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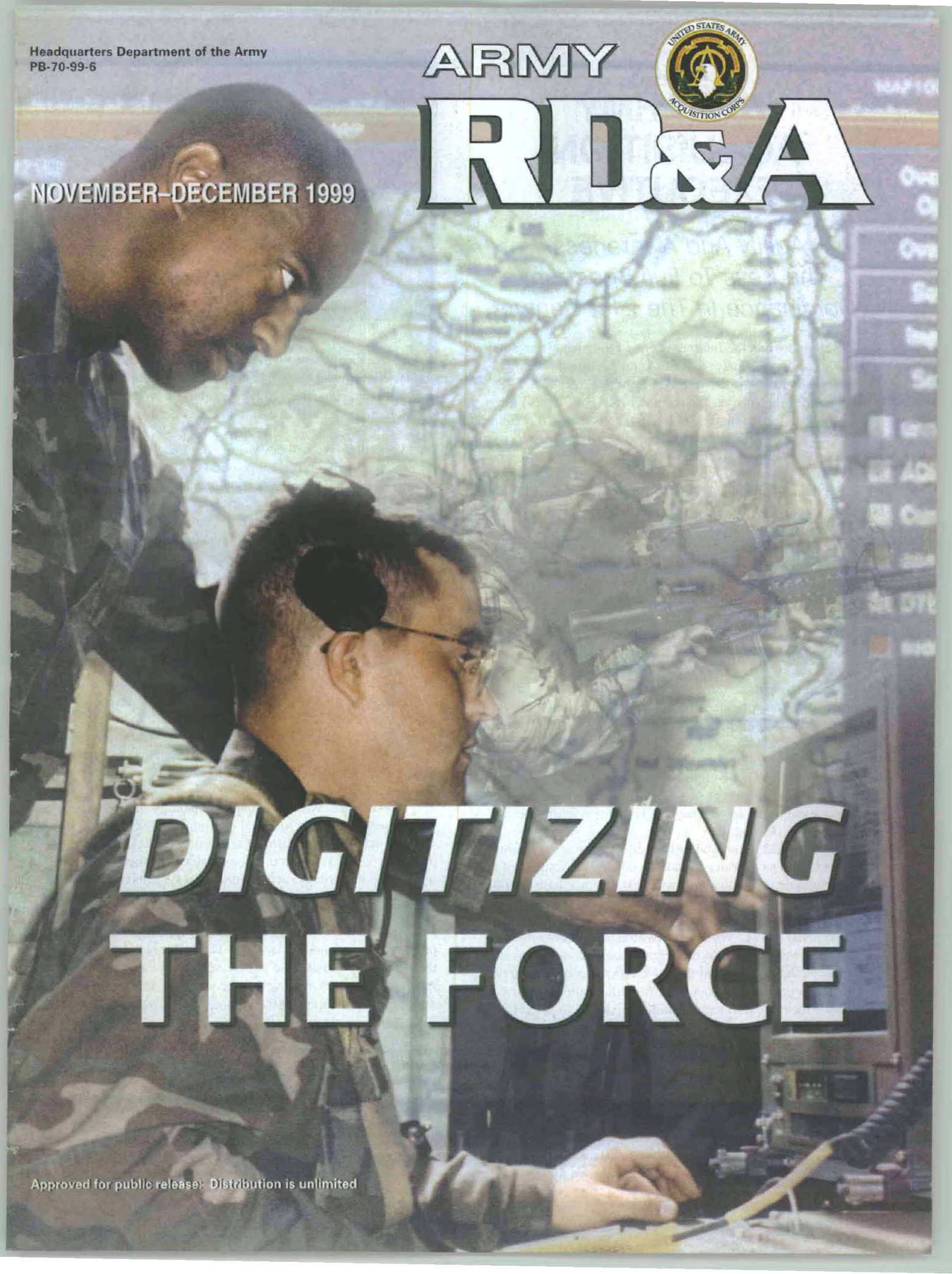

DIGITIZING THE FORCE

FROM THE ARMY ACQUISITION EXECUTIVE

Agility And Awareness: The Keys To Full Spectrum Dominance In The 21st Century

We all know that the Internet is one of the greatest inventions of the 20th century. What we do not know is its real potential. The Internet and the World Wide Web continue to evolve. The same is true for the Army's Tactical Internet. The Tactical Internet is the backbone for the digital communications that will revolutionize land warfare in the 21st century. It will enable a leap forward in situational awareness so commanders and soldiers know where they are, where friendly forces are, and where the enemy is in real time. We do not know what else the Tactical Internet will bring to future operations. As technology evolves, we will discover new uses. We do know that digitization is a vital part of the larger Army process of meeting the challenges of the next century.

Army Chief of Staff GEN Eric K. Shinseki has told us "to roll our sleeves up and get on with transforming this most respected Army in the world into a strategically responsive force that is dominant across the full spectrum of operations." This spectrum ranges from missions of humanitarian assistance and disaster relief to peacekeeping and peacemaking to major theater wars that may involve the use of weapons of mass destruction.

To meet any point on that spectrum, the Army must field agile systems that are responsive, deployable, versatile, lethal, survivable, and sustainable. What we do cuts across all of these areas. Let's look at our efforts to make the vision articulated by Secretary of the Army Louis Caldera and GEN Shinseki a reality.

Responsive: We will continue to challenge the current materiel development and procurement cycle times to more quickly field equipment to the force. Our goal is to cut at least 4 years from concept to fielding.

We will leverage our ability to conduct contingency contracting operations in any theater so that we take full advantage of the support available in country. We will also leverage base operations and Logistics Civilian Augmentation Programs to reduce the requirement to provide quality of life support with internal assets to our deployed forces. Wherever possible and feasible, we will rely on prime vendor support or Defense contractors to provide support to the battlefield from distant locations using the Tactical Internet and telesupport techniques. We will ensure that our prepositioned stocks support the capabilities required in theater. These actions contribute not only to responsiveness, but also to our efforts to become a more deployable and sustainable force.

Deployable: We will attack weight and bulk and reduce it. For major combat systems, we will treat weight like cost as an independent variable. As in life-cycle cost reduction, we will find ways to minimize the logistics support tail and the associated weight for current and future systems. We will challenge the status quo and build systems that maximize self-sufficiency. We will develop systems with built-in diagnostics that give us advance indications of subsystem failure so we can reduce the contingency stocks of repair parts. We must develop systems with redundant subsystems that fail gracefully over time so our soldiers can continue the fight while meager amounts of critical supplies are provided vertically. We must increase the probability of our systems achieving a single-shot kill to reduce the mountains of ammunition we bring in theater. As we make these changes, we will see vast improvements in sustainability. These changes will significantly enhance our ability to put a combat force anywhere in the world in 96 hours, a warfighting division on the ground in 120 hours, and field five divisions in 30 days.

Versatile: We will design into our materiel solutions the ability to accomplish a broad range of tasks. Again, we will challenge the status quo and develop or modify platforms to accomplish multiple missions with minimal adjustment and allow our warfighters to dominate quickly at any point on the spectrum of operations. These multifunctional platforms must include built-in decision aids and other automated systems to minimize the soldiers' burden. Our rotary aircraft are already highly versatile, but we must look at materiel and doctrinal modifications that will enhance their lethality and sustainability.

Lethal: We must accelerate the development and fielding of systems such as the High Mobility Artillery System, Land Warrior, Line-of-Sight Anti-Tank System, and the XM777 Joint Lightweight 155mm Howitzer to retain today's light-force deployability while providing the lethality and mobility for decisive outcomes that our heavy forces now have. We must develop and field systems such as the Future Scout and Cavalry System and the Future Combat Vehicle System that will retain heavy-force lethality through overmatch while providing deployability and employability in areas currently accessible only by light forces.

Survivable: We will employ technology that provides maximum protection to our forces at the individual-soldier level whether that soldier is dismounted or mounted. Ground and air platforms will leverage the best available combination of low-observable technology; active protection systems; long-range acquisition and targeting; early attack; and higher first-round hit-and-kill technology at smaller calibers. We must protect the force.

Sustainable: We will aggressively reduce our logistics footprint and replenishment demand. This will require us to control the number of vehicles we deploy, leverage reach-back capabilities, invest in a systems approach to the weapons and equipment we design, and revolutionize the manner in which we transport and sustain our people and materiel.

The Tactical Internet is a multiplier in every single area from responsiveness to sustainability. All that we do must be aimed at improving logistics and acquisition products, processes, and information systems to accelerate efforts to become an agile and aware warfighting force able to dominate across the full spectrum of 21st century operations.

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FEATURES

DEPARTMENTS

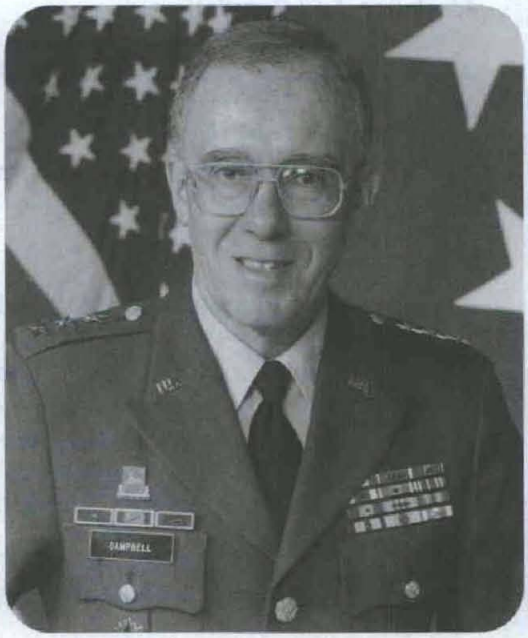
ABOUT THE COVER

Army digitization—a key element in the Army's modernization strategy—will enhance individual weapon systems while also integrating sensors, shooters, logistics, and commanders on the battlefield.

ARMY DIGITIZATION: AN INTERVIEW WITH LTG WILLIAM H. CAMPBELL, DISC4

Army RD&A: **How did the Army arrive at the "Digitizing the Battlefield" strategy?**

Campbell: Let me answer that in the context of our National Defense Strategy. Since World War II, our nation has been irrevocably committed to leveraging high technology as a basic tenet of our Defense strategy. Our goal has been to gain and maintain dominant strategic and tactical superiority. We have sought the type of qualitative superiority that would enable us to fight outnumbered and win decisively. The atomic bomb, nuclear weapons, and night vision devices are examples of applied technology that gave our warfighters dominating advantages. But any advantage lasts only as long as it takes our adversaries to catch up or develop countermeasures. That's why modernization is a continuous process rather than an end state.



The high technology of the last several decades has been electronic technology. Application-specific electronic devices and embedded digital technology were widely employed in our weapon systems. By the early 1990s, the microprocessor and related digital technologies were revolutionizing not only weapon systems but the rest of the world as well. It was clear that digital technology had the power to provide information dominance on the battlefield, and whoever could best leverage this technology would have an enormous advantage.

Given the widespread availability of digital technology to virtually any nation, Army leaders saw the need for a program that would allow us to get ahead and stay ahead in the digital domain. They envisioned a program that would not only continue to enhance individual weapon systems, but also provide the digital framework to integrate our sensors, shooters, logistics, and commanders on the battlefield. The digital framework would provide a common picture of the battlefield and shared situational awareness across the force. This would enable our warfighters to translate information dominance into battlefield dominance.

GEN [Gordon R.] Sullivan, former Army Chief of Staff, articulated a vision of leveraging the power of the microprocessor. He challenged our leaders to turn the vision into a strategy. MG Jay Garner, the Army's Force Developer, played a key role in developing that strategy. In early 1992, Jay called me and said, "Bill, we've got to digitize the battlefield." That became our bumper sticker as the Army reshaped its modernization strategy to embrace digitization. GEN [Dennis J.] Reimer further refined the strategy and kept it on the top of the priority list during his tenure as Chief of Staff.

Army RD&A: **How does this differ from previous modernization strategies?**

Campbell: There are major differences. When the Army modernized in the 1970s and 1980s, the focus was on the "Big 5" systems. It was a platform-centric strategy and was very successful in delivering the Abrams, Apache, and other world-class weapon platforms. Digitization, on the other hand, takes a more horizontal and network-centric approach to integrate weapons and other battlefield systems with a cyber backbone. The strategy also extends the digital computer network down to the pointed edge of the spear. In the past, we provided only radios to most platforms. Computers went predominantly to command centers. Today, we are introducing digital computers into our weapon platforms and vehicles. We are linking them together both vertically and horizontally with a Tactical Internet [TI].

Another major difference is the formalization of an Army Experimental Campaign Plan and the use of Advanced Warfighting Experiments [AWEs] to vet the concepts and systems with combat forces early in the development cycle. The Army identified the 4ID [4th Infantry Division] as the experimental force [EXFOR] and is equipping it with sufficient quantities of digitized systems to evaluate the effectiveness of the materiel and the changes in doctrine; organization; training; leader development; and tactics, techniques, and procedures that are needed to use the new technology effectively. The end user is playing a key role in defining and refining requirements. This is a real paradigm shift, and it's working well. Essentially, it capitalizes on the ingenuity of the American soldier and recognizes that true innovation often comes from the bottom up.

The Force XXI AWE process has already demonstrated the high payoff potential in using ruggedized commercial computers on the battlefield. It also confirmed that a winning strategy must include shortening acquisition cycles, investing in the enabling digital infrastructures, and reforming acquisition processes from industrial age to information age techniques. In this regard, "spiral development" is a very significant change from past practices.

***Army RD&A:* To what level will digitizing the battlefield extend?**

Campbell: Digitizing the battlefield extends from individual weapon platforms through command centers. All battlefield functional areas are included. The scope encompasses computers, radios, and microprocessors employed by combat, combat support, and combat service support units.

As the Army transitioned to a predominantly CONUS-based power projection force, the installation became the rear boundary of the corps or Joint Task Force in many scenarios. Consequently, the scope of our digitization strategy evolved to include the digital infrastructure on installations that serve as power projection platforms supporting deployed forces. The umbrella term for these initiatives that are leveraging the microprocessor evolved from digitizing the battlefield to digitizing the Army.

***Army RD&A:* Is it true that the Army is programming $3 billion per year for digitization?**

Campbell: I'm glad you asked because there's a lot of confusion about our investment strategy. You have to understand how digitization is defined and what's included under the digitization umbrella for programmatic purposes. Yes, there is about $3 billion per year programmed. But more than 85 percent of this money was programmed before we rolled over 100 budget line items into what we call digitization today. In addition to the classic computer and radio programs, digitization funding includes radars, aircraft survivability equipment, avionics, JSTARS, Guardrail, TENCAP, combat identification, JTAGS, second generation FLIR, test and diagnostic equipment, command post shelters, landmine RDT&E, and many others. This aggregation provides oversight of related programs and fosters program synchronization. However, it gives the illusion that we programmed large increases for radios and computers when the real delta in those areas was quite modest. There's a danger that this aggregation of funds might be a lucrative target in bill-payer drills.

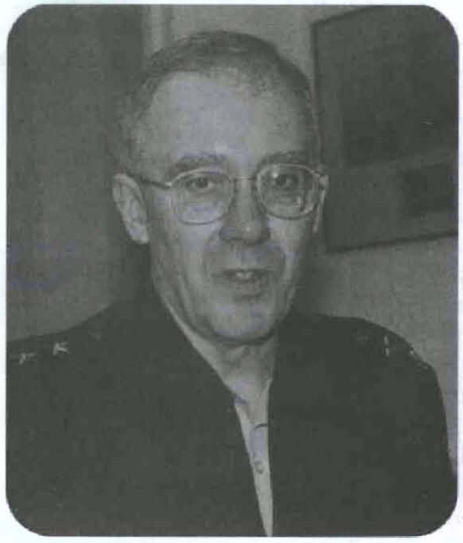
***Army RD&A:* What types of system architectures are you using?**

Campbell: The Army has defined an open system architecture based on commercial standards for our digital systems. Since one size does not fit all, the architecture has been divided into four domains: weapon systems, command and control systems, modeling and simulation systems, and administrative and logistic systems.

There's a wide variance in architectural requirements across these domains. Embedded processors with applications that involve a small set of functions repeatedly executed without direct human-computer interaction have relatively simple architectures. At the other end of the spectrum are more complex systems that interact like a digital nervous system in support of complex processes on the battlefield or in business.

***Army RD&A:* What are the objectives of digitizing the battlefield?**

Campbell: Our objectives are to achieve both information dominance on the battlefield and a revolution in military affairs. To this end, the Army has undertaken a broad range of command, control, communications, and computer [C4] programs and embedded processor initiatives to realize the vision of a digitized Army that leverages information technology [IT]. We will use information dominance as an enabler for projecting the force, [managing] decisive operations, shaping the battlespace, protecting the force, and sustaining the force in accordance with Joint Vision 2010. To realize the revolution in military affairs and use funds most effectively, we must import the best business practices and associated enabling ITs from the commercial sector. These actions must be complemented by some fundamental changes in the way we modernize and how we execute our core missions.



***Army RD&A:* What area do you consider in most dire need of change?**

Campbell: The most urgent and fundamental change required for acquiring and fielding IT is to reduce cycle times. Without this change, it will be difficult to stay ahead of our potential adversaries in deployed capabilities. Digitization must not be viewed as an end state to be achieved; rather, it's a journey during which we must always stay ahead of our adversaries regardless of the rate of change. This mandates the adoption of system architectures that will facilitate continual technology insertion in our battlefield and garrison systems.

IT is evolving very rapidly with no discernible end in sight. The raw power of the microprocessor is expected to increase more than 1,000 times from 1995 to 2010. This presents opportunities that are limited only by our vision, commitment, and capacity to further reform the Pentagon's acquisition process. However, our adversaries will have these same opportunities. Although America takes pride in its record of innovation, we have no monopoly on genius. Shorter acquisition and product improvement cycles for warfighter needs are mandatory for us to stay ahead of our potential adversaries. The need for constant improvement in this competitive environment is underscored by the following sound bites:

- Approximately 85 percent of the world's engineers reside outside of the United States, giving the rest of the world enormous potential.
- Bill Gates of Microsoft Corp. considers IT to be so dynamic that he believes Microsoft could be history in 18 to 24 months if they misjudged shifts in IT.
- Andy Grove of INTEL Corp. believes that "only the paranoid survive" in the IT world.
- Applications in the commercial sector are changing business processes at an accelerating rate, as evidenced by the explosion in Web-based commerce from $43 billion in 1998 to a projected $1 trillion in 2000. Web access is rapidly shifting from the personal computer [PC] as the sole end-user device to a world where palmtop devices and cellular phones will be used as Web browsers.
- Advances in embedded IT will make cellular phones as powerful as five of today's PCs by 2003.

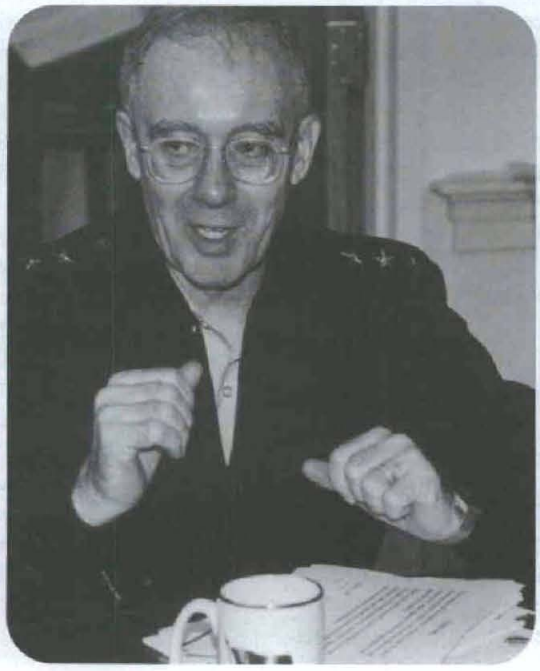
***Army RD&A:* What other changes must be made in the Army IT community to support the warfighter?**

Campbell: In addition to reducing cycle time, we must adopt other commercial practices for acquisition and testing of software-intensive systems. We must provide relief from legacy rules that applied in the industrial age but are counterproductive in the information age. End users must be involved during the development process. The development cycle itself must be in short spirals with "Beta" releases of software for user assessments in operational environments before full system maturity is reached. Requirements must be written with the flexibility for the user and developer to make adjustments to the desired content of incremental or phased deliveries. We must also permit users to decide whether commercial or ruggedized off-the-shelf computers are adequate for use in their intended environment without subjecting them to one-size-fits-all mandates like HEMP or TEMPEST criteria. Such criteria are important, but they should not be applied in blanket fashion lest we doom ourselves to excessive costs and continuous obsolescence by taking too long to acquire technology that's rapidly evolving.

Perhaps the most significant change must come in operational testing. We must conduct continual testing of software-based systems early in the development process to drive out software faults, without subjecting the system to pass-fail criteria during those early evaluations. This requires early acquisition of sufficient quantities of hardware for realistic tests. We must also permit the acquisition of more systems than the number of devices that will be employed in the test events. Test units must be equipped with sufficient quantities of new digital systems to facilitate the development of "digital doctrine" and comprehensive training in a representative unit before IOTE. For example, if we plan to use a "division slice" as the test unit, we should equip the division with its full complement of IT systems to be tested through an LRIP phase prior to IOTE. This will permit the command to make training with the new system the norm. Equipping only a "slice" of a unit for operational tests creates a training distraction and puts the system under test at risk of failure because of training shortfalls or the application of analog doctrine in the digital test environment. Recent dialogue between the Army and the Office of the Secretary of Defense regarding operational testing shows promise of improvements in this area.

***Army RD&A:* How is Force XXI progressing to support Army Vision 2010?**

Campbell: Our Campaign Plan for Digitization envisions equipping the First Digitized Division [FDD] in 2000 and the First Digitized Corps [FDC] by 2004. The top priority is to get the backbone of the computer and communication systems in place. As weapon systems are recapitalized and new systems are fielded, they will be linked digitally to the backbone. The result will be a digitized corps—a major step toward Army Vision 2010. Evolution to Joint Vision 2010 will be a learning process as we continuously transform our doctrine, training, leader development, organization, materiel, and soldiers [DTLOMS] to meet the demands of joint warfighting in the next century. Thus far, progress is good. Our intent is to evaluate our progress through a series of exercises and tests for the next 2 years and make course adjustments as required.



***Army RD&A:* What are FBCB2 and the TI?**

Campbell: FBCB2 means Force XXI Battle Command Brigade and Below. This system, accompanied by the Tactical Internet that provides connectivity, is the center of gravity for Force XXI. It provides soldiers in individual weapon platforms, tactical vehicles, and tactical operation centers [TOCs] with real-time situational awareness. FBCB2 comes in two versions. One is a commercial computer in a ruggedized package that is linked to a GPS receiver and digital radios and executes battle command software. The other is a software-only version that is embedded in computers integral to weapon platforms.

FBCB2 generates and transmits position-location reports, distributing them to friendly forces throughout the battlefield. It receives similar reports from other friendly units equipped with FBCB2 and posts them to a digital situation map in each platform or facility. The system also sends and receives spot reports on the enemy as well as logistic and command and control messages. Collectively, these data provide a common picture of the battlefield. Even in its most basic mode, it [FBCB2] provides real-time answers to the questions: "Where am I?," "Where is the enemy?," and "Where are my buddies?" FBCB2 is also being integrated with other onboard systems to enhance performance. For example, an interface to laser range finders will enable it to automatically compute and disseminate spot reports on the enemy and send calls for fire to bring artillery on the target.

The TI is the glue that ties FBCB2 systems together digitally. It is formed by integrating tactical digital radios, combat net radios, and commercial Internet technology. Primary components are the SINCGARS used in a data mode, EPLRS, and the Near Term Digital Radio [NTDR]. Since speed of delivery is paramount and the data bandwidth provided by these radios is quite small, the message formats developed for the TI are designed for efficiency and transmitted in short "bit-oriented" packets. We [the Army] will continue to optimize the TI while at the same time accelerating the development of the Joint Tactical Radio System [JTRS]. JTRS will replace existing radios at the tactical level and will provide the waveform commonality and increase in bandwidth necessary to implement network-centric warfare.

***Army RD&A:* What else contributes to the enabling backbone?**

Campbell: There are several key components. Data transport is critical. Today's data transport capacity in the tactical Army is totally inadequate. The

Warfighter Information Network [WIN] will provide a much needed expansion and modernization of today's Mobile Subscriber Equipment [MSE]. The new system will employ commercial high-capacity digital communications equipment housed in tactical vehicles. This will provide the infrastructure necessary to move large data sets such as digital maps anywhere on the battlefield. It will also link satellite communications to remote command centers and support facilities.

Expanded satellite bandwidth is also essential. The MILSTAR system will provide assured connectivity in high-threat and jamming scenarios. Modernized UHF SATCOM terminals will provide voice and low-data-rate communications over extended ranges. Commercial triband terminals will bring expanded capacity. The Global Broadcast System terminals will receive a continuous flow of data from higher echelons. We also need an improved, more secure GPS system. Collectively, satellite communications must provide connectivity to forces wherever they are deployed.

For the end users, the Army Battle Command System [ABCS] and the Standard Army Management Information System [STAMIS] are key tools. These computer-based systems provide the processing power and automated applications to execute both the "vertical" functional requirements in each battlefield functional area and the "horizontal" requirement to exchange data among systems. The ABCS and STAMIS are being integrated in TOCs with commercial routers and LANs to provide commanders and their staffs with the information needed to plan and execute wartime functions. They interoperate with each other and joint systems. They are the enablers for battlefield command and control, integrated staff processes, the revolution in military affairs, and the revolution in military logistics.

We also must pay attention to information assurance. Digital technologies and systems are great force multipliers, but they bring with them vulnerabilities that can be exploited. To minimize this risk, a robust security architecture must be in place from the foxhole back through higher level command centers and the sustaining base.

Another link in the backbone is the Defense Information Systems Network [DISN]. While the DISN is not an Army program, I mention it here because it is so fundamentally important to joint warfighting. It provides the connectivity between the deployed forces and the sustaining base through leased lines and satellite connections provided by DISA. A vital component of network-centric warfare, it [DISN] will provide part of the end-to-end connectivity for Army and joint systems.

Army RD&A: **You mentioned the importance of Army installations in projecting power. What improvements are we making to this infrastructure?**

Campbell: The corollary to digitizing the battlefield is digitizing the installation. It is essential to link deployed forces to the installation that supports them. The Army's name for installations that serve as the corps rear boundary is power projection platforms. For these installations to be effective, they must have major improvements in automation, communications, and business practices as we build Force XXI.

The logistics domain is perhaps the most critical because an Army cannot operate without logistics support. The revolution in military logistics depends on the next generation digital infrastructure on our installations to achieve the vision of a seamless logistics system, total asset visibility, rapid force projection, and distribution-based logistics. If we want to import commercial best practices, we must have the digital infrastructure that these practices require.

A key initiative that will enable the Army to achieve economies in day-to-day core functions and support power projection is called Power Projection Command, Control, Communications, and Computers Infrastructure [PPC4I]. This project expands the digital infrastructure of Army installations and enables us to import best commercial practices. PPC4I is essential to our warfighting readiness because it provides linkage to deployed forces, enables split-based operations, and provides connectivity to the Global Combat Support System and Global Command and Control System. It delivers the technologies necessary for virtual meetings and collaboration among commanders, electronic commerce, paperless contracting, Wal-Mart-like inventory control, knowledge management, distance learning, and Web-based operations Armywide.

Another important program is distance learning, which provides digital classrooms with connectivity to TRADOC schools and learning centers in support of a revolution in training Armywide. Distance learning will link all soldiers of all components to Army schools and learning centers. This not only reduces training travel costs, but also improves the training status of our soldiers.

Army RD&A: **Thank you for your time. Do you have any closing comments?**

Campbell: The Army has long employed computers and advanced electronic technology in our weapon and business systems. In fact, much of the early growth in electronic technology was the result of military investments in research and development. These investments produced leading-edge products that were usually expensive and available only in small quantities.

But things are different in the information age. The old paradigm is reversed. Today, IT is relatively inexpensive and readily available. Anyone with sufficient cash can buy it. Systems integration, while still the major hurdle, is becoming less of a challenge. Cycle times for technology turnover are very short. Consequently, advantages based on today's IT can be fleeting, and we must adapt our acquisition policies to this reality. Moreover, we must now invest in the enabling digital infrastructure for both the Army in the field and the institutional Army. Without that infrastructure, we will be unable to import many of the best business practices and tools from the commercial sector. Those tools are often built for use in environments where bandwidth is available on demand, processing power is available as needed, and the workforce is digitally connected. With the infrastructure in place, we can achieve the vision of a future land force with unprecedented knowledge, speed, and power. We must keep digitization investments at the top of the Army's priority list. Future readiness depends on these investments.

ADAPTING INFORMATION-AGE TECHNOLOGY FOR THE FIRST DIGITIZED DIVISION

Chris Leins

Historically, we have not had the exact Army we needed when we needed it. Still, we were never truly wrong because we built an Army with a core set of capabilities and infused it with the agility and flexibility to adapt to domestic or international demands as they arose. The future will demand more ... the modality of agility will be even more essential to our ability to adapt to a dynamic strategic environment. We will need to continuously leverage technology to ensure our force has the requisite advantage to preclude conflict if possible, but to win decisively if necessary, and to leverage the capabilities of our allies and coalition partners. In the aggregate, we must "lighten up the heavy forces and heavy up the capabilities of the light forces." Ultimately, ***we must always be assured of victory and [be] certain we will never be forced to negotiate from a position of weakness.***

—Army Vision 2010

Introduction

With the proliferation of information technology, any potential enemy can access new capabilities to use against the United States. In anticipation of such threats, the Army must first take advantage of the benefits offered by information dominance of the battlespace. The sooner we field these new capabilities, the sooner we provide our soldiers an advantage on the battlefield and the sooner we can adapt new operational tactics, techniques, and procedures (TTPs) for the entire digitized Army.

To rapidly achieve the full-spectrum dominance indicated in Army Vision 2010, we must leverage the mature leading edge of commercial technology. We recognize that information technology will continue to mature, and we require the ability to incorporate these enhanced capabilities as they become available. However, the technology in today's digitization systems provides improved force effectiveness that is needed in the field now. In fact, soldiers at Fort Hood, TX, who used a system such as Force XXI Battle Command Brigade and Below (FBCB2) in Advanced Warfighting Experiments (AWEs), told congressmen during a recent visit that the system is good enough now to take to war, even though it will continue to be enhanced through "spiral development."

Digitizing The Force

Digitization is part of the Force XXI process to evolve from the current Army of Excellence (AOE) to the "Army XXI" structure. Digitizing the force will allow warfighters to acquire, exchange, and employ data throughout the battlespace and share critical situational awareness and command and control (C2) information while reducing many of the constraints imposed by a hierarchical military organization. This capability will allow U.S. and friendly forces to share a constantly updated view of the entire battlefield, no matter what the mission, to penetrate the enemy's decision loop and act faster than the enemy reacts.

Digitization is subdivided into four components: communication systems, C2 systems, weapon platforms with embedded C2, and other platforms (both weapons and support vehicles) with appliquéd C2. The 98 systems that will be included in a fully digitized division are classified by the U.S. Army Training and Doctrine Command (TRADOC) into two categories, each reflecting their contribution to information dominance. Many of these systems exist in the force today or are scheduled for fielding as part of the normal modernization process.

Category 1 Systems

Category 1 systems are the "must haves" or enablers that constitute the backbone of the digitization architecture. The majority of these systems are the Army's core command, control, and communication (C3) systems that comprise the Army Battle Command System (ABCS). Again, many of these systems exist in the force today or are scheduled for fielding as part of the normal modernization process.

Category 1 systems consist of three interdependent components. First, the Tactical Internet (TI) provides the connectivity backbone of digitization and is made up of voice and data radios, mobile subscriber equipment, and other communication systems. These systems include the Single Channel Ground and Airborne Radio System-Advanced System Improvement Program (SINCGARS-ASIP), the Enhanced Position Locating

Reporting System-Very High Speed Integrated Circuits (EPLRS-VHSIC), the Near Term Digital Radio/Joint Tactical Radio System (NTDR/JTRS), and the Warfighter Information Network-Terrestrial (WIN-T).

