iRobot Corp. PackBot is a rugged, lightweight robot designed to conduct EOD; hazardous material handling; search, surveillance and reconnaissance; hostage rescue; and other tasks. Employment of robots to complete repetitive and often dangerous tasks keep Soldiers out of the immediate line of fire. (Photo courtesy of iRobot Corp.)

According to Contract Specialist Duane St. Peter, continued growth is expected as more line units request robots. "New robotics requirements are frequently generated due to rapidly changing tactics, techniques and procedures. As the number of fielded systems grows, the logistical support required will increase as well," he commented. "RS JPO was familiar with PEO STRI based on past business relationships and was seeking an acquisition center that had the capacity and desire to accept new requirements and rapidly turn those requirements into contract actions. PEO STRI accepted the challenge and has awarded more than $100 million in contracts since 2005 in direct support of RS JPO."

PEO STRI has contributed to the robotics program since 2005 through the acquisition and replacement of systems, spare parts and training required for RS JPO to pursue its mission. In addition to supporting the RS JPO, PEO STRI provides interoperable training and testing solutions, program management and life-cycle support for the Army's most advanced training systems around the world. Simulations help our Soldiers hone their individual and collective skill sets, rehearse their missions and return to their families safely when their missions are complete. PEO STRI responds quickly to critical, emerging requirements with innovative acquisition and technology solutions and is dedicated to putting the power of simulation into the hands of America's warfighters. PEO STRI stands ready to support the RS JPO's estimated $200 million in contract actions during FY07.

Kristen Dooley is a PEO STRI Public Affairs Specialist. She can be reached at (407) 384-5224 or **kristen.dooley@us.army.mil**.

Correction

In *Army AL&T* Magazine's January-March 2007 issue, we inadvertently did not include Glen W. Maylone as an additional author to the article "Rock Island Arsenal JMTC Brings Gold Shingo Prize to the Arsenal." Mr. Maylone's author biography follows. We apologize for any inconvenience.

Army AL&T Magazine Staff

GLEN W. MAYLONE is a Business Development Specialist for the Rock Island Arsenal Joint Manufacturing and Technology Center, where he supports the Business Office and Marketing Department. He holds a B.A in management and communications and an M.B.A. from Concordia University of Wisconsin. He is *Defense Acquisition Workforce Improvement Act* Level II certified in production quality management and program management, and is a U.S. Army veteran.

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