Second, the Army Tactical Command and Control System (ATCCS) links the following five command and control systems in a common software environment: the Maneuver Control System (MCS), All Source Analysis System (ASAS), Advanced Field Artillery Tactical Data System (AFATDS), Forward Area Air Defense Command and Control System (FAADC2), and Combat Service Support Control System (CSSCS).

Third, FBCB2 system hardware and software provide enhanced situational awareness down to the individual platform level. For a heavy division to be considered "digitized," it must be equipped with these basic systems as well as digitized weapon platforms including M1A2SEP and M1A1D Abrams tanks and M2A3 and M2A2ODS Bradley Infantry Fighting Vehicles.

Category 1 systems will provide the following:

- The minimum essential backbone of communication and C2 systems required to support the transfer of digital information across the battlefield;
- A common operating picture of the battlefield (both friendly and enemy locations, as well as maneuver control measures); and
- The communication infrastructure of the TI and Area Common User System (ACUS), including systems such as the EPLRS-VHSIC, SINCGARS-ASIP, Asynchronous Transfer Mode/Future Small Extension Node (ATM/FSEN) switches, Integrated System Control (ISYSCON), and the ABCS with C2 tools to support decisionmaking.

Category 2 Systems

Category 2 systems enhance the above digital capabilities and include the weapon platforms, sensors, combat support, and combat service support systems. These systems provide additional capabilities to the commander and enrich the common operating picture that results from the hundreds of sources of tactical data. Category 2 systems provide:

- Digitally enhanced weapon platforms, sensors, and support systems; and
- Systems digitally connected across the battlefield to ABCS, providing commanders, their staffs, and individual soldiers with enhanced situational awareness, the ability to digitally send and receive orders, and logistics management (total asset visibility and battlefield distribution).

First Digitized Division

The Army's digitization strategy will soon come to fruition as the 4th Infantry Division (4th ID) at Fort Hood becomes the first division-sized unit to be considered digitized—the First Digitized Division (FDD). For the past several years, the 4th ID provided a mechanized experimental force (EXFOR) for new ideas and testing of information age technology. It is organized as an armored division with two armored brigades at Fort Hood and a mechanized infantry brigade at Fort Carson, CO. By the end of 2000, the Fort Hood units will be equipped with all required Category 1 systems, including the critical C2 systems from each battlefield operating system, and a majority of the Category 2 systems. The remaining available new digital systems will *enhance* division capabilities but are not deemed necessary to demonstrate an initial digitized capability. However, the 4th ID will not receive the remaining available systems until the end of 2004 (as will the third brigade at Fort Carson). Once it is digitized, the 4th ID will be able to take advantage of increased situational awareness to dramatically improve the synergy of the combined arms team.

In the past, systems were fielded individually as they became available. Because many of the modernized and digitized systems operate synergistically with other systems, the Army is adjusting individual system schedules to field by brigade sets.

The 4th ID is already reorganizing to an Army Division XXI structure that has a deployed footprint approximately 25 percent smaller than an AOE division. By FY00, the division will have made the transition to the new organizational structure. Following this, the FDD will be equipped with critical digital C3 systems and most digital sensors and weapon platforms. All Category 1 systems will be issued to the FDD by the end of FY00. Category 2 systems will be issued to the FDD based on their availability. The 3rd Brigade Combat Team at Fort Carson, however, will not complete receipt of Category 1 equipment until the end of FY04.

The FDD will mark the fielding of an interim capability in the modernization of the heavy division. Meanwhile, other Army divisions are also adopting the Army Division XXI structure. These smaller organizations must also be able to take advantage of the increased agility, lethality, and survivability provided by digitization. The major difference between the FDD and subsequent heavy objective digitized divisions (ODDs) is the number and degree of Category 1 and 2 fielded systems. Subsequent ODDs will be equipped with all Category 1 and 2 systems.

TRADOC envisions a fully equipped Army Division XXI operating in a battlespace that is approximately 240 percent larger than today's optimum coverage because of the increased situational awareness and the ability to create synergy with all the weapon systems in the division. Army Division XXI will be able to conduct multiple, simultaneous operations on a distributed battlefield.

In the past, systems were fielded individually as they became available. Because many of the modernized and digitized systems operate synergistically with other systems, the Army is adjusting individual system schedules to field by brigade sets. This will provide our divisions with brigade combat teams that have full digital combat fighting capabilities. Most Category 2 systems will be fielded prior to the 4th ID's Division Capstone Exercise (DCX), scheduled for March 2001, or by the time the First Digitized Command is established in 2004. Some equipment, however, such as Crusader, will not achieve production status until later in the decade.

FBCB2 System

FBCB2 is a key component of the ABCS. FBCB2 consists of computer hardware and software integrated as an appliqué to fighting vehicles or critical logistic vehicles. When the software is embedded in the computers of combat vehicles, it is known as Embedded Battle Command (EBC). FBCB2 and EBC provide on-the-move, near-real-time situational information, a common picture of the battlefield, the locations of enemy and friendly forces, and the rapid exchange of information and orders. FBCB2 and EBC also exchange information with the five ATCCSs. Linking these systems is the TI, an adaptation of the Internet. This seamless communication network will give commanders the benefit of nearly instantaneous battlefield information, and soldiers will be aware of the larger tactical picture. For example, friendly force situational awareness was the highlight during the Task Force XXI AWE conducted at the National Training Center in March 1997. Digitally disseminated information showed great potential to improve movement and tactical maneuver. This helped commanders and their staffs develop a more complete picture of the battlefield. Analysis of data indicates a trend of improved performance in tactical capabilities, such as accuracy in locating enemy forces, friendly unit position awareness, and the ability to move forces at night.

Throughout several AWE battles, the EXFOR showed improvements in lethality and survivability. The division AWE that followed in November 1997 demonstrated significant time savings in planning cycles. The results of the August 1998 FBCB2 limited user test showed significant improvements over the Task Force XXI AWE. For example, message completion rates and faster speed of service significantly improved dissemination of orders and plans.

Digital Training

A culminating digital training event, the DCX, is being developed for the FDD. The DCX involves a live, brigade-level National Training Center rotation at Fort Irwin, CA, in March 2001 and a constructive, computer-based Battle Command Training Program warfighter exercise at Fort Hood in September 2001. The DCX will help the Army assess the current go-to-war status of the digitized division with operational and organizational (O&O) concepts under Mission Equipment Terrain Troops-Time (METT-T) conditions. During the DCX, the 4th ID will conduct a full range of stability and support operations in a joint and multinational environment, and conduct distributed operations using maneuver and firepower, facilitated by information dominance, to destroy enemy forces and to seize and retain ground.

The primary focus of the DCX, however, will be unit training, based on existing fielding and minimal joint experimentation. It will be used to refine the doctrine, training, leader development, organization, materiel, and soldiers (DTLOMS) of the FDD in both a tactical and simulated environment. The DCX is intended to secure support by validating the Army's commitment to digitization and answer previous and existing criticism of digitization. It will also validate the division O&O design, provide a comparative understanding of the new force, and demonstrate potential training methods of the future.

Integration of Reserve Components (RCs) into the Army digitization strategy began in earnest with the inclusion of RC units into the FDD. These include an RC General Support Aviation Company, a Multiple Launch Rocket System (MLRS) battery, and the Division Rear Operations Center.

Conclusion

Army XXI will be an important product of the Force XXI process, building on the Army's current capabilities and capitalizing on validated information technologies. Army XXI will be a capabilities and knowledge-based force, using information-age technologies to provide soldiers, leaders, and units the situational awareness, information dominance, and mental agility necessary for attaining full-spectrum dominance. Army XXI will be fully integrated with the digitized systems of other Services to produce a cohesive, effective joint force at all echelons. In addition, full interoperability with coalition forces will be an integral part of Army XXI.

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CECOM SUPPORT TO THE FIRST DIGITIZED DIVISION

MG Robert L. Nabors and Dr. Louis C. Marquet

Introduction

"CECOM Bottom Line: THE SOLDIER"

Nowhere is the commitment behind the CECOM motto more apparent than at Fort Hood, TX, home of the U.S. Army's First Digitized Division (FDD). The U.S. Army Communications-Electronics Command (CECOM), like the other commodity-oriented major subordinate commands of the Army Materiel Command (AMC), develops, equips, and maintains materiel for the troops. Teaming with program executive officers (PEOs), CECOM provides the Army with command and control, communications, computer, intelligence, electronic warfare and sensor (C4IEWS) systems. This entails a cradle-to-grave effort spanning research, development and engineering; software development and modification; contracting; systems management; logistics; and depot operations. With that full life-cycle effort, and as AMC's executive agent for Force XXI, CECOM supports the FDD. We serve as part of a large and dedicated team of researchers, PEOs, combat developers, and warfighters who are committed to the success of the FDD.

Genesis

The road to the digitized force and the FDD began in a conceptualization video CECOM prepared for former Chief of Staff of the Army (CSA) GEN Gordon R. Sullivan. The video dramatized the potential strength of situational awareness and how it could significantly affect the outcome of engagement. The CSA's support solidified an aggressive Army program to apply emerging digitization technology across the battlefield.

CECOM provided the underpinning for this effort by offering digitization capabilities via application of the tech base; through spin-offs and transitions from advanced technology demonstrations (ATDs) and advanced concept technology demonstrations; by leveraging commercial off-the-shelf/government off-the-shelf (COTS/GOTS) products and nondevelopmental items (NDIs); through software development; and by participating in Army Advanced Warfighting Experiments (AWEs) and exercises. Designated the "Army System Engineer," the Director of the CECOM Research, Development and Engineering Center provided another crucial element by developing and maintaining the Joint Technical Architecture–Army.

Developing Digitization Capabilities

CECOM's engineers and scientists were initially daunted by the variety of platforms involved, ranging from the dismounted soldier, to wheeled and tracked vehicles, to aircraft. CECOM's experiences led to the first digitization experiment, DESERT HAMMER SIX, designed to demonstrate the capability to digitally link these platforms. The experiment showed that while there was value in sharing tactical information between these platforms, gateways and translators were a cumbersome way of achieving interoperability. Common protocols were essential. Our early experiments also revealed that voice and data did not coexist well on the same nets and that common graphics were required.

The second significant digitization experiment, WARRIOR FOCUS, centered on digitization down to the lowest platform level, the combat soldier. CECOM support included architecture engineering, computers, software, installation, integration in the tactical operations centers and tactical command post, testing, and a variety of training and support functions. Initial attempts to integrate existing technologies for the soldier left much room for improvement. The prototype Dismounted Soldier System used six different types of eight batteries. They lasted for less than 3 hours, and 30 minutes were required to change them and restart the system.

Another problem was in combining many individual electronic systems for the soldier—heads-up integrated helmet-mounted displays, computers, radios, weapon-sighting devices, and position location hardware. The radio illustrated the problems of interaction between the systems. Under ideal conditions, the radio passed digital data up to 6 kilometers. However, when the radio was integrated with the rest of the soldier's equipment, the radio range dropped to less than 600 meters. The problems encountered were typical of the rocks and boulders CECOM and the research and development (R&D) community surmounted along the road to the FDD.

To support the digitization process, CECOM developed the Digital Integrated Laboratory (DIL), a dynamic integration of local and remote Army and joint-Services laboratories. The DIL could be rapidly reconfigured using geographically separated but electronically connected facilities to quickly replicate work in many diverse command, control, and communications (C3) environments without physically moving resources. This allowed evaluation of new technology, evolving equipment, COTS/GOTS products, and NDIs in a full-system environment.

CECOM used the DIL in another experiment, FOCUS DISPATCH, to illustrate the strength of modeling and simulation to support digitization efforts. This experiment used a real armored vehicle in northern Kentucky, driving next to a simulated Bradley Fighting Vehicle at Fort Knox, KY, and working in concert with a simulated Apache helicopter at Fort Rucker, AL. Simulated Single Channel Ground and Airborne Radio Systems (SINCGARS) at Fort Knox accurately depicted communications performance, including the effect on received signal strength as units moved through the terrain. Simulation helped the R&D community understand the complex interactions of many disparate platforms working together, without a huge investment in hardware or in exercise support. Data collected at the DIL during early experiments and exercises allowed CECOM to transition hardware and software packages to transform the 4th Infantry Division into the FDD.

The First Digitized Division

PEO, C3 Systems is responsible for the FDD. CECOM works with the PEO to introduce the new technology at Fort Hood. Principal among the innovative mechanisms employed is spiral development between the user and the technical community in the field, supported by the PEO's local Central Technical Support Facility connected to various contractor and government facilities through the DIL. This allows identification of the user's problem (technical, operational, or training) and, if equipment, rapid isolation to a particular module or item. It allows trouble-shooting in the field and the immediate evaluation of solutions, including hardware

improvements, software modifications, the insertion of new technology and developmental solutions, revised operational objectives, and improved training. For example, user problems with the Tactical Internet were quickly resolved using the CECOM DIL to connect contractors, users, field locations, and test beds in a virtual collaborative environment.

CECOM provides the PEO with technologies such as information dissemination management, frequency management/co-site interference, and wireless local area networking. The command provides engineering support on a multitude of systems and equipment including the Army Battle Command System (ABCS), and transitioned versions of the Global Broadcast System, the Surrogate Data Radio for Networking, and Asynchronous Transfer Mode Switching. Through its Tactical Command and Control (C2) Protect ATD, CECOM is participating in "red teaming" the information assurance architecture and stress-protect tools that are being developed or modified for use in the tactical environment.

As part of this ATD, CECOM conducted Force XXI Battle Command Brigade and Below (FBCB2) electronic and information warfare testing and limited signal intelligence testing in both lab and field environments. The FBCB2 vulnerabilities CECOM identified are now being eliminated in new software releases planned for FY00.

In the Battlespace C2 ATD, CECOM transitioned course of action development and analysis software to the Maneuver Control System. This software will allow FDD soldiers to build and compare multiple courses of action based on the commander's intent and guidance. The software will have some wargaming capability and two-dimensional course of action animation, as well as provisions for inclusion of data in decision briefs and operational orders. The ATD is also providing interim 3-D visualization and natural language processing capabilities. Visualization will allow users to explore the 3-D battlespace and to visualize key unit icons and control measures.

CECOM's two recently approved ATDs, Multifunctional On-the-Move Secure Adaptive Integrated Communications (MOSAIC) and Command Post XXI, will provide technology development and insertion beyond the FDD, continuing the spiral development process.

CECOM is the Army focal point for joint interoperability certification of joint interfaces and for developing MIL-STD-188-220 and the joint variable message formats fundamental to achieving effective intra-Army and joint interoperability. CECOM developed the tools to assist FDD system developers to measure conformance to the standards.

Software has been an important ingredient throughout the digitization process. CECOM's computer scientists and engineers were there to quickly resolve problems. They investigated anomalies, then modified, integrated, and tested software prior to release to the FDD. Ongoing efforts include the upgrading and modification of existing systems to provide greater bandwidth to move large amounts of digital information rapidly. Efforts also include developing software systems for the Forward Observer System, FIREFINDER (Q-36 and Q-37), and the Meteorological Measuring Set slated for fielding to the FDD. Another effort includes developing applications in the Microsoft Windows NT operating environment to provide the warfighter in the tactical situation with an operating environment similar to that found in garrison.

On-Site Support

No discussion of CECOM support to the FDD is complete without addressing the command's team at Fort Hood, which is comprised of the Materiel Developer Cell, the Logistics Coordination Cell with its Help Desk, and the Electronic Sustainment Support Center. This team is our lead element to relay on-the-ground experiences and concerns to the CECOM leadership and to facilitate the information flow between combat and materiel developers. The team coordinates fielding of prototype and force modernization systems and manages new equipment training, testing, spectrum management, maintenance and repair, platform safety releases, and retrograding. The team also supports AWEs and digital rotations at the National Training Center (NTC) and the Joint Readiness Training Center. Deploying with the soldiers, team members work 24 hours a day, 7 days a week alongside unit maintainers and program managers to diagnose and resolve equipment problems with prototype and fielded systems. Their achievements include resolving more than 7,500 equipment trouble calls from soldiers, training almost 23,000 soldiers on new ABCS equipment and about 1,400 soldiers on new FBCB2 equipment, and installing hundreds of systems in a variety of configurations on hundreds of vehicles for limited user tests. The on-site team is CECOM's most visible face to the soldiers of the FDD, their "911."

Wholesale Logistics Modernization Program

Just as CECOM paved the way for the FDD's cutting-edge systems, the command's Wholesale Logistics Modernization Program (WLMP) will provide the Army with focused logistics to ensure combat readiness as the FDD evolves into the First Digitized Corps. The WLMP will provide anticipatory logistics, asset visibility, distribution-based logistics, and an overall smaller logistics footprint. The business processes used at the wholesale level have not changed significantly in 30 years. The WLMP will modernize and re-engineer these processes to provide the warfighter with the best-in-class commercial business practices embodied in a COTS package and enabled by information technology.

Ultimately, the modernized wholesale logistics business processes will integrate with the Global Combat Support System-Army to provide a single wholesale/retail logistics system that will provide timely, flexible, and cost-effective worldwide distribution of assets to sustain military and peacetime operations.

Conclusion

The support CECOM provides to the FDD embodies our mission to develop, acquire, and sustain superior information technologies and integrated systems, enabling battlespace dominance for America's warfighters as the Army makes the transition from the industrial age to the information age. The C4IEWS payoff is becoming apparent to the soldiers of the FDD and will be critical to the soldiers of the First Digitized Corps and the Army 2010 and beyond. Indeed, soldiers ARE our bottom line!!

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DIGITIZING INSTALLATIONS

LTC Curt McCabe and Carlos E. Davila

Introduction

Installation Information Infrastructure Architecture (I3A) sure sounds like a mouthful, but a quick look at its simple approach and positive results makes it easy to understand and swallow. I3A uses an architecture-based methodology to modernize the command, control, communications, and computers (C4) infrastructure on Army installations. Moreover, I3A provides the means to implement the Army XXI doctrinal concepts of power projection and split-based operations and creates the environment mandated by the Defense Reform Initiative (DRI). I3A also plans for the fully digitized installations required to support the information needs of emerging digitized forces.

Challenges

The DRI challenged the Army to revolutionize its approach to conducting daily business on its installations, primarily network-centric approaches dependent on modernized information communication capabilities. I3A is the Army's response to the DRI and is also the natural and vital follow-on to architecture efforts for the First Digitized Division (FDD) and subsequent warfighter representations. It achieves Army modernization efficiencies by identifying installation information infrastructure requirements, sanctioning and funding them, and then managing their development. I3A's methodology is simple—determine the existing condition of the communication "plumbing," overlay standard engineering solutions that will produce a fully connected installation, and determine the cost required to upgrade. The *engineering solutions* are stable, scalable, efficient, and tested. However, it was the *existing condition* of the communications infrastructure on installations that became the genesis for I3A.

For the Army, the main challenge of the DRI was to improve the chaotic and decayed state of the information infrastructure. I3A began when Army Chief Information Officer (CIO) LTG William H. Campbell looked at Army installations and saw old and decaying information transport systems consisting primarily of 1940s and 1950s technology. Further complicating matters was the unsynchronized approach to identifying and meeting modernization requirements and funding of the modernization process. Moreover, the lack of a centrally standardized and funded vision forced installations and major commands to acquire products and modernize in the best way they could to meet their most pressing needs. This process did not always work well. The question then became, "How can we realistically expect to field and maintain the dominant edge that the digitized forces provide if we ignore where they live, train, and reach back to for their command, control, and support?"

Strategy Formulation

In October 1997, the CIO directed his Programs and Architecture (P&A) Directorate (then headed by BG Peter Cuviello) to formulate a strategy to fix the Army's communication shortfalls by more quickly providing assistance to Army installations. The only way to do this was to get funding, and the only way to get funding was to determine the requirement.

Armed with experience and insight gained from designing the FDD architecture, P&A established a team of information technology (IT) experts and personnel with specialized skills from major commands and Army installations. The team agreed to a simple strategy. First, it would determine the existing condition of the communication plumbing. Second, the team would design a standard, mission-capable computer and communication target architecture and tailor it to each individual installation. Third, it would develop and use a costing model to quantify the difference between the existing IT infrastructure and the target architecture and then use the information to support the Army's IT investment strategy. Fourth, it would institutionalize I3A processes and procedures. Finally, and most important for supporting the warfighter, it would assist information management directors and installation managers in their modernization efforts by applying the same tools and databases used to determine the capabilities and needs of our digitized fighting forces.

To meet the first step of assessing the existing condition of the communication plumbing, the team turned to the Information Systems Engineering Command (ISEC) and its Fort Detrick Engineering Office (FDEO). Engineers were tasked to create a flexible, noninvasive data call using the Deputy Chief of Staff for Operations' Installation Sequence List. This data call would yield the requisite information to determine the existing condition of the fixed communications network and the cost once FDEO overlaid the standard target design.

Working with Forces Command, the Army Materiel Command, and the Training and Doctrine Command, the FDEO produced "cost models" (called Target Architecture Models or TAMs) for large and medium installations and used the information in the FY00-05 Program Objective Memorandum (POM). This was achieved in less than 4 months. The FDEO created a database as it gathered the information. Using state-of-the-art engineering software, it began creating digitized versions of engineering drawings depicting the installation's IT infrastructure. The drawings were stored in a secure, Web-based, digital repository called the Communications Resource Engineering Drawing Repository (CREED). As of this writing, the CREED holds nearly 100 percent of

the I3A-required information for sequenced continental U.S. installations, 100 percent of Korea's installations, and is completing information gathering for installations in Europe, Okinawa, and Japan. Fort Detrick, MD, engineers are also documenting the Reserve Components' "virtual installations" in the CREED. Commands and installations can now request access to these engineering drawings and associated installation data sources via the I3A home page at **http://archodisc4.army.mil/I3A/I3A.htm**.

As the FDEO engineers gathered information, they worked closely with the Army Signal Command, the Program Manager for Defense Communications and Switched Systems, the Technology Integration Center, and other ISEC agencies to meet the second and third steps of the team's strategy.

The I3A approach will be applied to five to seven Army installations during FY00. The I3A approach assumes all buildings will require connectivity to the main information pipeline. As such, the pipeline's route and branches will be designed to most efficiently service them. Once buildings are connected to the installation network, they can then exchange information with other agencies on post, ride the infrastructure to other posts via the Defense Information Systems Network, and communicate with their deployed soldiers and activities.

Further, the architecture itself does not dwell on the exact bandwidth or level of traffic coming from or to the building. Instead, it emphasizes a reasonable but robust communications pipe to meet most current needs and those in the foreseeable future. Details are codified in the I3A *Design and Implementation Guide* and on the I3A home page.

The I3A Team's fourth step began with the June 1999 Army CIO memorandum. The CIO would not permit the I3A to be just a funding or departmental tool that provided nothing but dollars and oversight to the installation customers it was designed to support. The CIO believed it was necessary to keep the installation data current, to ensure the architecture was flexible and forward looking, and to relieve as much administrative burden from installations as possible. To address these challenges, an I3A Configuration Control Board (CCB) was established.

Working Groups

Charged with synchronizing the entire I3A effort, the CCB developed a charter, consolidated all existing I3A documentation, established procedures for updates and changes to the Army's I3A baseline, and set up working groups to address specific issues. The initial working groups focused on the I3A *Implementation and Design Guide* (identified as an ad hoc, task-specific working group), information assurance, network systems management, operations and manning, technology, and business areas. Business areas include finance, logistics, and personnel, and require connectivity to an installation's information infrastructure.

The Power Projection Division (PPD) manages the final aspect of the fourth step of the I3A Team's strategy. Using the Communications Requirements Information Management System-Warfighter Reachback (CRIMS-WARR) database, the PPD is I3A's implementation arm for the Army XXI doctrinal concepts of power projection and split-based operations.

Working from the U.S. Army Signal Center at Fort Gordon, GA, LTC Willow Solchenberger heads a section within the PPD that surveys, captures, and analyzes information-bandwidth requirements. These requirements are manifested at key power-projection, warfighter installations such as Fort Bragg, NC; Fort Drum, NY; and Fort Hood, TX. The PPD ensures that required information is formatted and compatible with the CREED database so engineers and planners can more effectively allocate funding to critical information needs. In addition, funds can be allocated to ensure vital communications with deployed units. Using the same integrated data, deployed units can better support large bandwidth-consuming applications and the high level of command and control traffic.

Applications such as distance learning, modeling and simulation, telemedicine, and command and control from home station are only a few examples where I3A can be of great assistance to the Army and DOD. These types of applications now consume more and more of the bandwidth of an installation's information infrastructure. Consequently, I3A components, such as the CREED and CRIMS-WARR databases, the TAM, and the CCB, can help the I3A Team identify requirements and ultimately help the Army more efficiently allocate its shrinking dollars. Moreover, as I3A matures, it will integrate with the Army's Metrics Program and the Army Flow Model and reduce intradepartmental data and function redundancies.

Conclusion

Since its inception in 1997, I3A has helped Army installations obtain nearly $1.3 billion to modernize their information infrastructures. Further, it serves as an important link between the warfighter and doctrinal concepts such as the DRI and Army XXI. Ultimately, I3A allows warfighters to conduct their missions unburdened by unreliable communications.

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Digitizing The Force . . .

FBCB2 PROGRESS AND THE ROAD AHEAD

Paul J. Dixon

Introduction

In an article in the September-October 1998 issue of *Army RD&A* magazine, LTG William H. Campbell, Director of Information Systems for Command, Control, Communications and Computers (DISC4), stated that the Army's path for digitization is a journey, not a destination. Force XXI Battle Command Brigade and Below (FBCB2) is a key program in that journey. As a result of lessons learned from the March 1997 Task Force XXI Advanced Warfighting Experiment (TF XXI AWE) at the National Training Center (NTC), the FBCB2 Program has progressed, using a spiral developmental process, toward a Milestone III decision in May 2002.

Much has been written about the FBCB2 Program since its exposure to the Army as a prototype (known as appliqué) in the TF XXI AWE. As the TRW Deputy Program Manager for FBCB2, I think it is appropriate to provide an update on FBCB2's journey and where it is headed.

Background

The accelerated tempo of modern combined arms warfare will demand full exploitation of rapid processing and transfer of crucial battlefield information. Land-force dominance at the tactical and operational levels requires improved battle command, improved synchronization of direct and indirect fires, faster and more comprehensive access to intelligence data, enhanced situational awareness (SA), and effective force protection. The need to quickly shift battle focus, reconfigure forces, and efficiently progress from one mission to another while on the move requires acquisition and use of timely battle information.

Timely information allows the soldier to make informed decisions consistently faster than the enemy. FBCB2 is a battle command information system that will complete the Army Battle Command System information flow from tactical operation centers (TOCs) at corps, division, brigade, and battalion levels to and across platforms (vehicles and dismounted soldier systems). FBCB2 is both a subelement and a key component of the Army Tactical Command and Control System (ATCCS) designed to interface with ATCCS at the brigade and battalion levels.

FBCB2 enhances total force effectiveness by automating the battle command process. It enhances the ability to operate in an unpredictable and changing environment throughout the battlespace from stability and support operations through war. It allows forces to simultaneously mount, execute, and recover from operations and synchronize all of the operating systems at a tempo that cannot be matched by the enemy. FBCB2 improves command and control (C2) while on the move by receiving and updating the ATCCS common battlefield picture and SA via horizontal and vertical links between TOCs and via horizontal and vertical links between mounted and dismounted platforms.

FBCB2 is located in the mounted and dismounted maneuver (divisional, separate, heavy, and light) cavalry and reconnaissance and armored cavalry, mechanized infantry, infantry, aviation units, and their associated logistic units. FBCB2 is unique as a digital system because it is provided to all combat, combat support, and combat service support units, thus equipping the entire brigade and below force with a near-real-time digital system. It answers the questions postulated by retired GEN Gordon R. Sullivan, former Chief of Staff of the Army, of, "Where am I?," "Where are my buddies?," and "Where is the enemy?" This is done by providing SA and C2 capabilities that enable tactical users to make and communicate decisions and react with synchronized fires and movement before the enemy can react, thus providing a significant battlefield advantage.

Functionality

As with any Army program, there are requirement documents that define desired functionality. The governing documents are the FBCB2 Operational Requirements Document (ORD), Version 5.2, Change 1, and the associated User Functional Description, Version 3.1. Other governing documents include the Joint Technical Architecture, Joint Variable Message Format (JVMF), and MIL-STD-2525. The adherence to and/or implementation of these documents are reflected within FBCB2 in three discrete areas: software, the Tactical Internet (TI), and hardware.

The phased implementation of requirements in successive versions of FBCB2 reflects a number of factors. These factors include schedule, cost, lessons learned from previous FBCB2 versions (and associated test events), as well as close coordination with the Program Executive Officer, Command, Control and Communications (PEO, C3S) on technical initiatives to ensure interoperability between FBCB2 and the ATCCS systems. This coordination also extends to other Army PEOs and program managers (PMs).

For each FBCB2 version, a crosswalk of the most current ORD and statement of work is conducted between the FBCB2 Program Management Officer (PMO) and the U.S. Army Training and Doctrine Command (TRADOC) Systems Manager (TSM) FBCB2. Additionally, the TSM and PMO conduct periodic "user juries" with other TSMs, PMOs, 4th Infantry Division (4th ID) representatives (as required), and the FBCB2 prime contractor team to address and resolve requirement issues.

The importance of the user jury process and its contribution to FBCB2 is exemplified by the soldier-machine interface (SMI) implementation of functionality (e.g., JVMF messages) that is intuitive and supports Army doctrine. A parallel and valuable activity has been the "after-action" reviews with soldiers of the 4th ID after major test events for FBCB2 (TF XXI AWE and the 1998 limited user test (LUT)). The benefit of these sessions is that all ranks and many different military occupational specialties are represented, thus providing a balanced input to developers (both government and industry) on behalf of all FBCB2 users.

Systems Engineering

The TI is comprised of government-furnished equipment communication devices such as the Enhanced Position Location Reporting System, the Single Channel Ground and Airborne Radio System, and the Internet Controller, which provide the communication backbone for transmitting SA and C2 digital traffic. Coupled with the hardware are the associated communication protocols needing to be implemented in the communication devices and FBCB2. Through modeling and simulation (M&S) at both the FBCB2 prime contractor's facility

Progress Toward The Objective System

CATEGORIES	TF XXI AWE	Field Test 1	LUT1
SA MCR	25 percent	78 percent	63 percent
SA SOS	1 minute	9.6 seconds	7.5 seconds
C2 MCR	29 percent	81 percent	81 percent
C2 SOS	3 minutes	3.6 seconds	3.65 seconds

Source: OPTEC brief dated Oct. 16, 1998

(TRW, with their resident subcontractor Raytheon) and within the government, the TI Working Group (TIWG) made recommendations on how to improve the performance of the TI.

The focus of M&S is on meeting the ORD requirements for speed of service (SOS), message-completion rate (MCR), and implementation of unit task reorganization. The progress of the TIWG effort is reflected in the overall improvement in MCR and SOS from TF XXI AWE through LUT1 for FBCB2, as presented in a U.S. Army Operational Test and Evaluation Command (now the U.S. Army Test and Evaluation Command) briefing. The accompanying table reflects this progress.

The TIWG is a textbook example of government and industry teamwork to solve some tough communication problems that individually could not be accomplished. For the FBCB2 Program, there is a weekly teleconference to address progress in M&S, software implementation of recommended TIWG enhancements, and test results at various contractor locations. Data sharing among industry players in TI development has been critical for the improvements made to the TI since the AWE.

Software

During the TF XXI AWE, FBCB2 was hosted on computers that were installed (appliquéd) in combat vehicles (wheeled and tracked) and helicopters and used for a prototype dismounted soldier system. While appliquéd computers with FBCB2 software will remain as the predominate configuration, the Army had a vision for two other implementations of FBCB2 into the force structure. The first is to leverage the investment in weapon platform automation systems by embedding (integrating) FBCB2 with the system (Abrams, Bradley, etc.). The other is to reduce the number of computers in certain vehicles (i.e., Linebacker), which requires multiple digital applications by co-hosting FBCB2 with other digital software.

FBCB2 Version 2 and beyond is composed of two major products. The first product or "backend" of FBCB2 is known as Embedded Battle Command (EBC) and is the component that supplies two primary services: SA and communication access (lower TI). This product is used not only in FBCB2, but is being embedded into weapon platforms such as the Abrams System Enhancement Program and the Bradley A3. It is also the primary component of the "TOC server" for PEO, C3S. In this use, there are no FBCB2 computers in the battalion or brigade TOCs. Through integration of the TOC server into the ATCCS Battlefield Functional Areas (BFAs) (i.e., Maneuver Control System, Advanced Field Artillery Tactical Data Systems (AFATDS), etc.), the BFAs will have connectivity to the lower TI (FBCB2) in addition to the upper TI (echelons above brigade).

In the future, EBC will be integrated into the Crusader and aviation platforms. Using EBC allows the Army to leverage its investment in onboard computer systems in weapon platforms and TOCs while providing connectivity to the TI. It also reduces the number of FBCB2 computers procured and appliquéd to the force by being co-hosted in such vehicles as the Linebacker and Paladin.

Through the re-use of FBCB2 and EBC (embedded or co-hosted), the Army is not only leveraging its investment in the FBCB2 Program but is also facilitating horizontal technology integration (HTI) across multiple platforms (Abrams, Linebacker, etc.). Re-use of FBCB2 and EBC supports the Army's goal of re-use and commonality by maintaining a common software baseline. This not only saves money for the Army, but also expedites HTI by providing upgrades that can be integrated into the various digital systems based on a planned schedule so that all the systems have the same capabilities concurrently.

FBCB2 currently runs on the Solaris/Intel, Solaris/SPARC, and VxWorks/Power PC Operating Systems (OSs). Future plans include porting FBCB2 to the Lynx OS and Windows NT. The Solaris/Intel OS is the standard for FBCB2. The porting of FBCB2 and/or EBC to other OSs are variants of the base case (i.e., Solaris/Intel). Irrespective of the OS, the goal is complete interoperability via the TI when the various platforms are deployed to the force. However, experience suggests that other choices of OSs may constrain functionality and performance while reducing timeliness of new technology insertion.

To date, the FBCB2 prime contractor met every software delivery schedule defined by the government for both FBCB2 and EBC. Work is well underway for FBCB2 Version 3.2, which will be used in the force development test and evaluation (FDT&E)/LUT2 in April 2000 at Fort Hood.

Currently, FBCB2 is supporting PM, Abrams and PM, Bradley in the integration of EBC on VxWorks OS to support a Bradley initial operational test and evaluation (IOT&E) scheduled for November 1999 (at the time this article was written) at Fort Hood. FBCB2 will be involved in this test also. In addition, EBC is being integrated into the TOC server for use by the ATTCS. The TOC server will be implemented by the PEO, C3S for the FBCB2 LUT2 and FDT&E in April 2000 at Fort Hood.

The FBCB2 Program played an integral part in the implementation of the JVMF for the Army and started the transition from the variable message format (used during the AWE) to JVMF in the recent release of FBCB2 Version 3.1. As part of this transition (spiral development) process, FBCB2 Version 3.2 will implement 32 JVMF messages. These are known as the "core messages" as defined by the TSM FBCB2. Of these 32 messages, 16 have been identified by the PEO, C3S as critical in supporting ATCCS and FBCB2 interoperability for the LUT2. By fielding of the First Digitized Division (FDD), FBCB2 will be in full compliance with the Army's acquisition directive on implementation of the JVMF "core message" set.

The second major product of FBCB2 is the front end or SMI. In layman's terms, it's what the computer screens look like and how the data within FBCB2 is presented to the soldier. Considerable effort has gone into the human factors aspect of the screen design as well as correct doctrinal represen-

tation of the data, etc. Through the TSM's user juries and close coordination among the PMO, TSM, and prime contractor team, the FBCB2 SMI is maturing into an intuitive Windows-like representation that facilitates training and use of the FBCB2 system by the soldier.

Integration And Testing

The FBCB2 Program schedule is aligned to support the Army's journey of digitization. While this realignment moved the FBCB2 IOT&E to November 2001, the Army implemented additional formal test events not only to validate the progress of FBCB2, but also to validate the Army's overall digital program for FDD and beyond.

As previously mentioned, the FBCB2 LUT2/FDT&E is one major test event to be conducted at Fort Hood, with approximately 350 FBCB2-equipped platforms interoperating with the ATCCS. The next major test event is the FBCB2 LUT3/Division Capstone Exercise 1 (DCX1) in April 2001, which will be conducted at the NTC with both FBCB2- and EBC-equipped platforms as well as the ATCCS. These two events reduce risk to the overall Army digitization program and, at the same time, provide the opportunity to assess the progress of FBCB2 and allow for improvements in the system. By conducting the FBCB2 LUT3/DCX1 at the NTC, the Army will provide a stressful environment (as experienced in the TF XXI AWE) for the FBCB2 and EBC systems. This should be a good benchmark for assessing how well FBCB2 performs and meets its ORD requirements prior to FBCB2 IOT&E.

Not only does the FBCB2 undergo formal tests as identified above, but as risk mitigation, there are a number of field tests (FTs) planned where FBCB2 and the ATCCS are tested from an engineering perspective. These technically focused tests at the Electronic Proving Ground (EPG) are conducted with the support of the Test and Evaluation Command, government PMs, and prime contractors to evaluate and test various technical implementations. Additionally, the FBCB2 prime contractor conducted a number of tests at EPG prior to the FTs to evaluate various technical implementations. All these are done to mitigate risk and improve the system.

As in any program, there is also the formal System Segment Acceptance Test done in-plant for each version of FBCB2 and EBC.

Hardware

Just as with software, FBCB2 uses the spiral developmental process in maturing the capabilities of the FBCB2 appliqué+ computer and installation kits. During the TF XXI AWE, the Army evaluated commercial, ruggedized, and MilSpec computers. As a result of that evaluation, the Army determined that ruggedized computers met the environmental conditions of being installed in wheeled and tracked vehicles.

For the FBCB2 system (software and hardware), there is an ORD mean time between essential functional failure (MTBEFF) requirement of 910 hours by IOT&E. This is the equivalent of experiencing a failure only every 6 months (based on an 8-hour day, 5-day workweek). While the AWE computers were experimental in nature, the August 1998 LUT1 appliqué+ computer (ruggedized) was the next generation of computers designed to meet a three-line-replaceable-unit configuration (i.e., processor, display, and keyboard). The objective of focusing on a ruggedized computer is to package commercial components into a ruggedized chassis to reduce cost and yet meet the performance parameters imposed on the FBCB2 hardware.

During LUT1, the appliqué+ computer had a low MTBEFF. Based on lessons learned, changes were made to improve the manufacturing and reliability of the system. To validate these changes, the FDT&E appliqué+ is not only going through a full qualification test, but both the prime contractor and the government have conducted a series of reliability growth tests under ORD conditions. Preliminary data indicate that the FDT&E appliqué+ computer has a marked improvement in MTBEFF compared to LUT1 results. Accordingly, the FBCB2 ORD performance level appears to be well within reach.

To support the FDD hardware requirements, the FBCB2 prime contractor, in conjunction with the FBCB2 PMO, updated the specification for the next generation appliqué+ (or appliqué+V4, as it is known). To take advantage of technology, the prime contractor, at the PMO's direction, is conducting a competitive request for proposal (RFP) for the next generation appliqué+. Given the FBCB2 schedule to date, this will be the first time in the FBCB2 Program that the Army will have the opportunity to "fly before buy" for hardware. This approach will reduce risk, based on the requirements imposed in the RFP, and will afford the Army an early look at the design and performance of the candidate solutions before the final decision is made on the ultimate manufacturer(s) of the FDD computers.

As with the computers, emphasis has been placed on the design and installation locations of the installation kits for the computers. Through a Platform Integration Working Group (PIWG) comprised of Army and industry players, each vehicle-type installation kit design and location is determined. Included in this PIWG process are the critical human factors and applicable safety releases.

To provide sufficient hardware to properly equip the force structure for a valid evaluation of FBCB2, the Army is implementing a low-rate initial production buy for the appliqué+ computer. Unlike the ATCCSs that are fielded at brigade and battalion TOCs, FBCB2 is distributed throughout the force structure. To properly assess the FBCB2, the Army must sufficiently equip the force to evaluate the FBCB2's contribution to lethality, survivability, and tempo of operations.

Conclusion

The FBCB2 is just one part of the Army's overall journey toward digitizing the force structure. While the journey is not without its challenges and problems, its successes are tangible and substantiated. A team effort between many Army and industry players has produced a system that is proving itself to be effective in field use by the soldier. This team effort, coupled with cross-program dialogue, is critical not only for the success of FBCB2, but also for the overall Army digitization effort. With the Army's continued emphasis on a strong military and industry team, FBCB2 will demonstrate its operational suitability and effectiveness prior to, and at, its IOT&E.

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Consolidation . . .

THE FUTURE OF ARMY TEST AND EVALUATION

LTC Bruce D. Lewis and Susan E. Swanson

Introduction

During the last two decades, the United States has seen the consolidation and merging of numerous large corporations to improve their effectiveness. The Army test and evaluation (T&E) community also consolidated. On Oct. 1, 1999, the Army Test and Evaluation Command (ATEC) was activated following a year of planning and preparation by multiple organizations. The reorganization consolidates the developmental testing mission of the Army Materiel Command's (AMC's) Test and Evaluation Command (TECOM) and the independent operational testing and system evaluation mission of the Operational Test and Evaluation Command (OPTEC). Committed to providing uninterrupted service to their customers, the impacted organizations achieved a seamless transition.

Background

The Army's decision to consolidate testing did not happen quickly. Although the Army Science Board recommended consolidation of both developmental and operational testing and evaluation in 1996, only the evaluation mission was consolidated. Effective Oct. 1, 1996, OPTEC assumed the developmental evaluation mission and resources from TECOM, the Army Materiel Systems Analysis Activity, and the Survivability and Lethality Analysis Division, and established the Evaluation Analysis Center (EAC) in Aberdeen, MD. At that time, consolidation of testing was deferred pending the results of the Quadrennial Defense Review.

In August 1997, an effort to again examine the feasibility of consolidating Army testing was initiated by the Vice Chief of Staff of the Army (VCSA). Consequently, the Assistant VCSA and the Deputy Under Secretary of the Army for Operations Research directed the Department of the Army Programs, Analysis, and Evaluation Directorate and the Test and Evaluation Management Agency to co-chair a study addressing the financial, regulatory, and organizational aspects of consolidation. The Study Group for Consolidation of Army Testing was established and, subsequently,

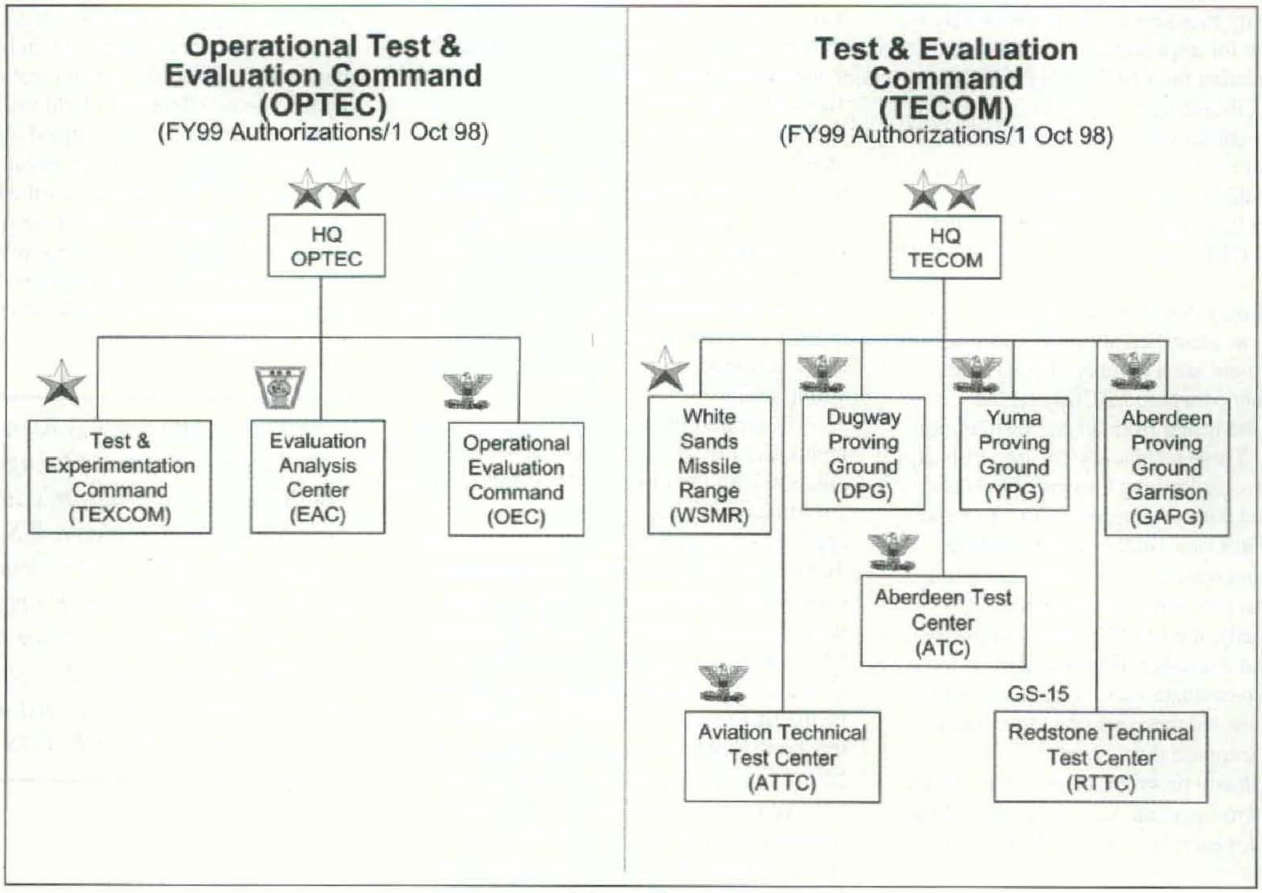

Figure 1.
FY99 Organization Structure

examined several alternatives and provided a recommendation both to a General Officer Steering Committee (GOSC) and to the VCSA.

In November 1998, the VCSA approved the consolidation of developmental and operational testing and directed that ATEC be activated Oct. 1, 1999. An ATEC Implementation Process Action Team was formed and a GOSC, with a supporting Council of Colonels, was established to oversee the consolidation process.

Organization

The FY99 organization structure of the two primary agencies involved in the consolidation, OPTEC and TECOM, is shown in Figure 1. Figure 2 portrays the new ATEC organizational structure that started in FY00. OPTEC is redesignated ATEC and is headquartered in Alexandria, VA; TECOM becomes the U.S. Army Developmental Test Command (DTC) and remains headquartered in Aberdeen, MD; the Test and Experimentation Command (TEXCOM) becomes the U.S. Army Operational Test Command (OTC) and remains at Fort Hood, TX; the Evaluation Analysis Center (EAC), OPTEC's developmental evaluators located in Aberdeen, MD, and OPTEC's Operational Evaluation Command (OEC) in Alexandria, VA, combine to form the U.S. Army Evaluation Center (AEC). AEC is located in Alexandria, VA, and performs integrated system evaluations. Both EAC and OEC personnel remain in place at their respective locations.

In addition to the name changes, ATEC headquarters also gains installation management responsibility. ATEC will continue to be a field operating agency, but has installation management responsibilities for White Sands Missile Range (WSMR), Yuma Proving Ground (YPG), and Dugway Proving Ground (DPG) because these installations remain part of DTC. Installation management responsibility for Aberdeen Proving Ground (APG), however, remains with AMC. Accordingly, the Soldier and Biological Chemical Command gains the APG Garrison and installation management responsibility. The Aberdeen Test Center remains with DTC and becomes a tenant organization at APG. The Redstone Technical Test Center (RTTC) and the Aviation Technical Test Center (ATTC) in Alabama, and the Electronic Proving Ground in Arizona also transfer to ATEC with DTC. Figure 3 shows ATEC's locations throughout the United States.

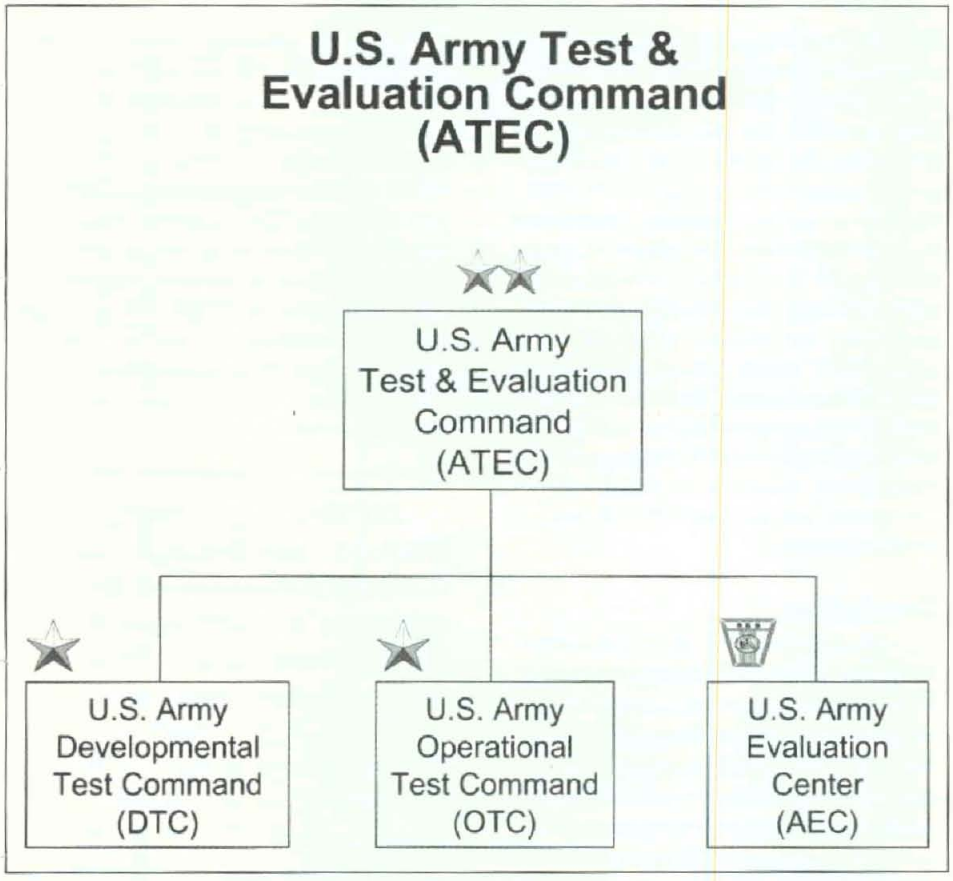

Figure 2.
FY00 organizational structure

This newly consolidated organization is geographically dispersed, as in the past, and will continue to rely on information management technology to accomplish its critical mission. This consolidation is similar to the trend we are seeing in business and industry.

Mission

The ATEC mission is to plan and conduct developmental tests, independent operational tests, integrated evaluations, and assessments of Army materiel and systems. This mission includes live-fire and lethality tests, joint and multi-Service tests, force development tests, field experiments and advanced technology demonstrations, oversight of the Army's Continuous Evaluation Program, and safety verification. ATEC will accomplish this mission based on a five-tenet T&E philosophy.

T&E Philosophy

ATEC's T&E philosophy consists of early involvement, testing to learn, integrated test and evaluation, modeling and simulation (M&S), and use of training events.

• *Early Involvement.* Early involvement of ATEC in the requirements process and in developmental and operational testing helps reduce acquisition costs by providing early feedback to materiel developers. System changes are more expensive later in the acquisition process. Early ATEC involvement aids in understanding requirements and allows ATEC personnel to design the most efficient tests and provide better quality evaluations.

• *Testing to Learn.* The DTC will continue to perform customer tests (CTs) for program managers (PMs) in addition to developmental tests required by the acquisition process. Additionally, OTC will continue to recommend CTs and one or more smaller scale operational tests. These tests will be conducted prior to a required initial operational test and evaluation (IOTE) to learn more about the system, provide early feedback to PMs, and potentially reduce the scope of a required IOTE.

• *Integrated Test and Evaluation.* Because both developmental and operational testing and evaluation are now the responsibility of one command, ATEC will produce only one integrated test plan and one system evaluation report instead of two. The integrated test plan will include required developmental tests (DTs), operational tests (OTs), any combined and/or integrated DT/OT events, and use of M&S. The system evaluation report will be issue-driven and link all testing by considering the different sources

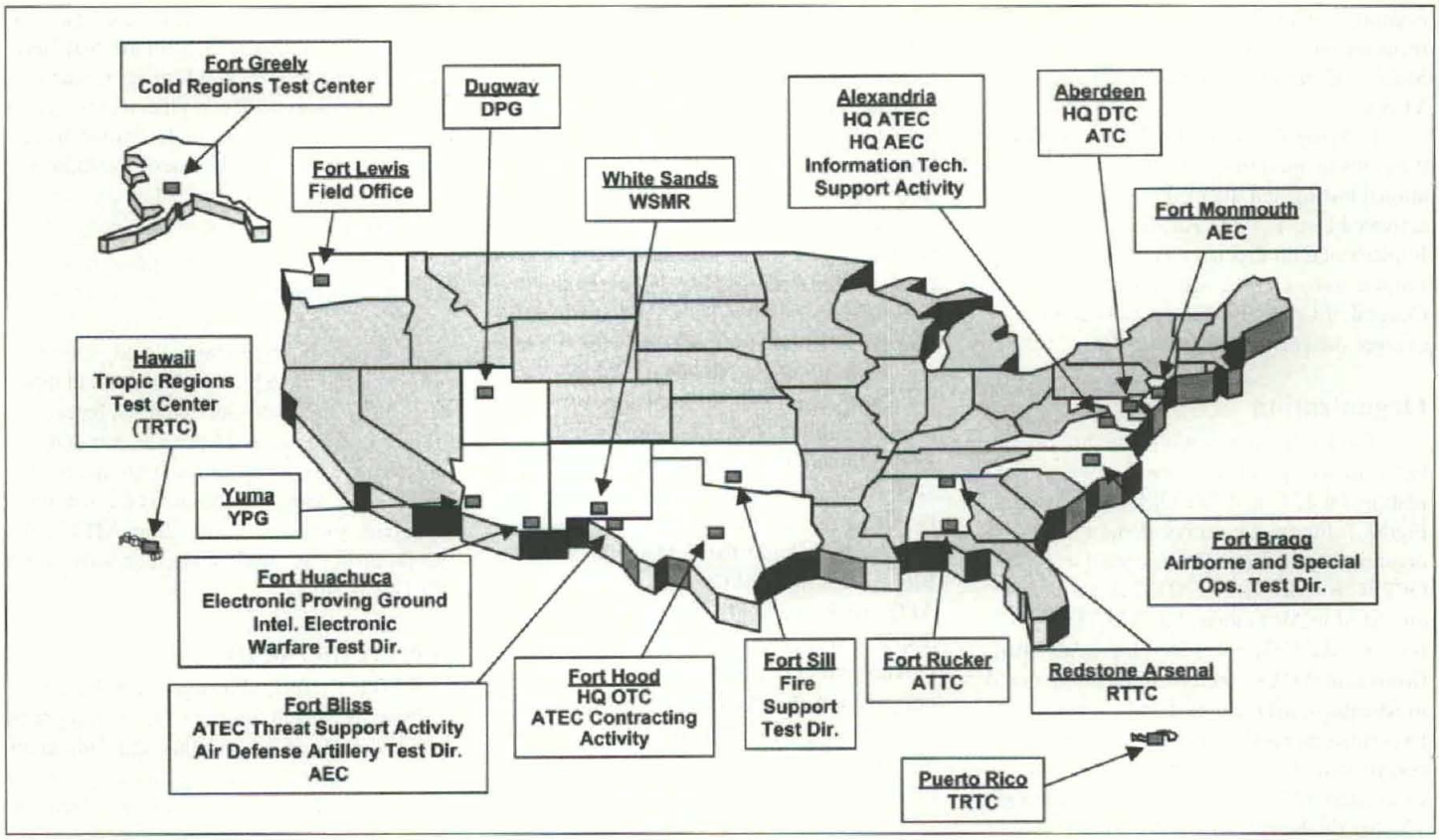

Figure 3.
ATEC locations

of data to determine the overall effectiveness, suitability, and survivability of a system.

• *Modeling and Simulation.* ATEC will continue to emphasize the use of validated, verified, and accredited M&S in both developmental and operational testing throughout the acquisition process. M&S can help reduce T&E costs, focus tests on critical areas, and help clarify test results. M&S is a powerful tool that should be developed and considered for early use in T&E.

• *Training Events.* ATEC will attempt, whenever possible, to conduct testing in conjunction with regularly scheduled training events and exercises because of decreased Army force structure and increased deployments and operational tempo. This can reduce test costs and improve operational realism. Testing during training events requires an innovative test design to accomplish both test and training objectives.

Using these five tenets, the diverse ATEC organization is now able to better facilitate joint integration, cooperation, and communication.

Why Consolidate Testing?

There are two significant benefits to consolidating testing and evaluation into ATEC. First, it provides unity of command. It allows one commander to determine how to best use critical Army T&E resources as well as those for joint T&E. Unity of command also better supports an integrated T&E philosophy. Second, the ATEC consolidation results in more effective and efficient T&E, which helps ensure mission accomplishment in an environment of diminishing resources. Although DT will continue to be associated with early acquisition efforts and OT with later efforts, the existence of both missions within ATEC should produce T&E strategies that are less sequential. The consolidation provides greater opportunity to conduct combined and/or integrated DT/OT events, wherever it makes sense to do so, thereby allowing "soldier" involvement earlier in the acquisition process.

Conclusion

The activation of ATEC resulted from the merger of two outstanding professional organizations that perform a critical mission for our soldiers and our Army. ATEC will continue to successfully accomplish its mission by providing insights and feedback to materiel developers; providing evaluations and assessments on the effectiveness, suitability, and survivability of weapon systems; and by providing independent advice and recommendations to senior Army leaders. The ATEC will continue to conduct T&E to ensure that our soldiers and our Army will have the weapons and equipment required for victory on future battlefields.

ATEC's ultimate customer is the soldier—the sons and daughters of America, who will judge ATEC's efforts with their mission accomplishments and, possibly, with their lives. This is an awesome responsibility and a sacred trust that ATEC will never compromise. Consequently, ATEC will continue to play a critical role in helping the Army prepare for the 21st century across the entire spectrum of conflict.

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ANNUAL ARMY ACQUISITION WORKSHOP HIGHLIGHTS MODELING AND SIMULATION

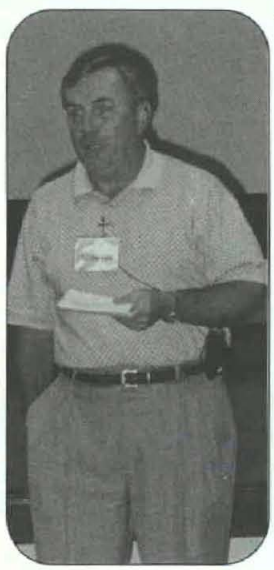
Sandra R. Marks

Introduction

Modeling and simulation (M&S) was the principal topic discussed by more than 200 key members of the Army acquisition community gathered at the annual Army Acquisition Workshop and Executive Session held at Redstone Arsenal in Huntsville, AL, Aug. 24-26, 1999. Cosponsored by the Office of the Assistant Secretary of the Army for Acquisition, Logistics and Technology (OASAALT) and Headquarters, U.S. Army Materiel Command (AMC), the workshop was attended primarily by program executive officers (PEOs); Deputies for Systems Acquisition (DSAs); acquisition commanders; and product, project, and program managers (PMs). The workshop gave participants the opportunity to focus on the latest developments in modeling and simulation and to hear updates on many of the key issues affecting the acquisition community. Other attendees included commanding generals, deputy commanding generals (DCGs), directors, deputy directors, and industry leaders.

Opening Sessions

Vicky Armbruster, Deputy PEO (DPEO), Tactical Missiles, spoke on behalf of the local host of the workshop in welcoming participants. After identifying the PEOs, DSAs, and major organizations at Redstone Arsenal and presenting a brief outline of the organizational structure, Armbruster introduced opening workshop speaker Paul J. Hoeper, Assistant Secretary of the Army for Acquisition, Logistics and Technology (ASAALT) and Army Acquisition Executive. In his opening remarks, Hoeper called Simulation and Modeling for Acquisition, Requirements and Training (SMART) one of the great enablers in the acquisition community. Simulation and modeling, Hoeper said, provides an opportunity to address complex issues much more economically and much more quickly. He stressed that the Army leadership is very committed to simulation and modeling not just in an engineering sense but also in how it impacts training, tactics, systems usage, and information and emotional overload prior to fielding a system.



LTG James M. Link, DCG, AMC

SMART was also the topic of two featured morning speakers. Dr. Hank Dubin, Director, Assessment and Evaluation, OASAALT, said SMART is primarily about exploiting and capitalizing on modeling and simulation. He discussed some of the areas where SMART can be used and some of the challenges for making better use of it. He encouraged collaboration among stakeholders as a major challenge, adding that M&S will be a great asset in modernizing the information-age Army. Citing the need for the Army to always focus on the warfighter, Dubin said SMART can help reduce total ownership cost and the time required for initial operational capability; improve supportability, maintainability, and military worth; and allow for more effective and cost-efficient training.

Army Vice Chief of Staff GEN John M. Keane

BG(P) William L. Bond, Commanding General (CG), Simulation, Training and Instrumentation Command (STRICOM), briefly reviewed STRICOM's mission and recapped some of STRICOM's development efforts that have incorporated SMART concepts. Focusing on training, Bond noted the need to integrate training and system development using SMART. This, he said, would allow training to begin earlier than it does now. He also praised the new Army initiative to collaborate with the entertainment industry on M&S, stating that it will benefit both communities that traditionally shared little information and technology. In conclusion, Bond said the Army will miss a great opportunity if it does not move forward on SMART now. "The Army needs it, the taxpayers expect it, and our soldiers deserve it," he added.

Keith Charles, Deputy Director for Acquisition Career Management (DDACM) and Deputy Assistant Secretary for Plans, Programs, and Policy, OASAALT, shifted from the subject of SMART to an update on the status of the military and civilian

Acquisition Workforce. Charles stressed that one of the major concerns of the acquisition leadership is the Army's plan to impose further reductions in the workforce while significantly increasing the pace of modernization. The impact of these personnel reductions will be even greater when combined with the high rate of officer retirements and the fact that more than half of the civilian workforce will be eligible to retire in 2005. To address this shortage, Charles called for greater professional development of both military personnel and GS-12/13 civilians for leadership positions. The best leader, according to Charles, initially attains a strong technical background and then broadens oneself with experience.

Other morning sessions included briefings by Dr. Steven L. Messervy, Project Manager, Advanced Threat Infrared Countermeasures/Common Missile Warning System/Aircraft Survivability Equipment (ATIRCM/CMWS/ASE) Joint Project Office, on M&S lessons learned and BG(P) Joseph L. Bergantz, Program Manager, RAH-66 Comanche, on Comanche simulation. Bergantz outlined the Comanche simulation strategy associated with the test program and preceded his presentation with a simulation video moderated by Dr. Sharon Johnson, Head of the M&S Program at the ATIRCM/CMWS/ASE Joint Project Office.

COL Charles A. Cartwright, Project Manager, Crusader, concluded the morning sessions with a presentation outlining the Crusader verification, validation, and accreditation process. Cartwright began with a video showing how Crusader is moving from requirements to reality. The implementation of a simulation-based development process will allow the Crusader to get to the soldier faster than by using other more traditional development procedures. Cartwright called the Crusader Program a leader in the use of M&S and in the implementation of the SMART philosophy.

Keynote Address

GEN John M. Keane, Army Vice Chief of Staff, was introduced by LTG Paul J. Kern, Military Deputy to the ASAALT, as the workshop keynote speaker. In providing his perception of the Army, Keane began his remarks by praising the Army Acquisition Workforce for their efforts. The Army Acquisition Corps plays a vital role in meeting America's national security needs and will continue to do so into the 21st century, Keane said. That role, he added, will expand as the Army shifts from an industrial-based force to an information-age force. Today, Keane said, there are almost 30,000 soldiers in 75 countries conducting disaster relief, peace operations, treaty verifications, and patrolling hostile borders. Much of the success in these endeavors during the past decade was achieved during a period of diminishing resources, according to Keane. Despite the reduction in resources, the Army was able to achieve some extraordinary efficiencies by leveraging the power of information technology and incorporating the very best commercial practices. In part, he credited these efficiencies to the Army's dedicated workforce.

BG(P) William L. Bond, CG, STRICOM

In addition, Keane noted that innovative approaches to materiel development; contracting; and command, control, communications, computers, and intelligence have enabled the Army to stretch its dollars and make the most of its limited funding. For example, initiatives such as SMART and spiral development have allowed materiel developers to break new ground in placing the latest technology in the hands of soldiers. Following the lead of industry, said Keane, the Army has embraced computer-aided design and computer-aided modeling to reduce production costs and produce better weapons. While industry has focused its M&S efforts on reducing production costs, the Army has taken the idea a step further. Using virtual prototypes, soldiers can work with developers and have a direct impact on pre-production design changes. In fact, soldiers can now train on new equipment before it rolls off the production line.

NASA Astronaut LTC Nancy J. Currie

In contracting, the advances are no less impressive. Cited examples include the IMPAC credit card, paperless contracting, and the single process initiative. These achievements, noted Keane, are a testament to the hard work and dedication of the talented men and women in the Army's Acquisition Corps.

Addressing some of the Army's key initiatives, the Vice Chief of Staff said the U.S. Army is the standard by which other armies are measured. In this role, the Army must "stay relevant" and adapt to an ever-changing world. Keane added that change is inevitable and always challenging and difficult. As such, Army Chief of Staff GEN Eric K. Shinseki has embraced this reality and recently issued his commander's intent, a short state-

ment of promise to make the Army more strategically responsive, to fix manning of the force issues, to develop Joint leaders, and to take care of soldiers and their families. To carry out this statement of promise, GEN Shinseki has directed GEN Keane to develop task forces on the Army's strategic vision, on manning the force, on a new modernization strategy, and on redesign of the Army Staff.

Relative to the Army's strategic vision—which was announced in October 1999—Keane stated that it will provide focus and direction for every Army soldier and every Army civilian. In short, said Keane, this vision will rightfully allow everyone in this organization to know where the Army is headed. In addition, the strategic vision will improve the Army's strategic responsiveness and embrace a full-spectrum capability in conducting the Nation's business.

Keane concluded by stating that no job in the Army is more important than getting the best equipment into the hands of soldiers. He also stressed the need to train soldiers in dangerous conditions so they are properly prepared for the realities of war.

During a brief question and answer period, Keane was asked to comment on the DA's relationship with Congress. Responding, he noted that working with Congress is a duty and an obligation, and called for improved communication, specifically face-to-face discussions.

Other Afternoon Speakers

Following GEN Keane, LTC Stephen R. Kostek, Product Manager, Joint Tactical Terminal/Common Integrated Broadcast Service Module (JTT/CIBS-M), presented a briefing on modeling and training simulation. He defined JTT, provided a program background, and described JTT's application in the areas of communications intelligence and electronics intelligence.

LTC Harry Greene, Product Manager, Aerial Common Sensor (ACS), spoke on integrating M&S into the PM, ACS life cycle. He presented an overview of ACS and discussed the application of SMART to the ACS Program.

The final presentation of the day was given by MG Timothy P. Malishenko, USAF, Commander, Defense Contract Management Command (DCMC). He outlined some of DCMC's current initiatives including acquisition reform, civil and military integration, and re-engineering business processes. DCMC's vision to provide world-class contract management services now and into the 21st century focuses on pre-award emphasis, risk management, centralized services, and alliances and partnerships.

In a brief review of the day's events, LTG Kern concluded that a lot of good ideas related to implementation of M&S had been presented. These ideas, he said, will improve life for the recipients of our products. Kern noted that a lot of progress has been made in M&S in the last few years, but many challenges remain. Kern closed by calling on the workshop attendees to address the problems facing the Army.

Awards Dinner

The day's activities culminated with a dinner honoring PMs and Acquisition Commanders of the Year. Also honored were the winners of the David Packard Excellence in Acquisition Award and the Defense Acquisition Executive Certificate of Achievement Award. Events also included a chartering ceremony and presentation of a Special Award for Excellence in Contingency Contracting. (See accompanying article on Page 23 of this magazine.)

NASA Astronaut

NASA astronaut LTC Nancy J. Currie was the evening's guest speaker. A member of the December 1998 shuttle mission crew that carried parts to commence construction of the International Space Station, Currie showed a video history of her shuttle mission while sharing her experience. She pointed out different aspects of the mission where particularly lengthy periods were spent training in virtual reality laboratories. Currie emphasized that the only way to train for shuttle missions is through simulation. She added that it is extremely difficult to train on Earth for certain operations that are carried out in the extreme environment of space. She highlighted the wide variety of simulation techniques that NASA employs to train astronauts and ground controllers for mission operations.

Dr. Hank Dubin, Director, Assessment and Evaluation, OASAALT

On the second day of the workshop, Vicky Armbruster, DPEO, Tactical Missiles, presented a briefing on horizontal technology integration as a best value strategy. She was followed by a panel discussion on the Army Arsenal Act. Edward J. Korte, Command Counsel, HQ AMC; Dominic A. Femino, Deputy Command Counsel, HQ AMC; and David Harrington, Associate Counsel, HQ AMC, presented an accelerated briefing on the history of the act and discussed current law and its implications for PEOs and PMs.

Army Y2K Overview

Miriam F. Browning, Director of Information Management, Office of the Director of Information Systems for Command, Control, Communications and Computers (ODISC4), presented an overview on the Army's preparation for Y2K. The bulk of Y2K preparation in the Army has impacted the acquisition arena, specifically AMC, and Browning thanked the acquisition community for the Army's current state of Y2K readiness. Browning presented lessons learned thus far in mission-critical testing. There have been no "showstoppers," she said, adding that no weapon system has encountered a major problem.

One major ongoing initiative Browning discussed was the development of transition operations. ODISC4 is working with the Army Deputy Chief of Staff for Operations and Plans to create a Y2K transition operations cell (TOC) within the Army Operations Center (AOC). Scheduled to be operational Dec. 28, 1999, the TOC will be a subcomponent of the AOC and will establish procedures for reporting and responding to Y2K issues. Browning called on PEOs, DSAs, and PMs to consider having their own response teams on call for mission-critical system response. Finally, Browning outlined final details for completing the Y2K readiness mission: fix remaining system glitches, write and test system contingency plans, complete required operational evaluations, participate in Y2K community outreach and public relations efforts, provide system emergency contact information for the Y2K TOC, and participate in transition period operations.

Additional Presentations

A brief summary of additional morning presentations follows:

No More Task Force Smith's; No More Procurement Holidays. LTG Theodore G. Stroup Jr., USA Ret., Vice President, Education, Association of the United States Army, reminded the attendees that the conscious post-Cold War decision to take a temporary break in the development and production of new and replacement military equipment is now stretching toward 10 years and threatens to plunge the military into a readiness crisis.

Modeling and Simulation Support to Biological and Chemical Programs. Richard W. McMahon, Chief, Edgewood Chemical and Biological Center, U.S. Army Research Laboratory, emphasized that the use of nuclear, biological, and chemical simulation-based acquisition is alive and well at the U.S. Army Soldier and Biological Chemical Command.

Lockheed Martin 21 Best Practices. Dr. Clovis Landry, Vice President, Technology, Lockheed Martin Corp., outlined some of Lockheed Martin's best-tried practices that can be applied industrywide.

BG Steven W. Flohr, DCG SMDC

Panel Discussion

The afternoon session began with a panel discussion to identify and consider acquisition issues. Panel members were MG John F. Michitsch, PEO, Ground Combat and Support Systems; BG(P) Robert E. Armbruster, DSA, U.S. Army Aviation and Missile Command; BG(P) William L. Bond, CG, STRICOM; Keith Charles, DDACM and Deputy Assistant Secretary for Plans, Programs and Policy, OASAALT; and Kevin Carroll, PEO, Standard Army Management Information Systems (STAMIS). Each panelist was called on to present a top 10 list of what he considers the most pressing acquisition issues affecting his organization. The diversity among the represented organizations allowed for an examination of a wide range of issues. Although each panelist chose a different format to present their views, many of the same issues surfaced, such as personnel shortages and resource reductions. In summarizing the panel discussion, LTG Kern reminded the audience that future improvements in Army systems require investments now.

Additional presentations during the final day included the following: *Ground Combat Simulation At TACOM-ARDEC: Virtual Training For Live Simulation*, William Davis, Systems Engineer, TACOM-ARDEC; *Digitized Platform Integration Strategies*, Ken Welker, General Engineer, HQ AMC; *Application Of Component, Life-Cycle Reliability Modeling Tool To HMMWV Data*, Dr. Michael J. Cushing, Technical Advisor, Acquisition Reform and Standards Team, AMSAA; and *An Information Technology Approach For Managing The Army's Equipment Modification*, Robert Lane, CALIBRE Systems. In the final formal workshop briefing, BG Steven W. Flohr, DCG, SMDC, outlined SMDC's mission to provide space and missile defense capabilities for the warfighter and the Nation, and reviewed SMDC's organizational alignment concept of operations.

Closing Remarks

Concluding workshop remarks were presented by LTG James M. Link, DCG, AMC, and by Paul J. Hoeper. Speaking first, Link thanked "team" Redstone for hosting the conference. In response to concerns expressed by PMs that they are not getting the cooperation they need from AMC's major subordinate commands, he encouraged PMs to first seek help within their own chain of command prior to elevating issues to headquarters. Hoeper termed the workshop "terrific" and encouraged use of the simulation and modeling tools that were discussed throughout the workshop because they will, he said, help make a hard job easier.

SANDRA R. MARKS, an employee of Science Applications International Corp. (SAIC), provides contract support to the staff of Army RD&A magazine. She has a B.S. in journalism from the University of Maryland, College Park, MD.

Awards Ceremony . . .

ARMY ACQUISITION WORKSHOP HONORS PMs AND ACQUISITION COMMANDERS OF THE YEAR

Krystal Morton and
Sandra R. Marks

The Army's Project Manager of the Year Award, Product Manager of the Year Award, and two Acquisition Commander of the Year Awards were presented in recognition of outstanding achievements at an awards dinner held as part of the annual Army Acquisition Workshop on Aug. 24, 1999, in Huntsville, AL. The awards were presented by Paul J. Hoeper, Assistant Secretary of the Army for Acquisition, Logistics and Technology (ASAALT), and LTG Paul J. Kern, Military Deputy to the ASAALT, and Director of the Army Acquisition Corps.

Project Manager Of The Year

COL Jeffrey A. Sorenson, former Project Manager, Night Vision, Reconnaissance, Surveillance and Target Acquisition (PM, NV/RSTA) received the Project Manager of the Year Award for FY98. (Sorenson is now the Director of Information Technology Acquisition, Office of the Director of Information Systems for Command, Control, Communications and Computers (ODISC4). The Office of the PM, NV/RSTA serves as the centralized manager for the Army's most critical multisensor technologies and is responsible for overseeing engineering and manufacturing development, production, and fielding. It also serves as the DOD Joint Service Executive Agent in the development and acquisition of common use day and night vision items.

Sorenson was cited for using his acquisition management and certified public accountant skills to the fullest. He expertly managed four separate Army appropriations: Aircraft Procurement Army; Other Procurement Army; Research, Development, Test and Evaluation 6.3 and 6.4; and Weapon Tracked Combat Vehicles for total direct funding of $237 million. He met or exceeded all HQDA obligation goals.

While PM, NV/RSTA, Sorenson developed and fielded the technologically advanced Recognition of Combat Vehicle trainer. This CD-ROM-based trainer teaches master gunners and the Abrams and Bradley commanders to detect, recognize, and identify the thermal signatures of various combat vehicles.

Sorenson was also credited for his key role in reducing the costs of thermal devices by sponsoring Foreign Comparative Test Programs during FY98 to qualify international sources for critical forward looking infrared (FLIR) technology, and by supporting combined performance testing of the second generation FLIR.

Product Manager Of The Year

LTC Stephen R. Kostek, Product Manager, Joint Tactical Terminal/ Common Integrated Broadcast Service Module (PM, JTT/CIBS-M), received the Product Manager of the Year Award for FY98. The Office of PM, JTT/CIBS-M is responsible for the development, production, testing, product improvement, and fielding of JTT and CIBS-M to the Army, Navy, Air Force, Marine Corps, Special Operations Command, and other DOD agencies.

The JTT Program was designed as a model program in acquisition streamlining (e.g., use of performance-based specifications, elimination of military standards, open systems architecture, use of commercial off-the-shelf/nondevelopmental items (COTS/NDIs), cost as an independent variable (CAIV), 10-year

COL Jeffrey A. Sorenson, former PM, NV/RSTA, and now the Director of Information Technology Acquisition, ODISC4, receives the Project Manager of the Year Award.

LTC Stephen R. Kostek, PM, JTT/CIBS-M, receives the Product Manager of the Year Award.

COL Ronald C. Flom, Commander, DCMC-Baltimore, receives an Acquisition Commander of the Year Award.

LTC Mary K. Brown, Commander, CRTC, Fort Greely, AK, receives an Acquisition Commander of the Year Award.

MG Timothy P. Malishenko, USAF, Commander, DCMC, accepts a Contingency Contracting Award on behalf of COL Donald R. Yates.

Paul J. Hoeper (far right), ASAALT, recognizes Dan Hosek (left) and COL Jeffrey A. Sorenson (center), who represented the OMNI V Night Vision Devices Source Selection Team, which was honored as the Defense Acquisition Executive Certificate of Achievement winner.

Paul J. Hoeper (right), ASAALT, presents the DSA charter to COL(P) Michael R. Mazzucchi.

Shown far left and far right in each of the first five photos above are Paul J. Hoeper, Assistant Secretary of the Army for Acquisition, Logistics and Technology (ASAALT), and LTG Paul J. Kern, Military Deputy to the ASAALT.

warrant value engineering, and prime vendor support). The program focus is on providing a best-value product to warfighting soldiers, sailors, airmen, and Marines.

Kostek was cited for his compelling vision, his ability to translate that vision into a program plan, and his ability to implement that plan to produce dynamic operations and support (O&S) cost reduction. As a result of the O&S cost-savings initiatives, the JTT Program will realize a 63 percent ($227.6 million) reduction in O&S costs during its 20-year life cycle compared with the baseline program.

Kostek initiated a modeling and simulation program to address risk mitigation, resulting in teaming trade-off decisions to resolve processor loading and throughput issues. The program was recognized as a winner in the Army's 1998 CAIV competition.

Acquisition Commanders Of The Year

COL Ronald C. Flom and LTC Mary K. Brown were each recipients of an Acquisition Commander of the Year Award for FY98. Flom was recognized for his achievements as the Commander, Defense Contract Management Command (DCMC)-Baltimore, the largest contract administration office in DCMC. The command is responsible for

providing program support to more than 40 major Defense weapon programs, including the Army's Global Command and Control System and Reserve Component Automation System, the Marine Corps' V-22, Osprey Joint Advanced Vehicle Aircraft and Advanced Amphibious Assault Vehicle, and the Navy's Standard Missile Program.

COL Flom was cited for superbly managing the largest and most complex field command within DCMC, with 27 percent of all contracts in DCMC, including 30 percent of the command's large (more than $100,000), flexibly placed contracts.

DCMC-Baltimore was at the forefront of the single process initiative (SPI). It had the first approved SPI for a geographic contract administration office and 20 approved SPIs through the end of FY98. DCMC-Baltimore was also a finalist in FY98 for an Office of the Secretary of Defense award for increased SPI participation.

Flom provided a program support team at a prime contractor location in support of the $1.6 billion Reserve Component Automation System. The team collaborated with the Army project manager and prime contractor to improve delivery and payment processing, which resulted in a reduced backlog of incompleted incurred cost audits and a single general and administrative rate to provide cost savings to the Army.

LTC Brown was recognized for her achievements as the Commander, Cold Regions Test Center (CRTC), Fort Greely, AK, DOD's only natural, cold-weather test center. She directs up to 160 soldiers, DA civilians, and contractors in planning and conducting developmental, operational, and production verification tests in cold-weather climates with temperatures dropping to minus 60 degrees Fahrenheit, and reporting on the results.

Specifically, the CRTC mission is to plan and conduct winter, mountain, and northern environment phases of developmental testing, and to report on the results. CRTC also provides advice and guidance on testing to materiel developers, materiel producers, other Services, and private industry. CRTC tests conducted for major acquisition systems were valued at approximately $1.9 million.

Brown has been instrumental in ensuring that CRTC is an integral part of the global test community by initiating programs to include CRTC in the Virtual Proving Ground and developing low-cost, long-term partnerships with other organizations.

Other Awards

COL Donald R. Yates was honored with a Contingency Contracting Award for his demonstrated excellence as Commander, U.S. Army Contracting Command Europe, and Principle Assistant Responsible for Contracting, U.S. Army Europe, while supporting the Balkans mission. MG Timothy P. Malishenko, USAF, Commander, DCMC, accepted the award on behalf of Yates, who was unable to attend the event.

The U.S. Army Joint Program Office for Biological Defense Portal Shield Team was recognized for its selection as a David Packard Excellence in Acquisition Award winner. This 27-member integrated product team was praised for using modular design and a COTS approach to improve system supportability and reduce ownership costs. The team was previously honored with the award at a Pentagon ceremony in July during Acquisition and Logistics Reform Week.

The OMNI V Night Vision Devices Source Selection Team was honored for its selection as a Defense Acquisition Executive Certificate of Achievement winner. The integrated product team from the Office of the PM, NV/RSTA was recognized for using acquisition reform initiatives and best-value procedures that stressed commercial practices resulting in reduced total ownership costs. The team was previously honored with the award at a Pentagon ceremony in July during Acquisition and Logistics Reform Week. Army Acquisition Executive (AAE) Paul J. Hoeper recognized COL Jeffrey A. Sorenson, then PM, NV/RSTA, and Dan Hosek, Source Selection Evaluation Board Chairman and current Project Leader, NV/Electronics Sensors Directorate, as representatives of the team.

The awards dinner also featured a charter ceremony to appoint COL(P) Michael R. Mazzucchi as the Deputy for Systems Acquisition (DSA) for the U.S. Army Communications-Electronics Command. As DSA, Mazzucchi will be the Army manager for assigned programs and report directly to the AAE through the Commander, HQ Army Materiel Command. AAE Paul J. Hoeper read the charter, which remains in effect until assignment of a new DSA.

KRYSTAL MORTON, an employee of Science Applications International Corp. (SAIC), provides contract support to the Acquisition Career Management Office. She holds a B.A. in criminal justice and is currently working toward an M.A. in public administration.

SANDRA R. MARKS, an employee of SAIC, provides contract support to the staff of Army RD&A magazine. She has a B.S. in journalism from the University of Maryland, College Park, MD.

THE REGIONAL MASTER'S DEGREE PROGRAM IN PROGRAM MANAGEMENT

James M. Welsh

Introduction

The Master of Science in Program Management (MSPM) graduate degree program provides a unique opportunity for civilian members of the Army Acquisition Workforce to earn a master's degree in program management from the Naval Postgraduate School (NPS). The program is currently underway at Edgewood Arsenal/Aberdeen Proving Ground, MD; Warren, MI; Huntsville, AL; and Fort Monmouth, NJ.

As part of NPS' program management curriculum, MSPM 836 is designed to enable students to complete the program in 27 months. The curriculum consists of 50 credit hours completed in 9 quarters through a series of predetermined courses. During the first eight quarters, classes are held at on-site locations during duty and nonduty hours via a Video Teleconference Center hook-up with an NPS classroom in Monterey, CA. The final quarter of the program takes place through an accelerated 8-week residence session at the NPS campus in Monterey.

To fulfill its mission, NPS strives to sustain excellence in the quality of its instructional programs, to be responsive to technological change and innovation, and prepare officers and civilians for future technologies.

NPS is accredited by the Accrediting Commission for Senior Colleges and Universities of the Western Association of Schools and Colleges. Aeronautical, electrical, and mechanical engineering curricula are accredited by the Accrediting Board of Engineering and Technology. The systems management curricula are accredited by the National Association of Schools of Public Affairs and Administration. Certification for the Phase I Program for Joint Education is approved by the Chairman of the Joint Chiefs of Staff for graduates of the Joint Education Electives Program.

MSPM 836 is comprised of a highly demanding curriculum requiring a balance between the student and his or her organization. Consideration must also be given to the student's family responsibilities and academic demands. The commitment of organizations and supervisors is essential for the success of this program. Organizations make a substantial investment of additional resources in terms of facilities, scheduling projects, administrative support, and student participation. Unlike standard "after-hours" courses where the educational institutions and the student's organization have little interaction, MSPM 836 is largely dependent on the close interactive relationships among NPS, the student, the student's organization, and the student's supervisor.

Because of the challenging demands of this program, the selection process is highly competitive. The most recent Acquisition, Education, Training and Experience Selection Board, held in June 1999, chose only 15 applicants to participate in the program. Successful applicants must clearly show consistently high levels of performance over a sustained period of time in a variety of acquisition assignments. Additionally, applicants must demonstrate a high potential to succeed in the program and, in doing so, show how the Army will benefit from their success. The Army Acquisition Corps (AAC) philosophy is that a solid balance of education, training, and experience is required for career development. As a result, individual applications are evaluated to determine the need for this educational opportunity, as well as the applicability and appropriateness of the opportunity when measured against the overall content of the applicant's file.

Program Expansion

As indicated in the September-October 1999 issue of *Army RD&A* magazine's "Career Development Update" section, planning is underway to expand this program to two other pilot locations: Picatinny Arsenal, NJ, and the National Capital Region (NCR). The Acquisition Career Management Office, Office of the Assistant Secretary of the Army for Acquisition, Logistics and Technology, anticipates that participants in the NCR pilot program will be comprised of members of all the military Services. Establishment of this program at these locations is contingent upon local organization and individual interest. Guidance on how to apply for MSPM 836 at these two regions is available in the *Acquisition Education, Training and Experience Catalog*. If sufficient interest in this program is expressed, the start date for Picatinny and NCR would probably be in calendar year 2000.

The AAC wishes to congratulate the following individuals, listed by organization and/or geographic location, who are currently participating in the MSPM 836 Program (those shown in bold are the most recent selectees):

Edgewood Arsenal And Aberdeen Proving Ground

Denice P. Brown is a Supervisory Mathematician assigned to the U.S. Army Research Laboratory. She holds a bachelor's degree in mathematics from Pennsylvania State University and is a member of the AAC assigned to a critical acquisition position (CAP). She has served in numerous Army acquisition positions for more than 20 years and is Level III certified in systems planning, research, development, and engineering.

Shawn M. Funk is a Mechanical Engineer at the Chemical Research, Development and Engineering Center, U.S. Army Soldier and Biological Chemical Command (SBCCOM). He holds a bachelor's degree in mechanical engineering

from Virginia Polytechnic Institute and a master's in mechanical engineering from Johns Hopkins University. Funk has served in Army acquisition assignments for 8 years and is Level II certified in systems planning, research, development, and engineering.

Stella Y. Lee is an Industrial Engineer assigned to the Chemical Research, Development and Engineering Center, SBCCOM. She holds a bachelor's degree in industrial manufacturing engineering from Virginia Polytechnic Institute and a master's in environmental health engineering from Johns Hopkins University. Lee has more than 8 years experience in various Army acquisition positions and is Level III certified in systems planning, research, development, and engineering.

Joan M. Smith, a Computer Engineer at the U.S. Army Test and Evaluation Command, has a bachelor's degree in electrical engineering from the University of Alabama. A member of the Corps Eligible (CE) Program, she recently completed the Army Management Staff College. She is Level III certified both in systems planning, research, development, and engineering and in test, evaluation, and engineering. Smith has served for more than 15 years in various Army acquisition assignments.

George R. Hunt is a Contracts Specialist at SBCCOM. He holds a bachelor's degree in business administration from the University of Wisconsin and a master's in business administration from Pennsylvania State University. Hunt has more than 6 years experience in various Army acquisition positions and is Level III certified in contracting.

Laurence G. Gottschalk is an Industrial Engineer in the Office of the Program Manager, Chemical Demilitarization. He has a bachelor's degree in industrial engineering from Virginia Polytechnic Institute and is a member of the AAC. He has worked for more than 18 years in various Army acquisition assignments and is Level III certified both in program management and in systems planning, research, development, and engineering.

Janet E. Grobstein is an Engineer assigned to SBCCOM. She holds a bachelor's degree in engineering from the University of Illinois. She has served for more than 15 years in various Army acquisition assignments and is Level III certified in systems planning, research, development, and engineering.

Sandra L. Quinn is a Mechanical Engineer with SBCCOM. She holds a bachelor's degree in engineering from the University of Maryland and has served in Army acquisition assignments for 8 years. Quinn is Level II certified in systems planning, research, development, and engineering.

Robert R. Carestia is assigned to SBCCOM as a Mechanical Engineer. He holds a bachelor's degree in mechanical engineering from the University of Maryland and has served in Army acquisition assignments for 6 years. He is Level II certified in systems planning, research, development, and engineering; test and evaluation; and program management.

Warren, MI

James S. Roberts is employed at the U.S. Army Tank-automotive and Armaments Command (TACOM) as a Mechanical Engineer. He has a bachelor's degree in mechanical engineering from The Catholic University of America, and a master's degree in mechanical engineering from Virginia Polytechnic Institute. Roberts has served for 8 years in various Army acquisition assignments and is Level III certified in systems planning, research, development, and engineering.

Steven A. Dawson is a Mechanical Engineer at TACOM. He holds a bachelor's degree in mechanical engineering from the University of Maryland. Dawson has worked in various Army acquisition assignments for 10 years and is Level III certified in systems planning, research, development, and engineering.

Thomas O. Archinal is an Operations Research Analyst at TACOM. He holds a bachelor's degree in engineering from the U.S. Military Academy and a master's in operations research from Wayne State University. Archinal has 8 years experience in Army acquisition and is Level II certified in systems planning research, development, and engineering.

Coleen M. Setili is employed at TACOM as a Program Analyst. She has both a bachelor's degree in business management and a master's in management from the University of Michigan. In addition, she has 18 years experience in Army acquisition and is Level III certified in business, cost estimating, and financial management.

Harry P. Hallock is assigned to TACOM as Associate Director, Commodity Business Unit. He has a bachelor's degree in business administration from the University of Delaware and is a member of the AAC in a CAP. He has 19 years experience in various acquisition assignments and is Level III certified in contracting and Level II certified in program management.

Vicki L. John is a Program Analyst assigned to the Program Executive Office (PEO), Ground Combat Support Systems. She has a bachelor's degree in finance from Walsh College, has 21 years experience in Army acquisition, and is Level III certified in business, cost estimating, and financial management.

Kenneth E. Schramm is a Budget Analyst at TACOM. He holds a bachelor's degree in banking and finance from the University of Michigan and a master's in banking and finance from the University of Detroit. Schramm has worked in Army acquisition for 12 years and is Level II certified in business, cost estimating, and financial management.

Fort Monmouth, NJ

Jeffrey Bongard is a Contract Performance Measurements Officer at the U.S. Army Communications-Electronics Command (CECOM). He has a bachelor's degree in business administration from Trenton State College and is a member of the AAC in a CAP. Bongard is Level III certified in business, cost estimating, and financial management and has worked in Army acquisition for 20 years.

Susan S. Chiu is a Program Analyst in the PEO, Command, Control and Communications Systems. A member of the 1997 Competitive Development Group, Chiu holds a bachelor's degree in accounting from Northern Maine Technical College and a master's degree in library science from the University of Mississippi. She also has more than 20 years experience in Army acquisition and is Level III certified both in business, cost estimating, and financial management and in program management.

Edward F. Herman, an Electronics Engineer at CECOM, holds a bachelor's in electrical electronic communications engineering from New Jersey Institute of Technology. He is Level II certified in systems planning, research, development, and engineering, and has 4 years experience in Army acquisition assignments.

Michael J. Linkletter is an Electronics Engineer at CECOM. He holds a bachelor's degree in chemical engineering from

the Polytechnical University of New York. Linkletter is a member of the CE Program and is Level III certified both in program management and in systems planning, research, development, and engineering. He has 14 years experience in Army acquisition.

Michael E. Ryan, a Mechanical Engineer assigned to the PEO, Intelligence, Electronic Warfare, and Sensors, holds a bachelor's degree in mechanical engineering from Fairleigh Dickinson University. A member of the AAC in a CAP, he has more than 18 years experience in Army acquisition. He is Level III certified in systems planning, research, development, and engineering and Level II certified in program management.

Renata Sawicki, an Electronics Engineer at CECOM, has a bachelor's degree from Rutgers University and has more than 14 years experience in Army acquisition. Sawicki is Level III certified in systems planning, research, development, and engineering; acquisition logistics; and program management. Additionally, Sawicki is Level II certified both in manufacturing and production and in test and evaluation engineering.

Redstone Arsenal, AL

Robert J. Balla is employed at the U.S. Army Space and Missile Defense Command (SMDC) as an Electronics Engineer supporting the THAAD Project Management Office. He holds a bachelor's in electronics engineering from Virginia Polytechnic Institute. A member of the AAC in a CAP, he has 11 years experience in Army acquisition. Balla is Level III certified both in systems planning, research, development, and engineering and in test and evaluation engineering.

Dean M. Barten is assigned to the Cargo Helicopters Project Management Office, PEO, Aviation, as an Aerospace Engineer. He holds a bachelor's degree in aerospace engineering from Auburn University. Barten has served for 15 years in acquisition assignments and is Level III certified in test and evaluation engineering.

Richard H. Brown, an Engineer at the U.S. Army Aviation and Missile Command (AMCOM), has a bachelor's in mechanical engineering from Auburn University and is a member of the AAC in a CAP. He has worked for more than 20 years in Army acquisition. Brown is Level III certified in systems planning, research, development, and engineering.

Daniel S. Beck is an Engineer Supervisor supporting the PATRIOT Project Management Office at AMCOM's Missile Research, Development and Engineering Center. A member of the AAC, he has more than 14 years experience in Army acquisition. Beck has bachelor's degrees in chemical engineering from the University of Pittsburgh and in electrical engineering from the University of Alabama. He is Level III certified both in systems planning, research, development, and engineering and in manufacturing and production.

Alvin L. Cooper is assigned to AMCOM as a Logistics Management Specialist. He holds a bachelor's degree in business administration from Tarkio College and a bachelor's in information sciences and systems from Saint Louis Community College. Cooper is a member of the CE Program and has more than 20 years experience in Army acquisition. Cooper is Level III certified in both acquisition logistics and in program management.

Sidney F. Hoyt is assigned to AMCOM as a Systems Engineer supporting the MEADS Product Management Office. He holds a bachelor's degree in computer engineering from the University of California at Los Angeles. He is a member of the AAC assigned to a CAP. Hoyt has served with the Army for more than 10 years in various acquisition positions. He is Level III certified both in systems planning, research, development, and engineering and in program management.

Mike C. Lawrence is an Engineer in the Air-to-Ground Project Management Office, PEO, Tactical Missiles. He holds a bachelor's degree in industrial engineering from Auburn University. He is a member of the CE Program and has served the Army for more than 13 years in a variety of acquisition assignments. Lawrence is Level III certified both in systems planning, research, development, and engineering and in program management.

Kathleen Leonard is an Engineer at AMCOM supporting the Instrumentation Targets and Threat Simulators Program Manager. She holds a bachelor's degree in engineering from Tulane University and a master's in engineering from Johns Hopkins University. She is a member of the CE Program and has served with the Army for more than 13 years in various acquisition assignments. Leonard is level III certified in systems planning, research, development, and engineering.

Jose F. Martin is an Engineer at AMCOM supporting the Army TACMS-BAT Project Management Office. He holds a bachelor's degree in mechanical engineering from the University of New Orleans. Martin has 13 years experience in various aspects of Army acquisition. He is Level III certified in systems planning, research, development, and engineering.

Henrietta H. Maples is assigned to AMCOM as a Logistics Management Specialist. She holds a bachelor's degree in business administration from Athens State College. Maples has served with the Army for 15 years in various acquisition assignments and is Level III certified in acquisition logistics.

Michael E. McGee is employed at AMCOM as a Logistics Management Supervisor supporting the Air-to-Ground Missile Systems Project Management Office. He holds a bachelor's degree in business administration from the University of Alabama and is a member of the AAC assigned to a CAP. He has 17 years experience in various acquisition assignments and is Level III certified in acquisition logistics.

Glen S. Roberts is assigned to AMCOM as an Engineer supporting the Army TACMS-BAT Project Management Office and holds a bachelor's degree in mechanical engineering from Southern Illinois University. He is a member of the CE Program and has served in Army acquisition for 14 years. Roberts is Level III certified in systems planning, research, development, and engineering.

For more information on the MSPM 836 Program, please contact James (Jim) Welsh, Acquisition Career Management Office, at (703) 604-7116, DSN 664-7116, or e-mail **welshj@sarda.army.mil**.

JAMES M. WELSH is an Education and Training Specialist in the Army Acquisition Career Management Office, Office of the Assistant Secretary of the Army for Acquisition, Logistics and Technology. He holds a bachelor's degree in management from National-Louis University.

Versatility For Light Infantry Forces. . .

JAVELIN

David M. Easterling

Introduction

Since the introduction of the tank, light infantry forces have been at a severe disadvantage on the battlefield. In today's rapid-response environment of humanitarian, peacekeeping, and deterrent missions, the U.S. Army is relying more and more on its light infantry to deploy, hold ground, and protect civilians against hostile armed forces. Described as one of the greatest advances in infantry weapons since the machine gun, the Javelin anti-armor weapon system gives Army and Marine Corps infantry forces the capability to deploy anywhere in the world within hours and defeat mechanized and armor units.

"If my battalion could've continued giving me Javelin rounds, I could've stayed on this hilltop and killed enemy vehicles all day long," declared an 82nd Airborne Javelin gunner during the February 1999 Airborne/Heavy National Training Center (NTC) rotation. The one armor and two airborne battalions' (1st and 2/325 Parachute Infantry Regiment) task force deployed 40 Javelin systems against NTC's "world renowned" opposing forces (OPFOR).

During the defensive exercise of this NTC rotation, the airborne battalion that encountered the brunt of the OPFOR attack was able to eliminate their forward security element (FSE). If the battalion had more missiles, they would have been able to attack the OPFOR's main body. During the offensive attack, the task force positioned an airborne battalion on a major enemy avenue of approach. Their mission was to strip the enemy of the FSE, which would slow the enemy and allow the armor battalion to attack the enemy's flank. One airborne Javelin-equipped company (eight command launch units (CLUs)) caught the OPFOR moving. The OPFOR couldn't find the well-emplaced and dispersed Javelin teams and proceeded to lose their FSE and advanced guard main body. Throughout the course of the rotation, new doctrine, tactics, techniques, and procedures showcased the seemingly limitless potential of the Javelin System.

The Javelin Weapon System, renamed from the Anti-Armor Weapon System–Medium (AAWS-M) in 1991, is a fire-and-forget, medium-range, manportable anti-armor missile system replacing the Dragon Weapon System. It features top attack and direct attack modes; has a soft-launch capability, enabling the gunner to fire from enclosures or covered firing positions; and is capable of defeating current and future armor in day and night engagements at ranges in excess of 2,500 meters.

Javelin's two major tactical components are its 34-pound round missile sealed in a disposable launch tube and its 14-pound reusable CLU. A salient advantage over current command-to-line-of-sight missiles is gunner survivability. Once gunners fire, they can move or refire at another target.

Although a proven success today, Javelin was not developed overnight. It involved years of hard work and unwavering support from both the U.S. government (from Congress to the Department of the Army) and industry.

Concept

In the early 1980s, the Army expressed a need for a lightweight anti-armor weapon system to replace its aging inventories of Dragon systems. In October 1985, the Army leadership authorized the AAWS-M Program to enter into a Proof Of Principle (POP) phase. In April 1986, the Army and Marine Corps approved a Joint Services Operational Requirement, making the Marine Corps a partner in the AAWS-M acquisition.

During the 27-month POP phase, three contracts were awarded for systems using different leading-edge technologies. These three systems were based on laser beam rider, imaging infrared seeker with fiber-optic guidance, and imaging infrared fire-and-forget (IIR F&F) technologies. At the conclusion of the POP phase, the Army and Marine Corps selected the IIR F&F system as the best candidate for the new weapon system. In June 1989, the Army awarded a development contract to a joint venture (JV) consisting of Texas Instruments and Martin-Marietta (now Raytheon Systems and Lockheed-Martin respectively).

The Javelin Team prepares to fire on enemy tanks crossing a bridge.

Engineering And Manufacturing Development

The Javelin development phase was conceived as a 36-month effort. However, as a result of technical problems, scope of work changes, and funding constraints, a program stretchout of an additional 18 months was incurred, resulting in a total development program of 54 months. In October 1993, after proving that technical challenges were mastered during initial operational test and evaluation (IOT&E), the Javelin Project Office announced that the Javelin Weapon System was ready for production. However, program adjustments that extended the production effort from 6 to 14 years and reduced the Army and Marine Corps requirements as a result of force restructuring from 70,550 to 31,269 missiles caused the Javelin unit costs to increase significantly.

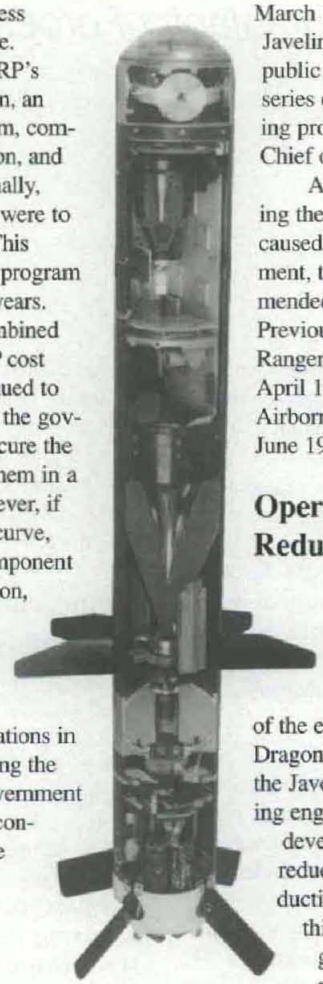
Cost Reduction Plan

Confronted with an affordability issue, the Army developed its first and most successful Cost Reduction Plan (CRP) and presented it to the Defense Acquisition Board in June 1994. Based in part on the success of Javelin during IOT&E and the agenda set forth in the CRP, the Defense Acquisition Executive approved award of a Javelin Low Rate Initial Production (LRIP) contract. The Javelin LRIP contract was awarded to the JV on June 24, 1994.

The final version of the CRP, signed by government representatives and JV officials in August 1994, returned $1.4 billion dollars (30 percent of the total production costs) to the Army and Marine Corps' total obligation authority between FY94 and FY05. It also committed the JV to an aggressive cost curve in which the

cost of the next component is less expensive than the previous one. Initiatives taken to reach the CRP's goals include acquisition reform, an Enhanced Producibility Program, component breakout and competition, and multiyear contracting. Additionally, savings realized from the CRP were to be reinvested in the program. This enabled the Javelin production program to be shortened from 14 to 11 years.

These initiatives were combined and resulted in the overall CRP cost curve. As long as the JV continued to meet the CRP cost projections, the government would continue to procure the Javelin Weapon System from them in a sole-source environment. However, if the JV failed to meet this cost curve, the CRP called for selected component breakout, component competition, and system competition. This was revolutionary in getting competitive prices and avoiding laborious and unproductive protracted negotiations in a sole-source environment. Using the CRP as a basis for cost, the government signed three succeeding LRIP contracts with the JV between June 1994 and March 1996.



Cutaway of the Javelin Missile

Production

In May 1997, the Javelin Program received the Department of the Army's approval for Milestone III to transition from LRIP into Full Rate Production. This effort required incorporating the 1997 addendum to the CRP and successful completion of a series of development and user tests initiated during LRIP. The effort culminated in the awarding of the first multiyear procurement contract.

The first year of Javelin's first multiyear contract was awarded to the JV in May 1997. The second year's contract was awarded in December 1997, and the final year of the first multiyear contract was awarded in December 1998.

The Javelin Project Office plans to award a second multiyear contract for FY00-FY04 for missiles and for FY00-FY05 for training devices and CLUs. Contract award will be contingent on approval for multiyear procurement by the 1999 appropriations conference.

Fielding

The Javelin Program successfully met its planned First Unit Equipped fielding in June 1996. One of its first tests came during an Advanced Warfighting Experiment (AWE) in March 1997. During the AWE, the Javelin System gained both user and public notoriety as a superb weapon in a series of exercises aimed at demonstrating progress toward achieving the Army Chief of Staff's vision for Force XXI.

As a result of Javelin's success during the AWE and the lethality gaps caused by the Sheridan light tank retirement, the Army Chief of Staff recommended acceleration of fielding. Previously scheduled fieldings to the Ranger battalions were completed in April 1997, and fielding to the 82nd Airborne battalions was completed in June 1998, 8 months ahead of schedule.

Operating And Support Cost Reductions

Historically, a typical program's operating and support (O&S) costs account for 80 percent of its total life-cycle funding. This, coupled with knowledge of the excessive O&S costs that the Dragon Program experienced, prompted the Javelin Project Office to initiate during engineering and manufacturing development, an aggressive cost-reduction program to reduce both production and O&S costs. As a result of this aggressive cost-reduction program, the Javelin Project Office projected its O&S cost estimate to be only 47 percent of the total Javelin life-cycle cost. The Army and Office of the Secretary of Defense communities verified this cost estimate during the Milestone III decision process.

While O&S cost savings are important, the Javelin Project Office believes that responsive customer service and quick turnaround times are equally important. The project office has implemented a hotline to field customer inquiries.

Another tool that the Javelin Project Office developed to help manage its O&S costs is JAVTRAK. This is an Internet-based system (**www.javweb.com**) to track parts consumption and maintenance actions. The system provides a real-time database of failures, repairs, repair part consumption, equipment location, and equipment utilization. JAVTRAK already has provided data that enabled the Javelin Project Office to save millions of dollars by reducing spare buys. The project office continues to use this system to optimize its future procurement of spares. JAVTRAK is also used to identify systemic problems during the deployment and fielding phases. In turn, this can lead to process and design changes on the production line to preclude fielding of defective equipment and to improve overall field reliability.

For its efforts in developing and fielding an unequaled leading-edge weapon system, the Javelin team received the 1997 DOD Life Cycle Cost Reduction Award.

Foreign Military Sales (FMS)

Javelin's demonstrated success and capability have not gone unnoticed by the rest of the world. To date, 13 countries interested in Javelin have requested price and availability information. Two FMS-funded test programs were conducted for potential FMS customers and two acquisition cases are being processed. With Javelin's unique fire-and-forget capabilities, we expect to see many more of our allies acquiring our "world-class" weapon system. In anticipation of this interest in Javelin and to facilitate its acquisition, the Javelin Program has been designated as a pilot program for FMS reform.

Conclusion

In the past, light infantry forces were always the most vulnerable on the battlefield. In today's environment, where these forces are relied on for peacekeeping to rapid-response missions, the U.S. Army's light infantry world has become even more dangerous. With the unrivaled Javelin weapon system at their disposal, however, our light forces will no longer be viewed as a nuisance by enemy armor. Instead, they will be viewed as one of the most lethal and versatile forces on the battlefield, finally giving them the ability to stand their ground and protect those who cannot protect themselves.

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AMMUNITION PACKAGING AND BATTLEFIELD PROTECTION

James F. Zoll and Alan J. Galonski

Introduction

When a U. S. soldier fires a weapon in battle, he expects the ammunition he is firing to function as intended and only harm the enemy, not himself. He expects this level of performance despite the fact that the ammunition might have sat in an igloo for many years; was exposed to a large variety of environmental elements during transport and field storage; and was probably jolted, dropped, and stepped on several times during its journey. He also wants to be able to get at his ammunition quickly despite the weather, and he needs to easily transport it on the battlefield. Furthermore, the American public and our allies demand that ammunition being shipped over public roads, by trains, and through ports be safe in case of an accident despite its deadly explosive nature. The key component for making this happen is the packaging, which is developed and vigorously tested to meet these demanding requirements.

Too often in the past, ammunition packaging developed for the military was driven by another set of materiel and combat developer requirements. The packaging had to weigh nothing, cost nothing, and take up no space. Because this ideal package does not exist, careful consideration is needed during packaging development to provide a good balance between protection and cost. This article provides a short background on ammunition packaging development for the U.S. Army, discusses current designs, and presents some views for the future.

Packaging Development

Prior to World War II, packaging focused mainly on cost and ease of handling with little regard for the environments in which the ammunition would be exposed. Consequently, a high percentage of the ammunition was destroyed during shipment and handling. This led to the establishment of a packaging design group at Picatinny Arsenal, NJ. Packaging began to be designed for ultimate protection using rigorous verification testing. Metal, fiber, and wood containers, now common, were developed to meet the stringent requirements of military distribution systems.

After World War II and throughout the Cold War, packaging was further refined to help make it more protective in a greater variety of climates. For example, experience with high humidity in Vietnam led to the use of "jungle wrap," a wax-dipped wrap surrounding a fiber container, which must be hand peeled to access the ammunition. Packaging at this time was basically designed for the logistics system at the lowest cost and did not really focus on supporting the tactical mission.

This focus changed in 1984 with the formation of the Office of the Project Manager for Ammunition Logistics (PM-AMMOLOG). PM-AMMOLOG was established to give packaging and logistics a centralized management focus and to bring new technologies to the field of military packaging to help solve acute user concerns. PM-AMMOLOG, in conjunction with the U.S. Army Training and Doctrine Command's Munitions System Manager in Huntsville, AL, and the Packaging Division of the U.S. Army Tank-automotive and Armaments Command's Armament Research, Development and Engineering Center (TACOM-ARDEC) at Picatinny Arsenal, NJ, prepared a master action plan for ammunition packaging and resupply. This plan outlined 23 programs, from small-caliber to field artillery, to enhance the warfighting capability of the U.S. Army through improved packaging. The main goals were to reduce the weight and cube of packaging by 40 percent and 30 percent respectively; reduce battlefield debris and signature; provide safer storage of high explosives and propellants; facilitate nuclear, biological, and chemical decontamination; give the soldier quick and easy access to packaged ammunition to facilitate weapon system rearm; and enhance moisture and corrosion protection.

During the next 6 years, Army packaging was transformed from a system based on a large variety of wood boxes and pallets to a user friendly array of cylindrical and rectangular steel containers on steel pallets. These new containers gave utmost protection to the packaged ammunition by providing a sealed environment from factory to gun. The sealed environment also provided easier access to packaged ammunition and better interface with field materiel handling equipment, tactical resupply vehicles, and weapon systems, all which resulted in actual improvements to the warfighting capability of the Army.

New Packaging Methods

Two of the best examples of this new user focus are the new packages for the 120mm M1A1 tank ammunition family and the family of 25mm ammunition for the Bradley Fighting Vehicle System (BFVS). The new cylindrical steel 120mm tank ammunition container on a steel pallet allowed one-step access to the ammunition without breaking the pallet while simultaneously adding 10 extra cartridges on every pallet. The pallet was also configured to permit two rows of outward-facing pallets to be positioned on a Heavy Expanded Mobility Tactical Truck (HEMTT), therefore allowing 240 rounds per truck instead of 160 rounds in the old configuration, and enabling two tanks to be rearmed simultaneously. This change in packaging from a wood box reduced the time to upload one M1 tank with its full complement of ammunition from 33 minutes to uploading two tanks in only 14 minutes. More than $17 million in total life-cycle costs have been realized because of this change.

Relative to the 25mm ammunition, a new steel rectangular container was developed to replace a plastic container originally fielded with the BFVS. The old plastic container could not maintain a seal and consequently could not protect the packaged ammunition from water, particularly when stored under the floorboards. The new container solved this problem while also reducing cost and the amount of flammable material contained inside the vehicle. The new container also allowed quicker access to the ammunition for rearming the turret weapon. In both examples, a packaging initiative funded by PM-AMMOLOG improved

ammunition protection and the warfighting capabilities of a major Army weapon system.

Commercial Packaging Versus Military Packaging

In the 1990s, acquisition reform initiatives brought the acquisition of military packaging into question. One of the key reforms was the use of commercial standards versus detailed military specifications. Commercial packaging was examined and found to be lacking in many regards when compared to the rigorous requirements for U. S. Army ammunition. Some of the key military requirements regarding ammunition packaging are as follows:

- Packaging must protect the ammunition from rough handling at temperature extremes of 165 degrees Fahrenheit and minus 60 degrees Fahrenheit.
- Packaged ammunition must be safe to fire after being dropped twice from 7 feet and subjected to loose-cargo vibration at extreme temperatures.
- The package must hold a 3-pounds-per-square-inch pressure differential after being subjected to six 3-foot drops.
- The package must perform at this high level after being stored for more than 20 years in an igloo and exposed to the elements for 2 years.
- The package must provide this protection while still giving easy access to the ammunition.

Commercial packaging is not geared toward these temperature extremes, nor is it designed to be ultra reliable. When shipping a commercial item, the package is designed primarily to withstand only moderate levels of rough handling at ambient temperatures and only for a relatively short time so that the cost of packaging is kept low. Some damage is expected and is covered by insurance or shippers' warranties. This is cheaper than paying for expensive packaging for every item. Even for commercial hazardous materials, the focus is on meeting minimum established guidelines instead of ultimate protection from worst-case conditions. For these reasons, military packaging for ammunition items has remained focused on providing maximum protection through use of military-unique materials and designs.

The TACOM-ARDEC Packaging Division, in conjunction with the Industrial Operations Command at Rock Island, IL, is investigating the sensible use of commercial packaging to reduce cost. One potential area is small-caliber ammunition. Currently, all small-caliber ammunition is placed in full military packaging regardless of end destination. A usage study revealed that 30 to 40 percent of the ammunition is consumed in training within a few months never having traveled beyond a CONUS firing range.

A program was initiated to dedicate a percentage of ammunition to range-firing applications, where packaging is transparent to the warfighter, and to directly ship this ammunition in commercial fiberboard boxes. This was implemented first for the Marine Corps and will also be implemented for the Army. Total savings are estimated at approximately $5 million during the next 3 years. This packaging change does not affect the soldiers' "train as he would fight" requirement.

The Future

Ammunition packaging will become increasingly more important to ammunition logistics in Force XXI and the Army 2010 and beyond. TRADOC has already stated that by 2025, all Army equipment and supplies must have their weight and cube reduced by 75 percent. Specifically, future forces will have an increased need for lightweight, more protective packaging that interfaces with automated material handling equipment and "smart" logistics systems while mitigating mass propagation caused by unplanned stimuli. As ammunition becomes "smarter" through use of complex electronics to reduce the Army's need for large quantities of it, packaging actually increases in importance to protect these expensive limited commodities. High functional reliability and asset visibility, coupled with reductions in surveillance personnel and material handlers, requires the package to do more than just protect.

To respond to this need, the Defense Ammunition Logistics Activity (DALA), formerly PM-AMMOLOG, and the TACOM-ARDEC Packaging Division have established several new programs to develop packaging technologies for the future. Some of the ideas that are being investigated or planned are new composite materials that can give the performance of steel at a fraction of the weight, fratricide barriers and pressure vents to help meet insensitive munitions criteria, containers with embedded sensors and tags for asset visibility, and modular designs that allow rapid "plug-in" weapon rearm. When this article was written, the Army was scheduled to take delivery of small arms ammunition in commercial packing during fourth quarter FY99.

Conclusion

As the Army modernizes its weapon systems, advanced packaging will ensure these superb new weapons work for the soldier as expected. Through advanced technology, TACOM-ARDEC is leading ammunition packaging into the new millennium.

Soldiers load 120mm ammunition directly from improved containers on a HEMTT onto an M1A1 tank without breaking pallet banding.

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YG00 Competitive Development Group members. Keith Charles, DDACM, is shown back row, far left.

Year Group 2000 . . .

ACMO HOSTS COMPETITIVE DEVELOPMENT GROUP ORIENTATION

Sandra R. Marks

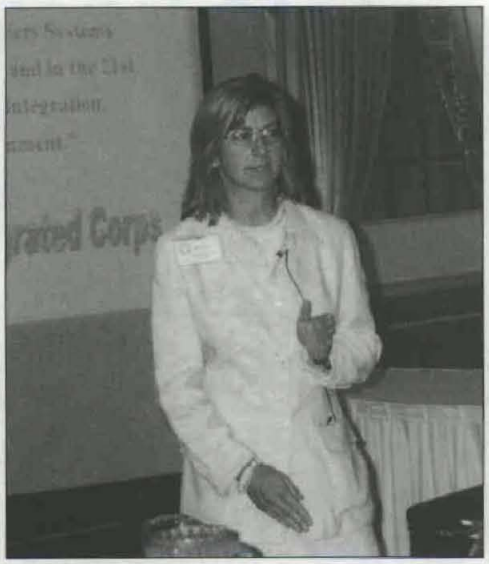
The Competitive Development Group (CDG) Orientation for Year Group 2000 (YG00), hosted by the Acquisition Career Management Office (ACMO), was held Aug. 17-18, 1999, in Springfield, VA. Sandy Long, Chief of the ACMO's Career Development Division and CDG Coordinator, opened the first day of sessions by introducing YG00 CDG members Marietta Allen, David Bundy, Chris Grassano, John Hart, Vicki Long, Will Meyer, Michael Padden, Dan Pierson, and Kathy Salas. In her opening remarks, Long also welcomed attending CDG97 and 98 members and stated that the orientation was an excellent opportunity for YG00 CDG members to meet previous year CDG members, familiarize themselves with the ACMO staff, their Acquisition Career Management Advocate (ACMA) sponsors, as well as to gain information on Army Acquisition Corps (AAC) initiatives and the CDG Program.

Following a brief outline of the day's agenda, Long introduced ACMO Deputy Director Mary Thomas, who spent the remainder of the morning presenting an overview of Acquisition Corps efforts and discussing CDG Program initiatives. Thomas stressed that the CDG Program is one of the ACMO's most important initiatives, adding that it is one of the first programs the ACMO put into place upon its inception. She added that the program is not only very special for those involved in career development in the ACMO, but for everybody involved in career development Armywide.

Sandy Long, CDG Coordinator, far left, moderates panel discussion about the CDG Program. Other panel members left to right are Kay Ward, an ACMA, and Assistant Deputy Chief of Staff for Strategic Plans and Analysis, SMDC; Sam Jones, then Chief of Logistics Management, Office of the PM, NV/RSTA, and now Product Manager, Combat Training Instrumentation Systems, STRICOM; and Shirley Hornaday, Acting Chief (now Chief), Review and Analysis, Program Management Division, THAAD Project Office.

Thomas reviewed the AAC Vision and outlined AAC objectives. In illustrating an integrated model of acquisition career development, she outlined the natural progression from first gaining a strong technical foundation to competing for critical acquisition positions. In reviewing opportunities for CDG members, she stressed the need to concentrate first on near-term goals, those for the next 3 years. Thomas highlighted some of the new and ongoing educational opportunities available to the YG00 class including the introduction of the Harvard Leadership courses. Among the long-term training opportunities Thomas discussed was the new regional master of science in program management course (MSPM 836) offered by the Naval Postgraduate School (see Page 26). This graduate program offers qualifying students a chance to earn a master's degree in program management. Thomas also touched on the University of Texas Senior Service Fellowship Program as an additional key opportunity to complete a graduate degree.

Opportunities offered through the Training With Industry Program were also addressed in Thomas'



ACMO Deputy Director Mary Thomas

DDACM Keith Charles

briefing. This program allows participants on a 1-year assignment with industry to learn how the private sector functions and experience commercial best practices.

The Operational Experience Program, also highlighted by Thomas, was established with the intent to continue providing Acquisition Workforce members with outstanding experience opportunities and increased leadership skills. Participants are given the opportunity to gain first-hand experience by interfacing with warfighters and their equipment in an actual operational field environment.

Junius Wright, Budget Officer in AAESA's Resource Management (RM) Division

On the topic of "Looking Your Best At The Board," Thomas stressed the need for Acquisition Workforce members to maintain an accurate and complete Central Management Information File (CMIF), the single most important source of information during board reviews. She suggested that YG00 CDG members get tips on how to maintain these documents from other CDG participants who have been successful in the PM board process.

Thomas also provided policy updates on continuous learning, certification, fulfillment, Senior Rater Potential Evaluation/Profile, and AAC membership issues. She concluded the morning session by identifying key players in career development including the ACMO, the U.S. Total Army Personnel Command's Acquisition Management Branch (AMB), the Army Acquisition Executive Support Agency (AAESA), and the Office of the Assistant Secretary of the Army for Manpower and Reserve Affairs (ASAM&RA), and by fielding questions from attendees.

In the afternoon, Sandy Long moderated a panel discussion to answer questions submitted by attendees earlier in the day and to field additional questions about the CDG Program. Other panel members were Shirley Hornaday, a CDG97 member, and Acting Chief (now Chief), Review and Analysis, Program Management Division, Theater High Altitude Area Defense (THAAD) Project Office, Huntsville, AL; Samuel Jones, a CDG98 member, and then Chief of Logistics Management, Office of the Project Manager, Night Vision Reconnaissance, Surveillance and Target Acquisition (PM, NV/RSTA), Fort Belvoir, VA (now Product Manager, Combat Training Instrumentation Systems, STRICOM, Orlando, FL); and Kay Ward, an ACMA, and Assistant Deputy Chief of Staff for Strategic Plans and Analysis, U.S. Army Space and Missile Defense Command (SMDC), Huntsville, AL. Topics included training requirements, operational and developmental assignments, the future of the CDG Program, and the importance of the Individual Development Plan (IDP). Long answered questions from a policy aspect, Ward from an implementation aspect, and Jones and Hornaday from an experience aspect.

The final presentation of the day, covering the processing of personnel actions, was provided by Carolyn

Creamer, Civilian Personnel Management Specialist in the Personnel Management Division of AAESA, and Junius Wright, Budget Officer in AAESA's Resource Management (RM) Division. Creamer identified which Civilian Personnel Advisory Centers (CPACs) and Civilian Personnel Operations Centers (CPOCs) provide civilian personnel administrative services to CDG members in their areas of responsibility. In addition, she identified the documents that CDG members need to bring onboard and explained timekeeping and other administrative procedures.

Carolyn Creamer, Civilian Personnel Management Specialist in the Personnel Management Division of AAESA

Wright discussed the relationship between AAESA's RM Division and the ACMO. The RM Division acts as ACMO's business office and provides necessary funding information to ACMO management. As the "budget shop" for ACMO, the RM Division is responsible for processing all fund certifications for travel orders and training. Wright discussed processing permanent change of station (PCS) orders, AAESA travel order requests, and travel claim processing requests. He concluded by stressing the need to keep IDPs updated since CDG training requests require that IDPs be approved by the ACMO prior to acceptance.

The day's activities culminated with a dinner honoring YG00 members. Keith Charles, Deputy Director for Acquisition Career Management (DDACM), was the guest speaker. His address focused on the topic of leadership. Charles shared passages from several experts on different aspects of what makes a leader. Based on his own leadership experience, he says it is important to establish priorities, take responsibility, and give people the authority to develop themselves into the next generation of leaders. In conclusion, he reminded all CDG members that they are the future leaders of the Army Acquisition Corps in the 21st century, and he challenged them to use every available opportunity to prepare for that responsibility.

Following his speech, Thomas joined him in presenting YG00 members with framed citations, a CDG pin, and an AAC coin in recognition of their selection to the program. At the conclusion of the evening's events, Deborah Pinkston, CDG98, presented Charles and Thomas each with a signed YG98 "yearbook" photo.

On the orientation's final day, Jerold Lee, a Senior Analyst with Science Applications International Corp. (SAIC), who supports the ACMO relative to implementation of the DOD Civilian Personnel Demo Project, presented a very informative overview of the demo to YG00 members, including a discussion of its potential impact on the CDG selectees. The personnel demo briefing was augmented with comments by Melissa Riesco, then Acting Chief, Policy and Program Development Division, Office of the ASAM&RA, who has been the Army Personnel Representative since the inception of the project in 1996. (Riesco is now employed by the Federal Aviation Administration.) In addition to briefing about the implementation of the demo project, Lee responded to questions from the YG00 CDGs, many of whom were receiving their first intensive briefing on the project.

Members of earlier CDG year groups were among the attendees at the orientation.

The personnel demo briefing was held concurrently with an FY97/FY98 CDG discussion on CDG Program expectations. This no-host, round-table discussion was held for CDGs to openly discuss positive and negative aspects of the CDG Program, share their experiences in the program, voice expectations, assess the program, formulate constructive criticisms, and document lessons learned.

In a closeout session with YG00 members, Sandy Long reminded CDG members to be very specific about near-term goals and training when completing their IDPs. She fielded additional closing questions and gave each CDG member their Functional Acquisition Specialist assignment.

SANDRA R. MARKS, an employee of Science Applications International Corp. (SAIC), provides contract support to the staff of Army RD&A magazine. She has a B.S. in journalism from the University of Maryland, College Park, MD.

ATMOSPHERIC MODELING AND SIMULATION STANDARDS

Dr. Richard Shirkey

Introduction

In today's climate of reduced funding, models and simulation must be reused whenever possible. However, the success of this effort is largely dependent on the development and use of effective standards to resolve shared modeling and simulation (M&S) problems. The DOD M&S Master Plan (**http://www.dmso.mil/**) (click on *M&S Documents*) is DOD's first step in resolving commonly shared M&S problems.

- The DOD M&S Master Plan has six objectives:
- Develop a common technical framework for M&S,
- Provide timely and authoritative representations of the natural environment,
- Provide authoritative representations of systems,
- Provide authoritative representations of human behavior,
- Establish an M&S infrastructure to meet developer and end-user needs, and
- Share the benefits of M&S.

These objectives form a framework for standards development.

Realistic simulations of military operations must include effects caused by munitions smoke, vehicle dust, and natural obscurants (fog, rain, and snow). These effects must be accounted for in all simulations, from high-resolution simulations that require physics-based models to low-resolution aggregate simulations that require a "broad-brush" outlook. This article describes the Army's rationale for establishing M&S standards and discusses standards in the Army's M&S Dynamic Atmospheric Environments (DAE) standards category.

Army M&S Master Plan

The Department of the Army (DA) publishes and maintains the Army M&S Master Plan (**http://www.amso.army.mil/**) (click on *Library*), which embraces the six objectives of the DOD M&S Master Plan cited above, establishes the Army's M&S objectives and management processes, and promotes standardization within each objective. In addition, the Army M&S Master Plan defines the Army's M&S standards development process and establishes the role of standards category coordinators within the Army.

Nineteen M&S standards categories were established by the Army to cover the realm of technologies and processes that are important to the Army M&S effort. Each standards category coordinator provides the Army Modeling and Simulation Office (AMSO) an annual standardization status report in their area describing significant progress during the past year and priorities for the next year.

The Army M&S Master Plan applies to all Army agencies engaged in development and employment of models and simulations and establishes the Army's strategic vision to guide M&S investments. DA also publishes annually the *Army M&S Standards Report*. This document, available through AMSO's Web site, is a snapshot of Army M&S standards efforts as work progresses toward the objective environment.

Standards Development

The term standard is applied in the broadest context to include procedures, practices, processes, techniques, data, and algorithms. M&S standards cover a variety of topics, and the type and source of relevant standards vary with each standards category. Standards are developed within the Army M&S community as well as adopted from other disciplines and organizations. There are three levels of Army M&S standards: draft, approved, and mandatory. The different levels indicate the degree of maturity of the standard and the level of enforcement. Thus, through the development of standards, the Army M&S community can share techniques, procedures, processes, and applications leading to commonality, reuse, sharing, interoperability, and added value for the consumer.

The Army Standards Nomination and Approval Process (SNAP) (**http://www.msrr.army.mil/snap**) is a Web-based tool used to track, discuss, and vote on standards nominations from the M&S community. Any individual may identify a new M&S standard requirement by submitting a Standards Requirements Document for consideration. Once consensus within a standards category is reached on a draft standard, the standard is reviewed by senior subject matter experts who recommend approval or disapproval through the online voting system in SNAP. Final authority rests with the Deputy Under Secretary of the Army for Operations Research (DUSA(OR)). If approved by the DUSA(OR), the suggested standard is adopted and integrated into the Army Standards Repository System (ASTARS) (**http://www.msrr.army.mil/astars**) as a new Army M&S standard. ASTARS is a user friendly Web-based tool that houses all approved M&S standards.

DAE Standards

Atmospheric standards for Army M&S are defined here as those covered by the Army's M&S DAE standards category. These are objects, algorithms, data, and techniques required to replicate weather, weather effects and impacts, backgrounds, acoustics, and transport and diffusion of aerosols and battle byproducts. The DAE standards category does not explicitly cover terrain, but it influences terrain in so far as weather effects are concerned. For example, snow cover will change the surface albedo, and the amount of rainfall will change the condition of the ground state, thereby changing mobility.

Because target acquisition depends heavily on target and background signature propagation through the atmosphere and on diurnal heating effects, background signatures fall under the purview of the DAE standards category. Target signatures, however, are in the domain of the Acquire standards category.

High-Resolution Simulations

Because of the dynamic range of atmospheric processes, the DAE standards category must represent a spectrum ranging from high-resolution, small-scale effects necessary to correctly visualize scenes to large-scale, low-resolution aggregated effects that represent general weather impacts. In high-resolution simulations, physics-based calculations, such as the Army Research Laboratory's (ARL's) Weather And Visualization Effects for Simulations model, are needed to represent high-fidelity natural and battlefield-induced atmospheric effects. However, these types of models and simulations are inherently computationally intensive and, thus, are available only at a high computational cost.

Engineering-level, line-of-sight propagation models from ARL's Electro-Optical Systems Atmospheric Effects Library (EOSAEL) and the Air Force Research Laboratory's MODTRAN, although fast, are similarly computationally burdensome considering the playing area, the potential number of lines-of-sight between entities, and the number of pixels needed to generate virtual scenes.

Low-Resolution Simulations

At the other end of the spectrum are the low-resolution simulations that deal with aggregated units. These simulations cannot support the computational burden needed to include detailed performance calculations for individual platforms and systems. Thus, a new approach is needed to include weather at a realistic level of fidelity and still maintain "faster-than-real-time" simulation capability. Such an approach may exist in using rule-based programs, such as ARL's Integrated Weather Effects Decision Aid model. This model, based in Army doctrine, provides color-coded matrix charts showing the impact weather has on various platforms, sensors, and weapon systems, thereby allowing for simple and fast assessments over large areas.

Standards Criteria

Criteria for becoming a standard are defined within each of the standards categories. Common sense also dictates that a proposed standard should be a mature model that is in widespread use. Models that are chosen to lead toward standards must be relevant to Army problems and must have a degree of maturity as evidenced by verification and validation efforts and also by acceptance and usage within the Army community. Many models contained in EOSAEL, which was developed initially in 1979, meet these criteria.

EOSAEL is a comprehensive library of fast-running, theoretical, semiempirical, and empirical computer models that describe various aspects of atmospheric propagation and battlefield environments. Studies have been performed using EOSAEL for sensitivity analysis, system performance, countermeasure, and cost-operations effectiveness analysis. EOSAEL has also been used for sensor applications, wargaming, and visualization effects.

Finally, EOSAEL models and documentation are available by registering with the Tri-Service Test and Evaluation Community Network (TECNET) at **http://tecnet0.jcte.jcs.mil/** and through the ONTAR Corp. at **http://www.eosael.com/**.

EOSAEL meets many of the requirements for becoming a standard. It contains models that are used extensively throughout the environmental community and ones that deal with specific battlefield situations that are relevant only to specialized fields. Models in the first category include the climatology model CLIMAT, the smoke model COMBIC, and the aerosol transmission model XSCALE. These models have shown their usefulness and validity through application in stand-alone modes and via incorporation into various other models and simulations. They have undergone validation and verification through comparison with real-world tests and other similar models.

Briefly, the CLIMAT model provides climatology for selected regions throughout the world and is available online through the Master Environmental Library (MEL). COMBIC, the Army's de facto smoke model, has had extensive validation performed on it. In addition, it is present in many war games (CASTFOREM, Janus, ModSAF, etc.) and has been used as the basis for many smoke visualization efforts.

The XSCALE model, which computes atmospheric transmission caused by natural aerosols, is semiempirical and therefore, by its very nature, has been validated. The XSCALE model has been incorporated into models such as MODTRAN, is available online through MEL, and has been used in the STOW-SE Program for visualization purposes. The CLIMAT, COMBIC, and the XSCALE models have all been approved by the DUSA(OR) as standards for the DAE category.

Conclusion

The environmental community is encouraged to participate in all of the Army's M&S standard categories. Participation is encouraged via category reflectors, which are on AMSO's home page, and at the Army M&S Standards Workshop, which meets annually in the spring. Further information can be obtained from the AMSO home page at (**http://www.amso.army.mil/**) or directly from the DAE Standards Category Coordinator via e-mail at **rshirkey@arl.mil**.

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MACHINE-ASSISTED LANGUAGE TRANSLATION FOR U.S./ROK COMBINED FORCES COMMAND

Dr. Young-Suk Lee, Dr. Clifford J. Weinstein, and Dr. Seok H. Hong

Author's Note: *The work described in this article was sponsored by the Defense Advanced Research Projects Agency (DARPA). Opinions, interpretations, conclusions, and recommendations are those of the authors and are not necessarily endorsed by the U.S. Air Force.*

Introduction

The U.S. military must operate worldwide in a variety of international environments where many different languages are used. There is a critical need for translation, and there is a shortage of translators who can interpret military terminology specifically. One coalition environment where the need is particularly strong is in the Republic of Korea (RoK) where, although U.S. and RoK military personnel have been working together for many years, the language barrier still significantly reduces the speed and effectiveness of coalition command and control.

This article describes the Massachusetts Institute of Technology (MIT) Lincoln Laboratory's work on automated, two-way, English/Korean translation for enhanced coalition communications. Our ultimate goal is to enhance multilingual communications by producing accurate translations across a number of languages. Therefore, we have chosen an interlingua-based approach to machine translation that is readily adaptable to multiple languages. In this approach, a natural language understanding system transforms the input into an intermediate meaning representation called Semantic Frame, which serves as a basis for generating output in multiple languages.

To produce useful and effective translation systems in the short term, we have focused on limited military task domains and have configured our system as a machine-assisted translation system. This allows the human translator to confirm or edit the machine translation.

The regular Commander-in-Chief (CINC) briefings at U.S./RoK Combined

Figure 1.
Foal Eagle slide translation example

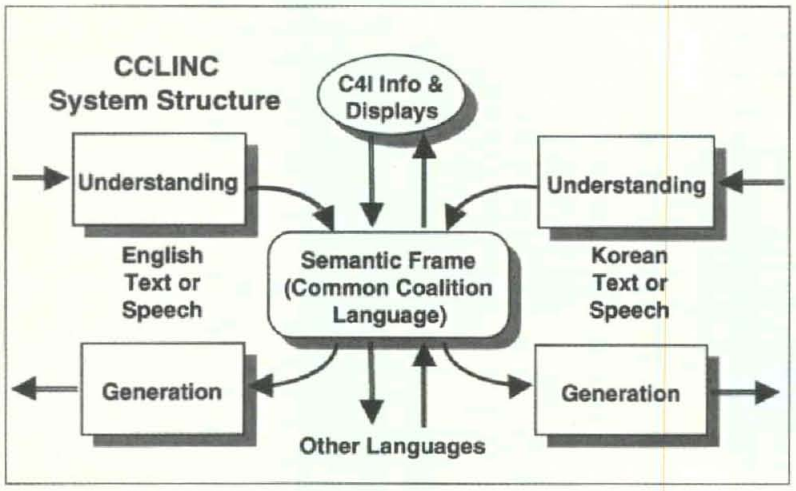

Figure 2.
CCLINC system structure

Forces Command (CFC) in the RoK are presented concurrently in English and Korean. These briefings are typically presented twice daily during exercises or crisis activities, and each consists of 60 to 80 slides, including speaker's notes. Translation of the briefings puts a heavy burden on CFC personnel; therefore, we chose automated translation of CINC briefing slides as our initial application focus. Figure 1 is an example of a CINC briefing slide, showing the original slide in English and the translation produced by our system.

CCLINC Translation System Structure

The system architecture (Figure 2) consists of a modular, multilingual structure including language Understanding and Generation modules in English and Korean. The core language understanding system called TINA takes the input sentence and produces a language neutral meaning representation of the input. The core language generation system called GENESIS takes the meaning representation as input and produces a translation output. Both TINA and GENESIS were originally developed at the MIT Laboratory for Computer Science for applications in human-computer interaction. Our project has been the first to adapt this technology to language translation and to the Korean language specifically. We refer to our system as the Common Coalition Language System at Lincoln Laboratory (CCLINC). The Understanding module of CCLINC converts each input into an interlingual meaning representation called Semantic Frame. Input to the system can be either text or speech. Although we have done some work on speech translation, our primary effort has focused on text translation in response to the priorities of U.S. Forces Korea (USFK).

The system provides feedback to the originator on its understanding of each input by forming a paraphrase in the originator's language. For example, when an English sentence is entered into the system, the sentence is transformed into a Semantic Frame by the English Understanding module. The English Generation module then produces a paraphrase of what the system understood, which can be verified by the originator.

Figure 2 illustrates how the interlingua approach expedites the extension of the system to multiple languages. For example, adding Japanese to the English/Korean system would require Japanese Understanding and Generation modules, but the English and Korean modules would not change. Figure 2 also shows a two-way connection between the translation system and a command, control, communications, computers, and intelligence (C4I) system. Because the translation system involves understanding each input, C4I data and displays can be updated based on this understanding, and users can request information from the C4I system while communicating with other people via translation.

CCLINC System Training And Development

The two core modules of CCLINC, Understanding and Generation, each require lexicons and grammars for the domain of interest. A substantial part of our effort has been the development of lexicons and grammars for the CINC briefing domain. The development of high-performance lexicons and grammars depends in turn on the availability and application of a substantial amount of training data, consisting in this case of examples of CINC briefings. USFK personnel provided us with a considerable number of CINC briefings, many in both English and Korean. These data were critical in developing our system.

The translation score used in this work is based on an operational value (OV) evaluation of the translation, which addresses the question of how well the essential elements of information (EEIs) are retained in the translation. Each translated sentence is assigned a score by an experienced human translator as follows:

- OV = 4: Precise; all EEIs intact, good word order, reads well and easily understandable.
- OV = 3: Intelligible; suitable for detailed understanding with little user inference, all EEIs present and in good word order.
- OV = 2: Incomplete; reader can get gist of meaning, but not detailed understanding; EEIs not lost or drastically altered.
- OV = 1: Unusable; loss of too many EEIs.

(Note: This operational value scoring procedure is a refined version of a procedure originally proposed by John Weisgerber of SYSTRAN Software Inc.)

CCLINC System Performance On CINC Briefings

After preparing CCLINC for English-to-Korean translation of CINC

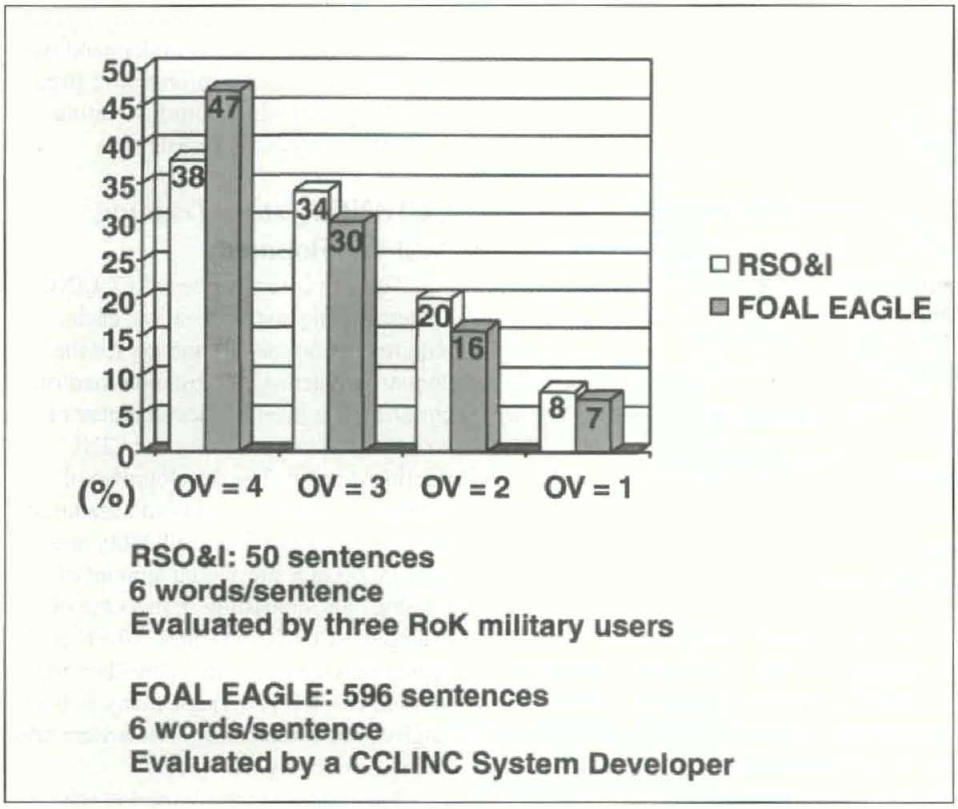

Figure 3.
Performance evaluation on RSO&I and Foal Eagle briefing slides

briefings, a number of tests on new, previously unseen CINC briefing data were run. The most significant of these tests were run at CFC Korea in June 1998 and in October 1998.

In June 1998, CCLINC was tested on 50 sentences taken from CINC briefings of the April 1998 Reception, Staging, Onward Movement, and Integration (RSO&I) Exercise. The evaluation was done by three RoK military users, all of whom were experienced with translations of similar material. As shown in Figure 3, 72 percent of the translations were given an OV score of either 4 or 3.

In October 1998, a much larger scale test was performed on CINC briefings from the Foal Eagle 1998 Exercise. Neither RoK personnel nor bilingual USFK personnel were available to score the translations, so a CCLINC system developer at MIT Lincoln Laboratory, Dr. Young-Suk Lee, scored them. Scores were comparable to and slightly better than those in the June 1998 test; 77 percent of the translations were given an OV score of either 4 or 3. Dr. Lee's scores tended to correlate well with a number of informal judgments on the translations made by RoK and bilingual USFK personnel at Foal Eagle.

CCLINC Korean-To-English Translation

In addition to the primary effort on English-to-Korean translation, a Korean-to-English translation capability has also been developed as part of CCLINC. Although the CCLINC Korean-to-English system is relatively small in scale, it is believed to be the first interlingua-based Korean-to-English translation system. It includes a Korean understanding module based on TINA and an English Generation module based on GENESIS. It addresses two unique challenges specific to translating Korean. First, because Korean text often combines word units (e.g., prepositions and nouns) and includes distinctive case markers attached to certain words, a morphological analyzer was developed to separate these units for input to the translation system. Second, the language Understanding module had to be developed to deal with Korean word order, which is much more variable than English word order. A successful prototype Korean-to-English system, addressing both these challenges, has been developed and demonstrated.

Automated Tools For Updating Lexicons And Grammars

During our various interactions with the users, it became clear that a mechanism was needed to facilitate user updating and modification of the system lexicon; e.g., to include new terms specific to a particular mission area. Such a capability was developed prior to the June 1998 exercise held at USFK and was demonstrated during that visit and the subsequent visit during Foal Eagle 1998. The update capability included a convenient user interface to update the vocabulary in system lexicons and an automated capability to integrate these words into the system grammar.

System Demonstrations And Technology Transfer

From the outset, this project has focused on developing an automated translation system that would be useful for military coalition forces. We have actively pursued and obtained user feedback by demonstrating and testing the translation technology in the user environment. Early tests included a system demonstration onboard the *USS Coronado* at the June 1996 Rim of the Pacific coalition exercises, and a system demonstration in April 1997 during RSO&I exercises.

Subsequently, in June 1998, the system was brought to Korea where RoK military users conducted the first formal quality evaluation of English-to-Korean translation on new operational material. Results of this test were described above. During this visit, CCLINC was also demonstrated to a number of U.S. and RoK military personnel, including the Deputy Commander-in-Chief of the U.S./RoK Combined Forces Command, with very positive results.

We have actively pursued and obtained user feedback by demonstrating and testing the translation technology in the user environment.

During Foal Eagle in October 1998, the first operational demonstration of CCLINC was successfully carried out. CCLINC was configured to operate as a translation server and was connected to the Theater Automated Command and Control Information Management System (TACCIMS) network. TACCIMS users were able to submit text to be translated to CCLINC via their Web browsers and obtain the translations at their terminals. The CCLINC server operated for 72 consecutive hours during Foal Eagle 1998, during which 3,132 translation submissions were made to the server. The server ran on a Toshiba Pentium laptop with 166 MHz and 140 MB RAM.

Most recently, the CCLINC translation system was demonstrated during the RSO&I '99 exercise in April 1999. For this exercise, a new system capability was developed taking a PowerPoint briefing as input and automatically generating a Korean briefing while preserving graphics and chart format. The system was adapted during the exercise to support grammar and vocabulary specific to RSO&I, which resulted in a substantial improvement in translation quality. A major milestone was reached on April 15, 1999, when Korean slides with translations produced by CCLINC were used in preparing the CINC's morning briefing. A demonstration of the system's capabilities to RoK Joint Chiefs of Staff/J-3 LTG Young-Jin Jeong and CFC/USFK C/J-3 MG William Lennox was received with enthusiasm. They emphasized the importance of automated translation capability in the Korean theatre. The system was left in Korea following RSO&I for further operational experimentation by USFK.

Conclusion

This project resulted in several major achievements:

- Initiation of the first automated English-to-Korean translation of operational CINC briefings,
- Demonstration of the first interlingua-based Korean-to-English translation system,
- Operation of a translation system in a Web-based client/server mode,
- Use of automated tools for user updating of lexicons and grammars to adapt the system to evolving tasks, and
- Conduct of several successful demonstrations and technology transfer activities.

Further technical challenges remain. Current efforts are focused on developing techniques to enhance translation accuracy, developing techniques to adapt the translation system to new domains, and extending the development of the interlingua-based Korean-to-English translation subsystem.

Next year, the software will be transitioned into the Global Command and Control System in Korea, with the goal of routinely supporting the translation of USFK briefing materials into Korean for the CFC and therefore reduce the translation burden on military personnel in CFC Korea.

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A New Concept . . .

CRADLE-TO-GRAVE PARTNERSHIPS WITH INDUSTRY

Suellen D. Jeffress

Introduction

Conferees at the 1998 Winter Senior Commanders' Conference wanted to strengthen the life-cycle management of weapon and automated data processing systems. As such, the Assistant Secretary of the Army for Research, Development and Acquisition (ASARDA) (now Assistant Secretary of the Army for Acquisition, Logistics and Technology (ASAALT)) was asked to develop an acquisition concept for cradle-to-grave partnerships with industry. Subsequently, a cross-functional Tiger Team was convened by the ASARDA and drafted a white paper, highlights of which are provided below.

The Tiger Team developed an outline of the Army's "life cycle acquisition concept for partnering with a contractor, or series of contractors, for new start systems." The bottom line of the cradle-to-grave concept is to provide better service to the warfighter without further burdening the soldier, improve readiness, and generate savings. It is designed to explore the implications, advantages, and disadvantages of integrating a contractor into the life-cycle process for specified Army systems worldwide throughout the spectrum of operations. This concept moves the Army another step closer toward meeting the Secretary of Defense's acquisition reform initiative to manage suppliers, not supplies.

The cradle-to-grave concept is fully directed at supporting the warfighter for Force XXI and the Army After Next, designed to meet the needs of the Army (and other Services and DOD agencies), and provides a framework for applying lessons learned relative to innovative approaches to life-cycle management. It also supports efforts required to conduct a revolution in military logistics, a revolution in business affairs, and provides viable life-cycle management alternatives as the Army continues to downsize. Relief from legislation and regulatory requirements may be necessary to implement a partnering strategy.

Cradle-To-Grave Concept

The cradle-to-grave concept integrates development, engineering, production, fielding, training, sustainment, supply, maintenance, disposal, and life-cycle support functions to the maximum extent possible by establishing a partnership for life-cycle program management and system support. The concept requires a partnering of government and industry to provide the functions and resources necessary to support Army customers worldwide. Further, the Competition in Contracting Act of 1984 requires the government to conduct a full and open competition to meet government requirements unless it meets one of several strict waiver requirements.

Objectives

The following objectives of the cradle-to-grave concept proactively apply acquisition reform and re-engineering tenets to weapon and automated data processing systems life-cycle management.

- Identify a program to determine the value of partnering with a contractor, or series of contractors, at different stages of the effort or program.
- Re-engineer the sustainment process by teaming with a contractor prior to determination of the logistics concept. Incorporate new sustainment processes and technologies during the early development phase and throughout the life cycle. Incorporate planning for changes in sustainment processes to adapt to modified mission requirements.
- Implement innovative business practices with contract structures that provide flexibility for technologically intense and spiral development-type programs. Apply innovative incentives for contractor participation and performance. Encourage dual-use production lines for overhead savings and efficiencies. Employ paperless contracting. Conform to doctrine for contractors on the battlefield.
- Outsource life-cycle support functions, including shifting responsibility for fielding, sustainment, and disposal to a contractor.

• Identify the potential for savings in total ownership cost.

• Identify the proper organizational mix of government and industry to provide superior support during war, stability and support operations, peacetime, and training, both in garrison and during field operations.

• Identify potential improvements to support the selected system by streamlining the supply pipeline and reducing the logistics footprint with distribution improvements. Modernize the fleet via continuous reliability and maintainability improvements of parts and components. Implement technological improvements and identify performance capability increases. Enhance information support via modern network technology for supply and finance systems.

Strengths And Opportunities

Small Business Opportunities. The government-industry team will work jointly to have a large amount of small-business participation as required by the Small Business Administration Reauthorization Act of FY97. Small businesses will continue to provide goods and services to the government, as either a prime contractor or a subcontractor, under this concept. Selected candidate programs will be evaluated early in the life-cycle process to determine whether or not small businesses can be identified to perform the requirement as the prime contractor. The government will benefit from the access to new technologies provided by innovative small businesses. The government also intends to partner with industry to ensure that significant subcontracting opportunities are made available to small businesses.

Cost Savings. An inherent advantage of life-cycle partnering, and the sharing of military forecasting information between the public and private sectors, is that long-range planning is facilitated. This permits a more realistic estimate of capital investment costs, permitting industry to better project both its short- and long-term costs. With long-term commitments to purchase goods and services through a contractor, or series of contractors, the government can make substantially improved fiscal projections and execute on a more economical basis. These economies will require long-term funding commitments and may require special legislation authorizing long-term multiyear funding.

Technology. Industry, in many cases, currently upgrades its technology much faster than the Army. The Army can share in the technology upgrades, incrementally modernize its weapon systems through Modernization Through Spares (MTS) and technology insertion, and shorten the materiel fielding cycle.

Profit/Fee. The government recognizes that it must offer contractors opportunities for financial rewards sufficient to stimulate efficient contract performance, attract the best capabilities of qualified large and small-business concerns, and maintain a viable industrial base. The concept of contractors being entitled to more profit/fee as they assume more risk is consistent with government policy. Profit/fee may be used as an incentive for contractors to achieve high performance, reduce life-cycle costs, and continue to invest as necessary to improve systems.

The prime contractor is encouraged to enter into public and private partnering and teaming arrangements to provide services consistent with public law and DOD policy.

Risks And Concerns

Fall Back Plan. The concept will clearly identify "exits" at appropriate milestones with an alternative course of action if the contractor does not perform. The failure of a business or a failure to perform is a heightened risk that would significantly affect a system's supportability under the cradle-to-grave concept. With the shift to performance-based requirements and away from item and process specifications, the government may have insufficient data in its repository for a reprocurement. The government acquisition process must ensure access to data. Furthermore, a reprocurement may come at a cost to the program and, if implemented with a new source, would most likely entail learning curve impacts to cost and readiness. The government may not have a trained force structure to fill the void in the case of contractor default or nonperformance.

The bottom line of the cradle-to-grave concept is to provide better service to the warfighter without further burdening the soldier, improve readiness, and generate savings.

Impact On Maneuver Force Availability. Expanded use of contractors will result in decreasing the sustainment greensuit footprint as contractors assume a more active role in sustaining our maneuver forces. This concept may decrease the maneuver force availability because some of these units may have to be diverted to provide security for contractors. The Army must make a conscious decision as to whether an increased contractor role is worth the potential reduction in combatant force availability.

Impact On The Distribution Function. The Army has made a commitment to work toward distribution-based logistics by synergistically integrating logistics and operations information to provide what is required, where it is required, and when it is required. The level of contractor involvement at the

various levels, i.e., theater, corps, and division, must be developed to integrate these elements with an expanded contractor's presence.

Integration Of An Expanded Contractor's Role. The Army is working to address the operational integration of an expanded contractor's presence. This strategy will have to integrate various contractor logistics systems (stovepipes) with the Standard Army Supply System into a synergistic effort to sustain the maneuver forces. For contractors to operate on the battlefield, the Army must provide links for communications, information and decision support systems, and logistics command and control systems.

Army Working Capital Fund (AWCF). The cradle-to-grave concept will have to address the impact on the AWCF. A decision not to buy or to use the AWCF impacts the fund's operating efficiency and financial stability. The financial impact of the decision must be considered in the Army's budget process.

Other Considerations. Organizational conflicts of interest arise when a contractor is unable to act objectively or has an unfair competitive advantage. Some present laws preclude the government from involving the same industry participants on a recurring basis in early upfront planning. An issue common to any life-cycle support program that attempts to address the total system is the question of how to integrate support of subsystems shared with other platforms. The issue of having to maintain adequate war reserves must be properly addressed in partnering contracts.

Metrics

Various metrics would be used to determine the success of this concept. The government-industry team should define specific metrics after the system is selected to ensure product integrity. Examples of metrics include readiness; manpower impacts; projected and actual savings and/or cost avoidance; fielding time; system improvements (e.g., MTS); operations and support cost savings; commonality of parts; commonality of maintenance procedures; customer satisfaction; back-order time; normal order and shipping time; and deployment logistics footprint.

Candidate Selection

The candidate program should be procured and executed outside of the depot system. However, partnering with an existing depot should not be automatically excluded. Select a new program, or, as a minimum, select a program prior to determination of the logistics concept. A compelling reason to select candidates in advance of the production award is to avoid pitfalls such as those experienced in the Apache Prime Vendor Support and M109 Family of Vehicles Fleet Management Programs.

Consider typical systems from which transferable lessons learned may be derived. Significant unique characteristics may hamper this process. Select a program that has wide, highly competitive interest because that is likely to generate more innovative approaches and multiple competitors in the conduct of the acquisition.

Cost as an independent variable is one of several complex, interactive, and important criteria that must be carefully considered. The criteria will include total ownership cost, performance capabilities, quality, responsiveness, the impact on Army readiness, deployment potential, and workforce flexibility. A strong and reasonable risk management strategy should be a scoring criteria in the proposal evaluation criteria.

Implementation

The draft white paper outlines general factors and considerations that must have defined implementing procedures in place prior to development of acquisition strategy for selected candidate programs. These procedures include, but are not limited to, assurance of core logistics compliance, funding propriety, and development of cost comparison methodologies to ensure that program objectives are met and the Army receives best value for its limited resources.

Summary

The full text of the draft white paper is posted at **http://acqnet.sarda.army.mil/news/crd2grv.htm**. It includes four Appendices: Definition of Terms, List of References, Discussion of the Apache Prime Vendor Support and M109 Family of Vehicles Fleet Management Lessons Learned, and a list of organizations that participated on the Tiger Team.

The primary goal of life-cycle partnering is to provide American soldiers with quality supplies and services in all operational environments, from peacetime through major theater war. This should be done on time and at a reasonable price while incentivizing the contractor to continue system improvements and reduce total ownership costs.

SUELLEN D. JEFFRESS was the Leader of the Tiger Team that drafted the white paper discussed in this article. She is also the Director of Systems Support in the Office of the Deputy Assistant Secretary of the Army (Procurement), Office of the Assistant Secretary of the Army for Acquisition, Logistics and Technology. She has a B.A. degree from Grove City College in Pennsylvania and an M.B.A. in procurement and contracting from The George Washington University. In addition, she attended the Industrial College of the Armed Forces and the Harvard University Program for Senior Executive Fellows.

A Candidate And Sponsor Perspective . . .

THE CDG PROGRAM: THE FIRST YEAR

Raymond J. Pietruszka and LTC John Burke

Editor's Note: *In this article, 1998 Competitive Development Group (CDG) member Raymond J. Pietruszka and his sponsor, LTC John Burke, share their personal perspectives on the CDG Program selection criteria, application process, and assignment opportunities.*

Background

The CDG Program is a 3-year program to provide GS-12 and GS-13 Corps Eligible and Army Acquisition Corps (AAC) members an opportunity to increase their potential for leadership positions in the acquisition community. Once selected for the program, individuals are placed in a position on the Army Acquisition Executive Support Agency (AAESA) Table of Distribution and Allowances (TDA) for a 3-year period. Placement on the AAESA TDA allows candidates to execute an Individual Development Plan (IDP) tailored to their career development.

Candidate Application

Applying for the CDG Program is a straightforward procedure, but it requires some time and attention. It's also an art. Read the requirements carefully. The Army is looking for individuals who have a broad background and a desire to advance. Therefore, the Army is looking for people who have served in different positions, have a wide range of experience, have demonstrated a self-determination to keep themselves up to date, and have a desire for continuous learning. Your application needs to show all your different experiences and how they are relevant to future promotion and career advancement.

The second part of the application process pertains to mandatory training. You need to be Level III certified in at least one career field. In addition, it is recommended that you be either Level I or Level II certified in a second. The training is out there; it's a matter of persistence and desire.

I [Pietruszka] had to apply to the CDG Program twice before I got accepted. Between the first and second attempts, I had to rewrite my Acquisition Civilian Record Brief so that it truly reflected all of my experiences and, in the meantime, earned my second Level III certification.

Preparation And Initial Orientation

Selection of the assignment

CDG Member: The first phase in getting into the program is determining the areas of acquisition you want to explore. This was a tough one for me. It helps to know what you want to be when you grow up. I wanted program management and aviation experience. Lucky for me I found out with just a few phone calls where I could gain that experience. If you don't know what you want, talk to people you respect. Talk to folks at the Acquisition Career Management Office (ACMO). Call your Acquisition Career Management Advocate and make sure your interest is known. This is similar to making a call about a possible job prospect—it takes courage. Don't worry if you are not able to locate something; the ACMO requests and receives many developmental assignments specifically for this purpose. Your CDG IDP, provided by the ACMO, will outline the opportunities best suited to your needs.

Sponsor: Each spring, the AAC provides an opportunity for offices throughout the acquisition community to sponsor CDG candidates for the upcoming fiscal year. In deciding whether to be a sponsor, an office will develop a rough sketch of the candidate's 3-year plan describing specific duties and tasks, consider the training requirements submitted by the AAC, evaluate available office space and facilities, assess administrative overhead, and determine how best to integrate the candidate into the program office. Each of these criteria must be carefully considered to provide a win-win opportunity for the sponsoring organization and the candidate. CDG candidates tend to be fairly senior both in grade (GS-13) and experience. The jobs, therefore, must be truly responsible and, between the mandatory training and annual leave, the candidate will be "out-of-pocket" 12 to 16 weeks a year during their assignment.

The CDG orientation

CDG Member: At your first orientation, hosted by the ACMO, you will receive information on the program, learn about ACMO initiatives, and work to refine your draft CDG IDP with assistance from your new supervisor, the ACMO, and your Functional Acquisition Specialist. Once again, knowing what your goals are helps. There are many training experience and educational opportunities established to broaden and enhance leadership capabilities. While many of the opportunities were not familiar to me, I had a chance during the orientation to become more knowledgeable of them. You need to assess your experience and then choose complementary training. This is not easy! The ACMO will provide substantial training and experience opportunities, but without balance it could be meaningless.

Sponsor: Training constitutes one of the two pillars of the candidate's assignment, the other being a productive exposure within a different organization or discipline. The sponsor must carefully assess the requested training courses and balance those with the candidate's experience and education to prevent "check the block" training and ensure that the candidate is taking challenging courses with growth

potential. Additionally, the training program must closely correlate with the experience curve over the course of the development period. Formal training plus the on-the-job assignments should form a cohesive package.

The New Assignment

The move

CDG Member: For some folks, this is no big deal. For others, this is worse than leaving home for college! As with any job change, you can expect some stress, uncertainty, and apprehension. It's important to remember why you wanted to be in the program—to challenge yourself and seek greater opportunity. A positive mental attitude goes a long way in easing your anxiety. One thing I did that helped was try not to come on too strong. You're a little fish in a big sea again. But you can't wait for someone to give you something to do. You are the new person and no one knows you yet. So you need to be proactive, ask for tasks to do, ones that are useful to the organization but more important, ones that will teach you about the organization and how it operates. Make the effort to meet people and learn the formal and informal organization structure. Also, read! Read everything you can get about the program and about your new area. In a short period, mine was a month, you will end up with more work than you want.

Sponsor: The transfer of the CDG candidate into the organization is no different than the arrival of any new professional employee. It's important to keep in mind the overt and subtle attitudes each stakeholder exhibits. The candidate is coming into an established office where jobs and functions are well defined. The organization must figure out how to accept the new person, his or her personality, skills, and attitude. A well-conceived transition plan needs to be executed to include introductions to management, co-workers, and inclusion in the first weekly staff meeting. The sponsor should meet with the CDG candidate weekly for the first month or so and then monthly to ensure for successful integration.

Settling in

CDG Member: As you settle into your routine, there are a few things to learn. First, get to know your supervisor and your sponsor. You need to know his or her preferences, expectations, and management style. For me it was straightforward; my boss was upfront in his dealings with me and consistently demonstrated this during the next few months. The next thing to do is take charge. We are in the CDG Program because we are leaders, so lead. Reach out for those leadership opportunities and gain the experiences that come with them. They are not easy to find and you will need to work with your supervisor to get them. Seek out the hard short-term jobs that lack people. I was able to do the program integrator job while the incumbent was at school for 4 months. Involvement in integrated product teams, source selection, and associate product manager positions are all good options. Just remember that you have to fit school in while you're doing this. The CDG Program has two parts: the developmental assignments, and schooling. You and your sponsor have to balance the two. You need to seek out new assignments that are different from previous ones and reinforce them with schooling.

Sponsor: The sponsor's responsibility to the CDG candidate and the Army CDG Program is to ensure the individual receives challenging assignments and good, frequent assessments of their performance and contributions. Situational opportunities arise where the candidate performs in real assignments as a product manager, with after-action reviews and critiques. There is an invaluable transfer of knowledge between the sponsor and the candidate.

The Other Benefit

The opportunity to expand your knowledge base is the other benefit of this program. Individuals in the program are scheduled for training in accordance with their IDP, which is based more on achieving the individual's goals than on the needs dictated by their job or organization. So you get to complete key training not only in your field and the acquisition field, but you also get advanced leadership training and the opportunity to attend senior management seminars and Congressional and Pentagon orientations. You'll get 10 to 15 years of training in 3! You'll learn how the Army and DOD work and how everyone works in concert with the current administration and Congress. This type of knowledge will serve you and your organization well.

While you are doing all of this, you have to remember the second objective of a CDG member—to advance to a key leadership position such as product manager. You don't obtain that position just because you are in the CDG Program; you have to apply for it! So on top of everything else you're doing, you have to keep your paperwork up to date and actively campaign for advanced leadership promotions. The good news is that the CDG Program prepares you very well for these positions. As of this writing, nearly one-third of year group (YG)97 and 98 CDG members have gotten promotions and moved on to very challenging leadership positions, even in the current downsizing environment. So all of this effort pays off.

Conclusion

The CDG Program is an exciting opportunity for individuals to expand their horizons and grow as professionals and members of the Army Acquisition Corps. Any member of the CDG Program must realize the investment the AAC and sponsoring organization make by accepting the CDG candidate. The individual needs to be flexible, technically proficient, and ready to deliver 110 percent every day. The payoff is a real opportunity for the individual and sponsoring organization, with the real possibility of advancement for the candidate. It's well worth the effort.

To apply for the CDG program, see **http://dacm.sarda.army.mil/news**.

RAYMOND J. PIETRUSZKA is a CDG YG98 member assigned to the Apache Longbow Program Office as an Acquisition Management Specialist. He has a B.S. degree in civil engineering from the Virginia Military Institute and an M.S. in business administration from Boston University.

LTC JOHN BURKE is the Product Manager for the Fire Control Radar on AAH64D Apache Longbow and RAH66 Comanche, the Radar Frequency Interferometer, and the Apache training devices. He is a 1995 graduate of the Defense Systems Management College and is Level III certified in program management and communications-computer systems.

ARMY MILSPEC REFORM

Lynn S. Mohler and Arthur B. Follansbee

Introduction

The Army's aggressive implementation of military specification (MilSpec) reform has led to significant achievements such as reduced weapon system acquisition and support costs, new technology insertions, military and commercial industrial-base integration, and meeting the Army's 4-year objective of reshaping its existing document infrastructure.

This article describes the initiatives, status, and accomplishments of the Army's MilSpec reform efforts depicted in Figure 1. The success of these efforts is the result of forceful action by the Army's dedicated Acquisition Workforce. The vision behind the efforts was detailed in the DOD memorandum *Specifications and Standards—A New Way of Doing Business*, which was based on the results of an Army report on the military acquisition process, *Blueprint for Change*. The overriding consideration in these efforts was to eliminate detailed military specifications and use performance-based requirements for future procurements.

Background

Each year, millions of requisitions and billions of dollars flow to suppliers who provide enormous quantities of goods and services to support America's soldiers at home and abroad. For decades, a system was developed through law, regulation, and precedent that prescribed how an acquisition was to be done. At the beginning of the 1990s, however, a series of reform initiatives created a new architecture for acquiring goods and services, fundamentally changing Defense business.

MilSpec reform is one of these initiatives. The idea is to inform suppliers of what is required by describing how a product or service must perform, but not restrict the manner in which it is produced. To implement the intent of the *Blueprint for Change* and conduct business in this new way, the Services reviewed and took action on DOD's inventory of 31,000 specifications and standards, of which the Army's share was 12,350. The review resulted in cancellation of obsolete or inappropriate documents, transfer of those required by the Defense Logistics Agency, inactivation of those not suitable for new design requirements, and conversion of the remainder to performance-based documents (either military or commercial). Always foremost in the disposition decision process was the overriding need of the ultimate consumer of the goods and services—the soldier. Soldiers must be equipped and supported with the quality and quantity of materiel and services they need accomplish the mission.

What Are Specifications And Standards?

Specifications and standards are the unseen glue of modern civilization. They ensure the quality, safety, and uniformity of products such as uncontaminated food items, automobile crash safety devices, and light bulbs for standard fixtures. DOD specifications are generally used to describe products, materiel items, and components, while standards describe methods, processes, or procedures. The commercial marketplace may describe specifications and standards somewhat differently, but suppliers of quality products throughout the world and consumers seeking quality products use them in some form.

In the past, most military specifications and standards included some mixture of performance requirements and "how-to-make-it" instructions. Now, performance-based specifications describe what the item being purchased must do in terms of form, fit, function, and interfaces, while standards—some military, many commercial—describe how to achieve the intended result.

An important outcome of using specifications and standards is standardization. Just as commercial standards ensure that light bulbs fit into "standard" receptacles, in a military context, standardization means interoperability and interchangeability between like equipment and consistency of performance. When a worn or damaged part or piece of equipment is discarded, a performance-based specification can be used to define the required function and interface of the replacements, ensuring that system performance is maintained.

Why Change The Way We Do Business?

In decades past, military specifications were developed because commercial standards did not exist. Defense development and procurement contracts drove the marketplace and the technology cycle.

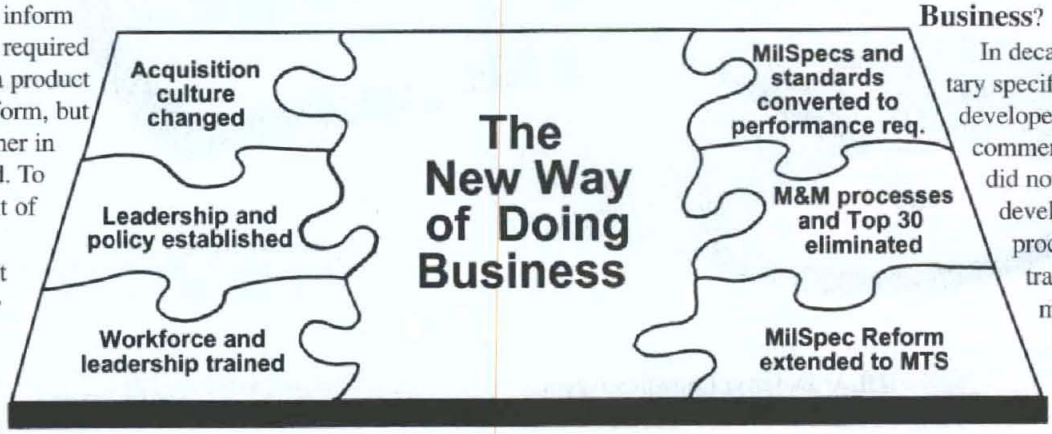


Figure 1.
Areas of significant reform

However, military specifications and standards did not always stop at specifying what was required. Initially, or in repeated use, they took on prescriptive details and described how to make the product or provide the service until, in the extreme, there was only a single acceptable way to produce a military product. In time, these prescriptive requirements diverged from commercial practice to the extent that the Services lost access to the items developed and produced by the commercial industrial base. With shrinking Defense budgets and a reduced workforce to maintain the specification and standards inventory, change was inevitable.

New Way Of Doing Business

Virtually overnight, the Army changed its procurement strategy, including re-procurements, to encourage contractors to propose manufacturing and management (M&M) processes and technical solutions based on Defense and commercial industry choices. Today, with few exceptions, Army procurements are performance-based.

A keynote speaker at the recent Army Acquisition and Logistics Initiatives Conference discussed the benefits of replacing prescriptive military specifications that lock in old technology with performance-based requirements that encourage innovation. He credited this change and other acquisition reform initiatives with allowing his company to save DOD more than 60 percent over initial costs on the latest procurements of several major systems.

Training

Training of key personnel was recognized early as critical to successfully implanting a MilSpec reform culture. Consequently, training in the principles and practices of MilSpec reform was incorporated into the Army Roadshows (now known as Army Acquisition Workforce 2000). Requests for proposals and revised specifications and standards prepared by Army acquisition organizations were sampled to measure training effectiveness and progress toward the integration of theory into practice. Based on lessons learned in the sampling, courses in specification writing and technical data package conversion were developed to further train the workforce. During a 4-year period, the Army's training program was used as the vehicle to instruct approximately 10,000 acquisition employees in how to apply MilSpec reform.

Eliminating Cost Drivers

In the beginning of the acquisition reform movement, industry pointed to restrictive M&M standards as significant contributors to the high cost of Defense contracts. In later surveys, suppliers identified the Top 105 DOD specifications and standards as primary cost drivers in producing military materiel. A two-pronged approach was taken. First, DOD established policy that M&M standards could not be mandated in contracts. Second, the Services were tasked to review and implement appropriate dispositions for the primary cost drivers. The Army had management responsibility for about a third of

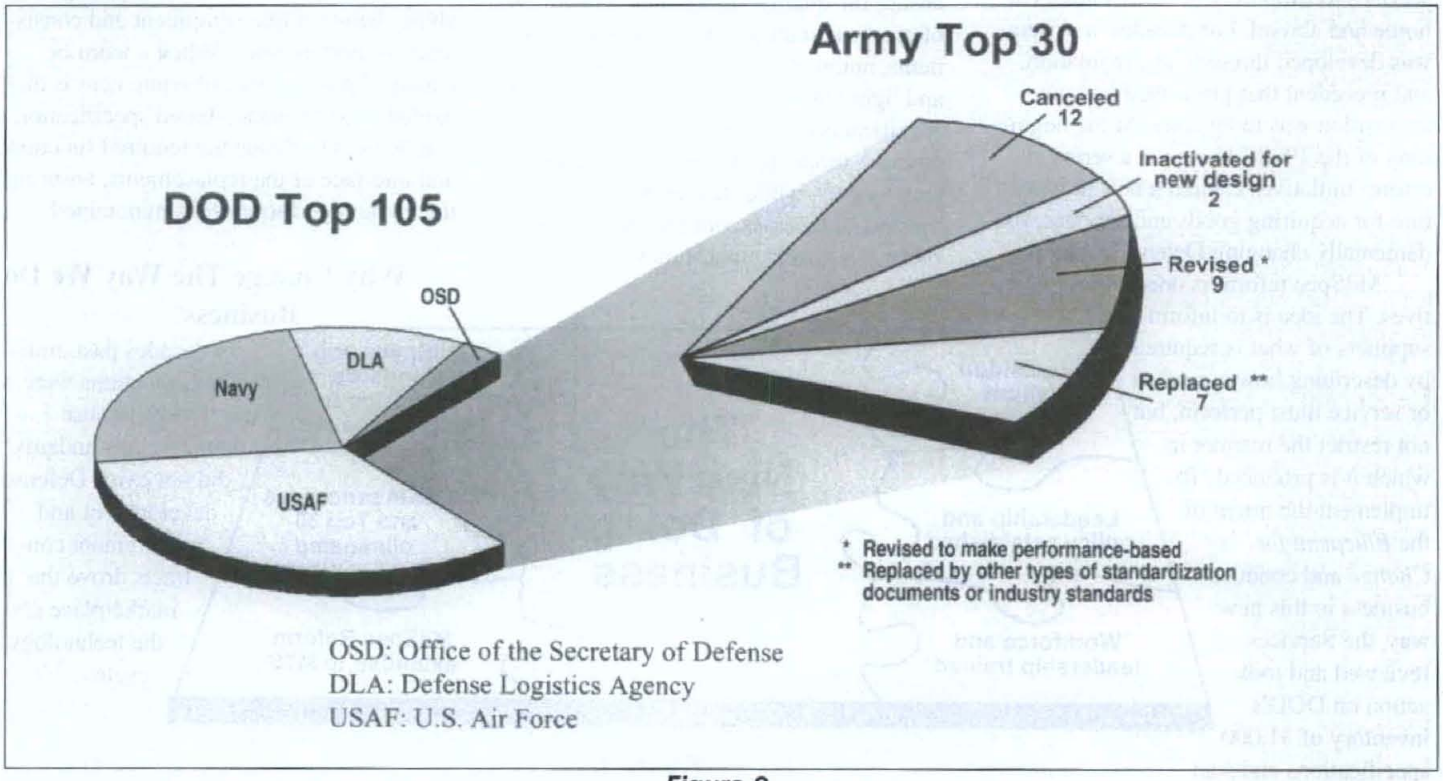


Figure 2.
Disposition of Army's cost-driving documents

these, a group of prescriptive documents dubbed the "Top 30," and moved rapidly to remove them from the inventory. As shown in Figure 2, the Army canceled or inactivated for new design 47 percent of these documents, revised 30 percent to make them performance-based, and replaced 23 percent with other types of standardization documents or nongovernment standards.

Clearing The Specifications And Standards Inventory

The Army canceled, inactivated, or converted its inventory of 12,350 specifications and standards, many of them overly prescriptive or obsolete. The objective was to align military production needs with the commercial industrial base. This lead to the following results:

- The number of standardization documents under Army management was reduced 50 percent.
- Of the original document inventory, 36 percent were inactivated for future design purposes.
- Only 14 percent of the original document inventory remains for procurement use. Although some detailed specifications were retained, the Army instituted a waiver process that recognized the potential need for these documents, but emphasized that performance-based procurement would be the rule, not the exception.

An indicator of achievement was a 1998 National Defense Industry Association survey that concluded that MilSpec reform was working and was leading other reform initiatives in producing intended results.

Leadership Commitment

The key to MilSpec reform was the strong and continuous support and interest of senior leadership. Their commitment was backed with the funding required to accomplish the effort and close attention to measuring progress. The success of the leadership effort was acknowledged in surveys of their industry counterparts.

Extending The MilSpec Reform Concept

An important extension of the MilSpec reform initiative is the concept of Modernization Through Spares (MTS), part of the Army's strategy for improving readiness and reducing ownership costs resulting from aging weapon system inventories. To capitalize on newer technologies that are continually available commercially, the Army has extended MilSpec reform—with its mandate to express requirements in performance-based terms—to spares procurement. This allows parts, components, and subassemblies to be replaced with spares employing newer technology, while the form, fit, function, and interfaces of the old systems are maintained without creating a logistics liability.

To capitalize on newer technologies that are continually available commercially, the Army has extended MilSpec reform—with its mandate to express requirements in performance-based terms—to spares procurement.

Benefits

Fulfilling its commitment to effectively arm, protect, sustain, and equip its soldiers, the Army has aggressively sought the best available technology, while reducing weapon system costs and lead times. MilSpec reform is at the core of these efforts, facilitating the integration of the military and industrial bases, giving industry the flexibility to innovate, and encouraging the application of current technology and business practices to Army requirements. The implementation of MilSpec reform enables the Army to access the commercial industrial base, which means quicker delivery at a better price of more technologically advanced, reliable, durable, and sustainable materiel than that of any adversary. Soldiers benefit by having enough of what is needed, when it is needed.

Conclusion

MilSpec reform is not over. The Army will continue to support and encourage innovative solutions to military requirements, facilitate the integration of the military and commercial industrial bases, develop and enhance partnerships with industry, train and support the Acquisition Workforce, and continually assess progress. The challenges are to maintain the momentum MilSpec reform has already achieved, widen its influence, and use it to advance the seamless integration of acquisition and logistics.

The full text of the Army MilSpec Reform report can be found on the Army Materiel Command's (AMC) Web site at **http://www.amc.army.mil/amc/rda/milspec/index.html** (click on *SPECS & STDS REFORM*).

LYNN S. MOHLER, now retired, wrote this article while he was the Army Standardization Officer in the Office of the Deputy Chief of Staff for Research, Development and Acquisition, Headquarters, AMC. He holds a mathematics degree from Juniata College and has done post-graduate studies at the University of Maryland.

ARTHUR B. FOLLANSBEE is a Senior Industrial Specialist with National Systems Management Corp. He holds a master's degree in engineering from The George Washington University. He is a former member of the Army Acquisition Corps (Level III certified), a graduate of the Defense Systems Management College Program Management Course, and a registered professional engineer.

What Do You Believe The First Digitized Division Will Do For The Army?

MG David R. Gust
Program Executive Officer
Intelligence, Electronic Warfare And Sensors

Several Program Executive Officers (PEOs) were involved in the first meetings on Army digitization held in 1993. The Army Digitization Office was formed to provide a bridge between the DCSOPS [Deputy Chief of Staff for Operations and Plans] Requirements Office and the Office of the Assistant Secretary of the Army for Research, Development and Acquisition [now the Assistant Secretary of the Army for Acquisition, Logistics and Technology].

Task Force 94-07 was a training rotation that proved the concept of digitization was possible, but would not be easy. Numerous coordination meetings were held prior to the Task Force XXI training rotation to smooth out the process of installing a small number of digitization enhancements to combat weapon platforms.

The after-action reports of each of these two training rotations are worth reading again as the Army prepares for the upcoming effort to "digitize a division" by FY00. For digitization to be successful, leaders at all levels of an organization must embrace this changeover.

Now that we have had several years of experience with the digitization process and field experience with the concept, what can we expect? Obviously, the two most important questions asked on the battlefield, "Where am I?" and "Where are my buddies?" may be answered with digital knowledge of the area of operations. This knowledge is known as "situational awareness." The commander of a combat weapons platform should be able to see graphically on a display in the "cockpit area" the disposition of his friendly order of battle. This factor alone will have the greatest impact on operations, doctrine, and tactics.

The warfighter can then concentrate on the third most asked question on the battlefield, "Where is the enemy?" Digitization of the battlefield, with all the concomitant increases in the bandwidth of communication pipelines, should permit the warfighter to have a more timely and accurate presentation of the enemy order of battle. If not "perfect knowledge of the enemy situation," it should certainly be a quantum improvement in timely knowledge of the enemy disposition as compared to today's standard.

Given these two enhancements to friendly and enemy situation status, the warfighter of the First Digitized Division (FDD) should become more efficient in the execution of the battle. The information dominance posture of that FDD was the vision given to PEOs by the Army Chief of Staff in 1993. It will be rewarding to see that vision become a reality in 2000.

BG Steven W. Boutelle
Program Executive Officer
Command, Control And Communications

The First Digitized Division (FDD) will be the first significant step in transforming today's Army of Excellence (AOE) into Force XXI, an Army capable of meeting the challenges of Joint Vision 2010. While the doctrine that supports the AOE was built on industrial-age equipment and concepts, emerging Force XXI doctrine is based on innovations from the information age capitalizing on the concepts of option dominance, speed of command, and information superiority. Realization of these concepts is vital for the success of future operations that will be nonlinear in space, time, and intensity. Nonlinearity, a major departure from AOE doctrine, means that operations will take place in parallel, simultaneously and continuously, without operational pauses. Fielding of the FDD hardware and software to the 4th Infantry Division represents our first opportunity to operationalize these concepts. The commander will no longer fight the plan, but through the situational awareness of his and the enemy forces, he will be able to fight the changing conditions. This fundamental change elevates the commander to a position of option dominance, a concept that goes beyond the notion of simply getting inside the decision cycle of the enemy to the point of allowing actions so quick and decisive that the enemy's options are closed out entirely. FDD is on the mark.

Greater speed of command gained through the automation provided by the FDD permits a flatter organizational structure consistent with the newly reorganized division and its support elements. Added importance will be placed on smaller units, increasing the value and necessity of high quality and timely commander's intent. If units are to function in a self-synchronized fashion, then the capabilities of video teleconferencing and whiteboards and the increased bandwidth offered by modern switching and transmission systems are essential. On

the future noncontiguous battlefield, the doctrine must be understood and supported. It must be able to be communicated, and the commander's intent must be both clear and timely. FDD responds to these requirements.

Information superiority is another basic tenet of Joint Vision 2010. FDD is a leap ahead in the horizontal integration of battlefield information systems that will be best displayed via the common tactical picture. A consistent view of the battlefield will be available at all echelons. This means the right target can be identified, located, tracked, and attacked. Capabilities such as functional map overlays, collaborative planning, 3-D graphics, light workstations, system control, and security will all contribute to getting the right piece of information to the right place.

FDD is the right step, but it is only the first step toward Force XXI. We must stay the course.

Stanley H. Levine
Deputy Director
Army Digitization Office

The First Digitized Division (FDD) is a key component of the Army digitization process.

Digitizing the Army is one of the enabling goals of the Army Modernization Strategy, which provides the implementing instructions to achieve the goals set out in Joint Vision 2010 and Army Vision 2010. It is virtually impossible to separate digitization and modernization because digitization spans the entire Army modernization strategy.

Digitization is a broad effort, not just a single program in the traditional acquisition sense. Rather, it is a strategy to *integrate* command and control software and hardware and the underlying communication systems with weapon systems to provide information sharing throughout the battlespace with Army, joint, and combined forces. The strategy includes leveraging the latest advances in information technologies from the commercial sector (e.g., Internet technology, portable laptop computers, direct broadcast TV). The digitization process involves upgrading or modifying some existing systems, adding to or "appliquéing" a capability to others, and ensuring future systems have information technologies "embedded" or built in as an integral part of the system when appropriate. All these capabilities are developed in compliance with a common set of standards to ensure interoperability and to enhance efficiency through software reuse.

Treated as a total system of systems package, digitization—across the Army modernization spectrum—offers synergistic increases in lethality and survivability as the Army transitions to a smaller, force projection force. The timely sharing of information enabled by digitization significantly improves the ability of commanders and leaders to quickly make decisions, synchronize forces and fires, and increase the operational tempo. Digitization is a means of realizing a fully integrated command and control capability from the strategic level to the platoon level, including interoperability links with joint and multinational forces.

Digitization is a force multiplier. It enhances combat power by integrating existing command and control capabilities with communications, sensors, and combat platforms, thereby enabling integration and timely sharing of critical information. It increases force lethality and survivability, and provides usable, timely information to warfighters that enables them to act faster than the enemy can react.

The Army's digitization plan includes experimentation, evaluation, and acquisition of 98 systems and many related efforts. In addition to the standard fielding of these systems in accordance with their approved acquisition plans, the Army will equip the FDD with the top priority systems by the end of 2000 and the First Digitized Corps by the end of 2004.

FDD capabilities will be demonstrated during the Division Capstone Exercise (DCX) in 2001. Achieving the expected synergy of operations requires the fielding of the Army's core command, control, and communication systems, including the Army Battle Command System. The FDD will demonstrate fielded capabilities in a two-phased DCX. Phase I will be a National Training Center rotation against a live opposing force. Phase II will be a constructive Battle Command Training Program exercise using simulations with brigade and higher command posts operating in field conditions, at doctrinal distances, and moving as the exercise demands.

The spiral development-based digitization process will allow the Army to thoroughly examine the impacts of digitization on Army, joint, and coalition doctrine; soldier and leader training; organizations; and logistics. The Army has followed a "holistic" approach to change by dedicating a division (the FDD) as an experimental force and linking civilian contractors, Army program managers, and soldiers to support this effort.

COL Jeremiah F. Garretson
Director Of Architecture
Office Of The Director
Information Systems For Command, Control, Communications And Computers

This pioneering effort has already had a profound effect across the Army. Two experiments, Task Force XXI and the Division Army Warfighting Experiment (DAWE), demonstrated the digitized force's substantial increases in mobility, survivability, and lethality. The 4th Infantry Divison "bumper sticker" statement on DAWE results puts it very simply: "The EXFOR Division killed over twice the Enemy, in half the Time, over three times the Battlespace, with 25% fewer Combat Platforms using Information Age Technology."

SPEAKING OUT

This bodes well for the Army because the First Digitized Division (FDD) is the precursor to the objective digitized force. The follow-on divisions will be even more effective as they take advantage of new technology, such as the Joint Tactical Radio System, and the horizontal sharing of information across the battlefield becomes even more pervasive. Lessons learned from the FDD also will allow these follow-on divisions to institute more dramatic improvements in how the Army organizes and fights.

The positive impacts do not stop here. The pressure of change has been brought to bear on a deliberate acquisition process that is serial in nature and fosters stovepipe solutions. To create a force that can deliver massed effects without massing forces, the Army adapted the process to accommodate the concept of fielding capability (e.g., situational awareness) rather than individual systems. Additionally, spiral development was emphasized, especially for the complex software intensive systems in FDD. In this way, program managers have been able to better respond with warfighter solutions that stay abreast of technology. The Central Test Support Facility at Fort Hood, TX, an activity that resulted from the need for spiral development, has been an invaluable asset where contractors, soldiers, and program managers mix to produce better and properly integrated solutions that work the way the soldier wants.

The FDD also served as the testbed for the Army Enterprise Architecture (AEA), the Army's tool to manage the insertion of information technology into the force. The AEA has been important in providing the Army with a comprehensive means to evaluate trade-offs among requirements, technology, and resources. It has been expanded to include the entire Army. Fundamentally, the FDD is about change. As such, perhaps the most important contribution will be that, in building the FDD, the Army is learning how to manage change to ensure that America's Army remains the best in the world well into the next millennium.

Correction

As indicated on Page 5 of the September-October 1999 issue of *Army RD&A* magazine, Keith Charles, the Deputy Assistant Secretary of the Army for Plans, Programs and Policy and Deputy Director for Acquisition Career Management, stated during an interview that "The PEO, Command, Control and Communications Systems has informed me that the AFGE President at Fort Monmouth, NJ, has also changed his position and is now for the Personnel Demo." This comment, which was in response to a question about the DOD Civilian Acquisition Personnel Demonstration Project, was factually incorrect. In fact, the AFGE President of Local 1904 at Fort Monmouth, NJ, John R. Poitras, has not endorsed this or any other Personnel Demo. He has informed *Army RD&A* magazine that he leaves that decision up to his members, noting that his members voted against the project by a margin of 62 percent.

We apologize for this error and for any inconvenience caused Mr. Poitras or his members.

LETTERS

Dear Sir:

As President of the American Federation of Government Employees (AFGE) Local in Huntsville, AL, I take strong exception to a comment made by Keith Charles in an interview published in the September-October 1999 issue of *Army RD&A* magazine. Charles, who is the Deputy Assistant Secretary of the Army for Plans, Programs and Policy, and Deputy Director for Acquisition Career Management, stated, "I met with the President of the American Federation of Government Employees (AFGE) in Huntsville, AL. He is strongly supportive of the Personnel Demo now, even though he was against it a year and a half ago." I want to emphasize that at no time did I ever say or even imply that I supported his Army Acquisition Demo Project. In fact, our AFGE members voted 106 to 0 to disapprove the proposed Army Acquisition Demo Project. My position has not changed and will not change until Mr. Charles proposes a Demo Project that our members will accept. Mr. Charles' statement that I now support the Personnel Demo is just not true.

Jim Brothers
President
AFGE Local 1858

LETTERS

Dear Editor:

Your May-June 1999 issue presented an article entitled "AMSAA's SMART Contributions" [Page 20]. The article in part states, "The Army Materiel Systems Analysis Activity (AMSAA) provides timely, reliable, and high-quality materiel and logistic systems analysis throughout the acquisition life cycle." Further, under Logistic Systems Analysis, "Wholesale, retail, force projection, and sustainment analyses, together with logistics methodology and model development, comprise the core functions of logistic systems analysis." Additionally, under Level Of Repair Analysis, "AMSAA performs a Level of Repair Analysis (LORA) to assist PMs [program managers] and major subordinate commands (MSCs) in evaluating and supporting maintenance policy decisions on major weapon systems while minimizing total support costs."

These statements have piqued our curiosities. Once these major weapon systems have been deployed, how does AMSAA analyze field performance data (including field maintenance performance data) on the weapon systems and their major subcomponents/assemblies? What logistic parameters does AMSAA generate as a result of its/their analyses? And finally, what/which analysis techniques and methodologies, and database analysis tools does AMSAA employ to obtain these parameters?

Jim Keebler
U.S. Army Aviation and Missile Command
Redstone Arsenal, AL
(256) 842-7910
DSN 788-7910

Response From The Army Materiel Systems Analysis Activity (AMSAA)

AMSAA conducts a wide range of analyses addressing the support costs, supportability, and sustainability of fielded weapon systems. These analyses support major Army Materiel Command (AMC) and Department of the Army weapon system initiatives for operations and support cost reduction, recapitalization, Class IX war reserve computations, and deployment stock policy.

Major data sources for these studies are the Field Exercise Data Collection (FEDC) and the Sample Data Collection (SDC) Programs managed by AMSAA. The FEDC Program provides maintenance data from training exercises in Korea, the National Training Center, Kuwait, and the Joint Readiness Training Center.

In 1995, AMC designated AMSAA as the Army's Executive Agent for SDC. Beginning in 1998, AMSAA began collecting data under SDC at Fort Polk, LA; Fort Lewis, WA; Fort Carson, CO; Fort Hood, TX; Fort Campbell, KY; and Fort Bragg, NC. Coordination is underway to open a site in Bosnia at Tuzla Air Base.

The FEDC and SDC Programs provide estimates of logistic parameters such as maintenance man-hours, parts consumption, and fuel and parts cost. Other important Army data sources for AMSAA logistics analyses include the Central Demand Database, the Logistics Intelligence File, and the Operating and Support Management Information System (OSMIS).

The major tools used in AMSAA weapon system support analyses include the Selected Essential Item Stock for Availability Method (SESAME) model for initial provisioning, the Computerized Optimization Model for Predicting and Analyzing Support Structures (COMPASS) for level of repair analyses, and the Optimum Stock Requirements Analysis Program (OSRAP) model for deployment stock and sustainment computations. The Extended Combat Sustainment model provides estimates of sustainability parameters for weapon system campaign planning. For additional information, contact our Web site at **http://amsaa-www.arl.army.mil.**

W. Donald Johnson
AMSAA
johnson@arl.mil

Dear Sir:

I have read the interesting article by Keith Charles [Deputy Director, Acquisition Career Management] about his experience in the Aspen Institute Seminar on the *Fundamentals of Values-Based Leadership* [July-August 1999 issue of *Army RD&A* magazine, Page 52], and I have grave concerns about the philosophical foundations revealed in the diagram in the article. It suggests that American managers may be beholden to philosophers of which they may be unaware.

The two end points of the horizontal line are defined as "efficiency" and "community," and the end points of the orthogonal axis are defined as "freedom" and "liberty." The pairs of points are connected by unbroken lines suggesting a continuum between the pairs of points, but the continuum is not defined and can never be. What is displayed is a trap built into Indo-European languages that forces us into two-valued thinking and subsequent action that causes so much grief in society. One of the axioms of General Semantics is that the systems of Aristotle, Euclid, and Newton are special cases and are outmoded as general systems.

A further examination of the chart shows there is no room for the teachings of W. Edwards Deming. In the statement "focus on what is best for a specific group despite the cost," the word *cost* is subconsciously defined as some number from a balance sheet not in terms of some human dimension. At the other end of the line, the embodiment of efficiency can be found in the teachings of Fredrick Winslow Taylor, who was seeking "the one best way" in the use of human beings as interchangeable bionic machines in the performance of work tasks. (Note the two-valued thinking in the expression "the one best way," which implies that all other ways cannot be the one best.) On the other axis, the conflict between the individual's ability to make choices and the group's ability to make choices need not exist according to the teachings of Deming, but is usually the result of the creation of zero-sum situations created by management.

I would like to suggest additions to the Aspen Institute's reading list: *Science and Sanity* by Alfred Korzybski, *Language in Thought and Action* by S.I. Hayakawa, *The Power of Words* by Stuart Chase, *People In Quandaries* by Wendel Johnson, and *Creativity* by Mihaly Csiksentmihalyi.

Sincerely,
William C. Pittman

From The Acquisition Reform Office . . .

Innovations In Contractual Incentives

DOD and the Army are changing the current control mechanisms used to ensure reasonable prices, on-time delivery, product quality, and superior performance. Government and industry are successfully streamlining acquisition processes through legislation and policy changes aimed at compressing cycle times, reducing program costs, leveraging commercially available technologies and practices, and shifting from government oversight to risk management by the contractor.

To continue to achieve these "better, quicker, cheaper" goals efficiently, and to benefit from both the pace of technology advancement and the innovation that high-technology companies offer, the Army must adopt many of the mechanisms and processes that have been successful in the commercial marketplace. This means re-examining our business relationships with existing and potential contractors. A critical component of this re-examination is the opportunity to develop a new range of innovative contractual incentives that can be used to ensure timely delivery of the highest quality goods and services at the best value to the Army. To this end, the Army is conducting a study on innovative contractual incentives.

Phase I of the study is a report providing a research baseline that explores the history of the current acquisition environment, the motivation behind performance, and practices throughout the government and private sector that provide incentives to Army contractors. This report is located on the Web at **http://www.acqnet.sarda.army.mil/library/study/default.htm**.

In Phase II, the Army will further investigate potentially more advanced and innovative approaches to increase performance through the implementation of contractual incentives. This will be accomplished in two ways. First, the Army will engage the talents, opinions, and suggestions of key senior government and industry leaders through two focus group sessions. Then, the comments, suggestions, insights, and recommendations from personnel in the field will be used to provide much needed perspective. Government and industry field contracting and acquisition managers are in the unique position of working on and developing contractual incentives daily. They can examine their experiences of what worked, what didn't work, what was tried, and what they wanted to try but didn't or couldn't. This information may be sent to **macfarlk@sarda.army.mil**.

The goals of Phase II are to identify a range of potential contractual incentives that the Army can employ and to develop a decision matrix that can be used by contracting and program professionals to assist in forming more effective business relationships.

Point of contact for this article is Ken MacFarlane, (703) 681-9086, DSN 761-9086.

Army Contracting Efficiency Analysis

The Acquisition Reform Office is developing new analysis tools to help discern trends in Army contracting efficiency. By looking at historical data since the inception of acquisition reform efforts, conducting ratio analysis, and assessing overall trends, the Army can reach important conclusions about the health of the contracting mission area, in general, and the impact of Army acquisition reform, in particular.

One key measurement tool that has been used since 1994 is the cost-to-purchase ratio. This ratio provides the cost expended (in cents) to purchase one dollar's worth of supplies or services. Throughout the analysis period of FY95 through FY98, the cost-to-purchase ratio decreased from $1.42 in FY95 to $1.15 in FY98, a decrease of 19 percent.

A new ratio being studied is the average annual obligation per person. Between FY95 and FY98, the average dollar amount awarded per contract professional has risen from $3.3 million to $4.5 million, an increase of 35 percent. This metric indicates that the average Army contracting professional has become significantly more productive in terms of total output. The increase in productivity can be attributed to a variety of reasons, including personnel reductions, process improvements, and acquisition reform initiatives.

A third ratio being examined is the average obligation per contracting action. Between FY95 and FY98, this ratio rose from $14,400 to $48,000, an increase of more than 233 percent. This reflects the increased use of the government purchase card for micropurchases, as well as the continuing emphasis on consolidating contract requirements where possible and useful. The Army centers and satellites organizational concept has contributed to this success.

The Army Acquisition Reform Office will continue to test these and other management metrics to determine if improvement efforts are yielding the desired outcomes. Much more work still needs to be done in this area. The Acquisition Reform Office welcomes your opinions on metrics and other acquisition reform initiatives. Your contributions will help us to develop the most effective and efficient Army contracting organization possible.

Point of contact for this article is Monti Jaggers, (703) 681-7571, DSN 761-7571.

ODASAP Personnel Changes

The Office of the Deputy Assistant Secretary of the Army for Procurement (ODASAP) has undergone several key personnel changes recently. Dr. Jim Edgar is now the Assistant DASAP as well as the Director of Acquisition and Procurement Policy Reform. Edgar was formerly the Director of the DASAP Contracting Career Program Office.

The Executive Officer to the DASAP, LTC Dan Gallagher, replaced LTC Chuck Jorgenson, who is now at the Army War College. LTC Kim Leach replaced COL Bill Phillips as Director of Information Management and Assessment.

Esther Morse, former Army Defense Acquisition Regulation (DAR) Council Representative, has been appointed Director for Procurement and Industrial Base Policy. Morse replaces John Conklin, who is now a Special Assistant to the DASAP, Dr. Kenneth Oscar. Greg Doyle has been appointed to replace Morse as the DAR Council Representative for the Army.

Ron Endicott returned from a special assignment in the Competitive Sourcing Office, replacing Doyle in the Acquisition Reform Office. Melissa Pittard also returned after having completed 18 months of Acquisition Corps-sponsored long-term training at the University of Texas at San Antonio. Pittard earned a Master of Science degree in management of technology.

Other recent arrivals in the Acquisition Reform Office include MAJ(P) Ed Turner from the Ballistic Missile Defense Organization; Lenora Evans from the Competitive Development Group Program; Monti Jaggers from the San Francisco District, Army Corps of Engineers; and Teresa Wright-Johnson from the Acquisition Career Management Office.

Recent retirees include Curtis Stevenson from Procurement and Industrial Base Policy, Don Tucker from the Contracting Career Program Office, and Jim Cooper from Procurement Field Support.

Point of contact for this article is Monti Jaggers (703) 681-7571, DSN 761-7571.

BOOKS

The Bridge on the Drina

By Ivo Andric
Translated from the Serbo-Croat by Lovett F. Edwards
The University of Chicago Press, 1977

Reviewed by Joe Sites, Vice President and Director of Defense Systems, BRTRC Inc., Fairfax, VA.

There are some Americans who are aware of the assassination of the Archduke Franz Ferdinand and his wife in Sarajevo in 1914 and the resulting actions that led to World War I. For many Americans, however, the struggles taking place in the Balkans today represent something new. Unfortunately, the wars in the Balkans have been in progress for at least 600 years. In many ways, the cultural environment of the Balkans can be compared to the geophysical environment of an area prone to earthquakes. The Balkans is an area where two opposing and shifting cultural plates come together and, on collision, a social earthquake (war) erupts. It is in the Balkans that the advancement of the Ottoman Empire into Central Europe was halted. In stopping this force, remnants of it were left behind. These remnants, coupled with tribal differences, remain a source of irritation to a peaceful existence.

The Bridge on the Drina provides the story of the wars and suffering in Bosnia Herzegovina from the time the bridge on the Drina was constructed by the Turks in the late 16th century until the destruction of the bridge in World War I. A bridge is normally thought of as a means of bringing people together, however, in this magnificent story of the clashing of different cultures, the stories that the bridge could tell only highlight the difference of the peoples and how political leaders used these differences to advance their own causes.

The bridge provided a meeting place for both the Moslems and the Christians. There, people from both sides were executed, people who could no longer bear the stress in their lives committed suicide, plots were hatched, crimes were committed and, finally, the bridge was destroyed. The stories detail the actions and reprisals, any of which can be compared to the alleged war crimes of today. If the reader substitutes the words "tractors" for "horses" and "trucks" for "carts," the descriptions of the refugees are almost identical to recent events. The following description of an event in the early 19th century is an example: "Once more, Turkish and Serbian houses flamed on the heights at Zlijeba, Gostilje, Crnice, and Veletovo. For the first time after so many years, the heads of decapitated Serbs again appeared on the Kapia. These were thin-faced, short-haired peasant heads with bony faces and long moustaches, as though they were the same as those exposed 70 years before."

In a discussion that took place in the early 1900s, the author states: "... the social problem in the Balkans has always solved itself by the way of national liberation movements and wars." *The Bridge on the Drina* ends with the final thoughts of one of the main characters. His fatalistic view of his homeland is a result of a lifetime spent coping with the social conditions in the Balkans. "Anything might happen. But one thing could not happen: it could not be that great and wise men of exalted soul who would raise lasting buildings for the love of God, so that the world should be more beautiful and man live in it better and more easily, should everywhere and for all time vanish from this earth. Should they too vanish, it would mean that the love of God was extinguished and disappeared from the world. That could not be."

Ivo Andric received the Nobel Prize in literature in 1961 for this book, which was first published in 1945. The story is as relevant today as it was then. It provides, as few sources can, insight into the problems that exist in the Balkans. It does not offer solutions, but with an understanding of the problems, at least there is a basis from which to build. It is easy to predict that our forces will be in the Balkans for a long time. We will have plenty of time to contemplate the history of conflict in that sad but beautiful region. *The Bridge on the Drina* should be a primer for all concerned about the Balkans.

BOOKS

Human Resource Skills for the Project Manager

By Vijay K. Verma,
Project Management Institute, 1996

Reviewed by LTC Kenneth H. Rose (USA, Ret.), Tidewater-Richmond Area Manager for WPI in Hampton, VA, and former member of the Army Acquisition Corps.

People skills in project management are often more assumed than studied because existing literature tends to focus more on technical skills and because general management or psychology literature is not always directly relevant in project contexts. Vijay K. Verma has bridged this gap with a three-volume series on the human aspects of project management.

Volume II, *Human Resource Skills for the Project Manager*, is a good place to start. It addresses six key interpersonal skills: effective communications, motivation, negotiation, conflict management, stress management, and leadership. Each area includes broadly scoped, complete, concise information that readers may consider in their own situation, not just a dogmatic "one true way." The book is peppered with illuminating aphorisms that inform and amuse. Each chapter opens with an outline and closes with a summary, both helpful to busy project managers.

Verma's discussion of negotiation skills is a major contribution of this book. He describes negotiation as a fact of life and guides readers through methods, strategies, and guidelines. Much of what he presents arises from the Principled Negotiation method developed at the Harvard Negotiation Project. He provides a model with general applicability and prescribes steps for inventing creative solutions that are essential to break the logjam of opposing views that generate the need for negotiation.

Verma's chapter on leadership, power, influence, and politics in project management is another unique contribution. These areas interact with each other and, if considered independently, can be a path to limited success. Verma presents a strong foundation of multiple leadership theories. He then links these theories to power, influence, and politics in a project environment. He offers useful tips in dealing with these often-challenging issues.

Communication and motivation may seem like standard topics. This book stands alone as a collective resource of information that is otherwise distributed across many separate texts. The chapter on communication includes suggestions on how to conduct meetings, how to counsel staff members, and—the sometimes bane of high-energy managers—how to listen. The chapter on motivation is a compendium of major theories, all of which approach the matter with a different view. It concludes with a wrap-up that combines the essential elements of all into a generalized approach.

Conflict and stress management enjoy similar, complete treatment. Each benefits from a two-part approach that first develops an understanding of the issue, then presents methods for dealing with it. The discussion of conflict management includes a description of three views: traditional (conflict is bad and should be avoided), behavioral (conflict is inevitable and can be either good or bad); and interactionist (conflict is necessary to improve performance and should be stimulated). The discussion of stress management includes both the energizing and debilitating potentials of stress. It links individual and organizational contributions and responses to stress, concluding with a set of guidelines for making stress a project ally, not an enemy.

Human Resource Skills for the Project Manager is a bookshelf keeper: a book to be read for immediate knowledge and maintained for future reference. The other volumes in this series address organization (Vol. I) and teams (Vol. III). Each volume offers great value individually. Combined, they constitute a comprehensive project management resource that does not exist elsewhere.

PERSONNEL

Maude Takes Over As Assistant DCSPER

MG Timothy J. Maude, former Director of Military Personnel Management, Office of the Deputy Chief of Staff for Personnel, has succeeded MG John M. Le Moyne as Assistant Deputy Chief of Staff for Personnel, Department of the Army.

With more than 33 years of active military service, Maude has served earlier tours as Deputy Chief of Staff for Personnel, U.S. Army Europe and Seventh Army, Germany; Director, Enlisted Personnel Management Directorate, U.S. Total Army Personnel Command, Alexandria, VA; Director of Manpower, Personnel and Security, J-1, U.S. European Command, Germany; and Commander, U.S. Army Enlisted Records Evaluation Center, Fort Benjamin Harrison, IN.

He holds an M.A. degree in public administration from Ball State University and a B.A. degree in management from Golden Gate University. In addition, he has completed the U.S. Army Command and General Staff College and the U.S. Army War College.

Listed among his military honors are the Defense Superior Service Medal, Legion of Merit with two Oak Leaf Clusters (OLCs), the Bronze Star Medal, the Meritorious Service Medal with four OLCs, the Army Commendation Medal with two OLCs, and the Army Achievement Medal.

FROM THE DIRECTOR ACQUISITION CAREER MANAGEMENT OFFICE

By the time you read this article, we will have formally celebrated the 10th anniversary of the Army Acquisition Corps (AAC). The AAC's 10th Anniversary Ball on Oct. 10, 1999, was a great way to end our first decade and begin our future endeavors. I hope all who attended enjoyed this festive evening. I extend my sincere appreciation to LTC Greta Lehman and Mary McHale, who volunteered a significant amount of their time to ensure that all the anniversary plans came together.

The Acquisition Career Management Office (ACMO) staff has been extremely busy during the past few months. We have been working with our counterparts from the U.S. Total Army Personnel Command; the Army Acquisition Executive Support Agency; and the Army Research, Development and Acquisition Information Systems Activity to review the roles and missions of each organization in supporting the AAC. Our conclusions align with many of your comments.

As the AAC has grown, each organization has attempted to fill voids in the management structure. The result has been a patchwork quilt that is often burdensome and confusing to our customers. We recognize the problems and are working on solutions that we can communicate clearly to everyone in the acquisition community.

As I complete my first few months in this position, I am constantly amazed at the number of ongoing initiatives to improve the career development of AAC and Army Acquisition Workforce (AAW) members. ACMO Deputy Director Mary Thomas has been working on an Acquisition Career Development Plan, which will focus on many of these diverse initiatives. The development plan will be the foundation for identifying AAW positions, managing members' careers, and ensuring that everyone is provided an opportunity to succeed. One of the many results from this effort will be identification of Acquisition Branch Qualification positions.

On the military side, we are working with the Office of the Deputy Chief of Staff for Personnel (ODCSPER) to capture the impact of implementing the Officer Personnel Management System for the 21st Century (OPMS XXI). In the steady state, FY01 and beyond, we should see career field promotion boards with promotion rates built around the Defense Officer Personnel Management Act (80 percent to major, 70 percent to lieutenant colonel, and 50 percent to colonel). For the operational support career field, board members will come from the acquisition and foreign area officer specialties. The combination of these changes should lead to a more predictable future for our younger officers. In the near term, we are trying to ensure a smooth transition.

Wishing all of you an enjoyable holiday season. See you in Y2K!

COL Roger Carter
Director,
Acquisition Career Management Office

New Staff Members Join Acquisition Career Management Office

The Army Acquisition Career Management Office (ACMO) would like to welcome three new staff members: LTC Greta P. Lehman, MAJ(P) Charles "Scott" Lambert, and MAJ(P) Joseph L. Bass.

Lehman is the new ACMO Functional Area 53 (FA53) Proponent. Her primary responsibilities include the development, implementation, and monitoring of career development policies and programs for the Army Acquisition Corps (AAC) and Army Acquisition Workforce (AAW). Additionally, she served as the coordinator and point of contact for the AAC 10th Anniversary Ball held Oct. 10, 1999.

Throughout her 16 years of military service, Lehman has served in a number of key positions, including Chief of Systems Engineering and Administration at the Joint Intelligence Center Pacific in Pearl Harbor, HI, and Executive Officer at the U.S. Army Information Systems Software Center, Fort Belvoir, VA.

A member of the AAC, she holds a B.S. degree in business administration from Campbell University in North Carolina and an M.S. degree in information systems from Marymount University in Arlington, VA. She has also completed the Army Command and General Staff College. Lehman can be contacted at **lehmang@sarda.army.mil**, or by calling (703) 604-7124 or DSN 664-7124.

Lambert is the ACMO's new Chief of Information Technology and Analysis. His primary responsibility is to provide information management and information technology products and services to the ACMO, the Director and the Deputy Director for Acquisition Career Management, and to the AAW.

Backed by 16 years of military service, Lambert has served in a number of key positions including Assistant Program Manager/ Director of Systems Engineering for the Composite Health Care System II Program Office in Falls Church, VA. He also served as Operations Officer for the Director of Corporate Information Management, U.S. Army War College, Carlisle Barracks, PA.

A member of the AAC, he holds a B.S. degree in environmental design from the University of Massachusetts and an M.S. in information systems from the University of Maryland. He has also completed the Army Command and General Staff College. Lambert can be contacted at **lambertc@sarda.army.mil**, or by calling (703) 604-7022 or DSN 664-7022.

Bass is a Special Projects Officer on the ACMO's Future Planning Team. He is currently working on acquisition management cross-functional projects dealing with future issues impacting the AAW, such as the Acquisition Branch Qualification process.

Having more than 16 years of active military service, he served previously in the Contracting Office of the Flight Concepts Division at Fort Eustis, VA, first as a Contracting Officer and most recently as Chief. A member of the AAC, Bass holds an M.A. degree in management from Webster University and a B.S. in business administration from Longwood College. He has also completed the Army Command and General Staff College, the Advanced Program Management Course, and the Materiel Acquisition Management Course. Bass can be contacted at **basslj@sarda.army.mil**, or by calling (703) 604-7174 or DSN 664-7174.

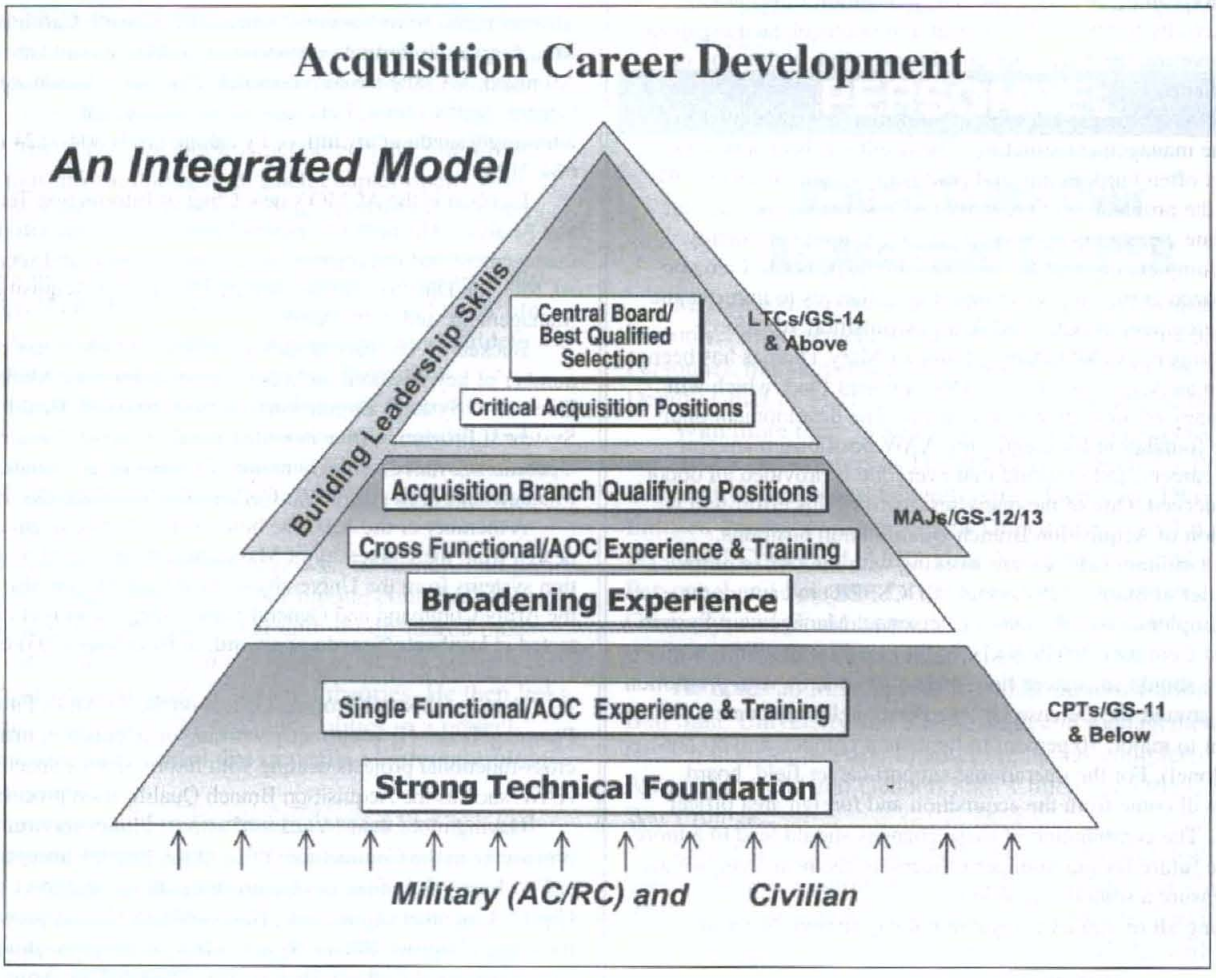
Acquisition Career Development Plan

The new Acquisition Career Development Plan (ACDP) enables Army Acquisition Workforce (AAW) members to take charge of their career development. Highly valuable for entry-level through senior-level positions, the ACDP actually provides the framework for developing a "career progression map" that guides an AAW member from a basic technical foundation through the leadership skills required for critical acquisition positions. In addition, the ACDP allows AAW members to understand the requirements for becoming competitive at all levels.

The objective of the ACDP is to provide a *common language* (leadership and functional competencies) to communicate career development information across all AAW fields and organizations. The 27 leadership competencies are extracted from the Office of Personnel Management's Five Executive Core Qualifications for the Senior Executive Service. These can be seen at **http://www.opm.gov/ses/html/ecq4.htm** and are universal for all of the federal government. Although the functional competencies are unique to each acquisition career field (ACF), they are used for all acquisition education, training, and experience aspects of career development.

The following bulleted list, which incorporates common ACDP language, are some of the suggested steps that AAW members can take to enhance their competitive status:

• *Obtain* a strong technical foundation; gain functional-specific knowledge and skills in an acquisition career field; complete 12/24 semester hours in business disciplines; complete training to gain certification at levels I, II, and III in a single ACF; apply for and obtain Corps Eligible status.



• *Broaden* your experience; branch out into an additional ACF to gain cross-functional experience; gain functional-specific knowledge and skills working in multiple ACFs; complete training to gain certification at levels I or II in multiple ACFs; add tasks that build leadership and management competencies; demonstrate strong leadership and management competencies.

• *Apply* multifunctional skills and leadership and management competencies to enable you to be competitive for senior acquisition positions in a best-qualified environment.

The ACDP contains three analytical tools to ensure the above steps can be accomplished. These tools, which are described below, use the common language to leverage centrally managed acquisition personnel files (Acquisition Career Record Briefs, Individual Development Plans (IDPs), Senior Rater Potential Evaluations, etc.).

• **Position identification** documents acquisition positions. The command or organization uses this template to submit acquisition positions to the Acquisition Position List Board for validation and assessment of leadership and functional competencies.

• **Individual assessment** is used by AAW members to assess current education, training, and experience in terms of achieved competencies. AAW members can see their strengths or weaknesses and determine where improvement is needed for career progression.

• **Career path development** is used by AAW members to tailor their career path by linking needed competencies to positions, experience, education, and training. AAW members will build an IDP structured to their planned path.

In summary, to ensure the ACDP is developed in a reasonable and deliberate manner and is responsive to the needs of the AAW, portions of the plan will be piloted throughout the next year. Be sure to look for more information on the ACDP in future issues of *Army RD&A* magazine. This plan is important to every AAW member because it puts your career development needs in a context that improves your competitiveness and contributes to a successful career. Information on the ACDP can also be obtained from Maria Holmes in the Acquisition Career Management Office at (703) 604-7113 or DSN 664-7113.

OMNI V Team Honored

The OMNI V Night Vision Devices Source Selection Team was selected to receive the Defense Acquisition Executive Certificate of Achievement by Dr. Jacques Gansler, Under Secretary of Defense for Acquisition and Technology. The integrated product team of the Office of the Project Manager, Night Vision/Reconnaissance, Surveillance and Target Acquisition (PM, NV/RSTA) was recognized for using acquisition reform initiatives and best-value procedures that stressed commercial practices resulting in reduced total ownership cost. The team was nominated by MG David R. Gust, PEO, Intelligence, Electronic Warfare and Sensors, and honored at a Pentagon ceremony July 14, 1999. The Defense Acquisition Executive Certificate of Achievement recognizes organizations, groups, teams, and individuals for exceptional contributions in reducing life-cycle costs and/or improving DOD's acquisition systems and programs.

PERSCOM Notes . . .

Critical Acquisition Position Service Agreement

A recent routine review of officer personnel records within the Acquisition Management Branch (AMB), U.S. Total Army Personnel Command (PERSCOM) revealed that many officers have not executed a critical acquisition position (CAP) service agreement. Although many officers may have had a valid agreement on file, rather than scrub the nearly 800 records individually, AMB decided to re-establish new agreements for all Army Acquisition Corps lieutenant colonels.

Under Subtitle A of Title 10, *United States Code*, military acquisition positions that are required to be filled by a commissioned officer serving in the grade of lieutenant colonel or higher are deemed "critical." The intent of the law is to stabilize these positions. The code goes on to state that "... any person who is assigned to a critical acquisition position shall be assigned to the position for not fewer than three years." Promotable majors, majors, and/or captains assigned to lieutenant colonel positions should be aware that the 3 years of stabilization also applies to them.

No person may be assigned to a critical position unless the person executes a written agreement to remain on Active duty in that position for at least 3 years. The service obligation contained in such a written agreement remains in effect unless and until it is waived by the Service Secretary. This waiver authority is currently delegated to the Military Deputy to the Assistant Secretary of the Army for Acquisition, Logistics and Technology.

Many officers have called AMB with questions regarding the recently mailed notice, fearful that signing another agreement would "restart the clock" in their current position. Others were not even aware that their positions are considered CAPs. In fact, the reassignment orders for any officer assigned to a critical position already acknowledge that a previously signed agreement "is maintained in the officer's career management information file" and that "the previously signed agreement is in effect for this assignment." For the purposes of the service agreement, the date an officer signs in, on official orders, determines the start date for calculating the length of time an officer is assigned to the command or agency. Lateral assignments within the command, done without official orders, do not affect service obligation calculations.

A CAP waiver is required any time an officer's departure from a CAP is initiated by PERSCOM. If an officer is retiring or resigning prior to serving 36 months in a CAP, their retirement or resignation packet must contain a letter of endorsement from the first general officer in their command. Because most waivers are approved, commands must be prepared to absorb the underlap in obtaining a replacement.

There are few options for Acquisition Corps officers who decide not to sign an agreement to remain on Active duty. Because all acquisition positions in the grade of lieutenant colonel or higher are considered CAPs under Title 10, refusing to

sign the agreement would limit an officer's assignment to positions at the grade of major or below. Therefore, officers who don't comply with the agreement cannot remain in the Acquisition Corps.

Service obligation agreements are not unique to the Acquisition Corps and, although they serve to provide stability to acquisition organizations, individual officers and their families can also benefit from the extended tours they provide.

Advanced Civil Schooling For Officers

During FY00, there are 60 Advanced Civil Schooling (ACS) openings available to Army Acquisition Corps (AAC) officers. The Army's ACS Program provides opportunities for officers to pursue advanced degree programs at civilian universities on a full-time, fully funded basis.

Prerequisites

AAC officers interested in applying for ACS must meet the following program requirements:

- A strong military file and potential for promotion,
- No more than 17 years active federal service upon the start of the ACS Program,
- An undergraduate grade point average of at least 2.5, and
- A Graduate Management Admission Test (GMAT) score of 500 or higher, or a score of 500 or higher in each of the Graduate Record Exam's (GRE's) 3 categories. The GMAT or GRE scores must not be older than 5 years.

Selection Of Graduate Schools

All graduate schools considered for ACS must be accredited universities, and the tuition for a full year of study (fall, spring, and summer semesters) may not exceed $14,500. At least one school considered must be a tax-supported school where the officer is able to receive in-state (resident) tuition rates.

How To Apply

An ACS application packet consists of the following:

- DA Form 1618-R (with original signatures from the applicant and the first field grade officer in the applicant's chain of command). The form is located in Army Regulation 621-1, *Training of Military Personnel at Civilian Institutions*.
- An original copy of all college transcripts.
- A letter of acceptance from each university listed on DA Form 1618-R except for the Naval Postgraduate School (NPS). The U.S. Total Army Personnel Command (PERSCOM) nominates officers to NPS and obtains this letter of acceptance. Letters of acceptance should include the title of the degree program to be pursued; the day, month, and year of registration; the day, month, and year school begins; the month and year the degree will be completed; the cost per credit per semester or quarter; and an indication of whether in-state or out-of-state tuition will be granted.

You are encouraged to discuss ACS possibilities with your assignment officer prior to submitting your application. ACS application packets should be mailed to U.S. Total Army Personnel Command, ATTN: TAPC-OPB-E (ACS Manager), 200 Stovall Street, Alexandria, VA 22332-0411.

Selection Process

The Acquisition Management Branch, PERSCOM, holds an in-house, informal review board each January and July to select officers to attend ACS. The January board looks at applications with summer and fall semester start dates. The July review board considers applications with a spring semester start date. The next board dates are scheduled for Jan. 10-14, 2000, and July 24-27, 2000.

For additional information on AAC participation in the ACS Program or application procedures, contact Paula Bettes at (703) 325-2760, DSN 221-2760, or e-mail: **bettesp@hoffman.army.mil**.

Staying In Touch

Now that the military's busiest moving time of the year has passed, officers should provide updated personal information to their assignment officers. As stated on all requests for orders, "You are required to forward a DA Form 3955, *Change of Address Card*, containing your new home address to your PERSCOM assignments officer within 30 days of arrival at your new duty station or upon change of residence."

In addition to your new mailing address, you should also include your home phone number, e-mail address, duty phone number (DSN and commercial), and fax number (DSN and commercial). This information should be updated each time a change occurs.

You may fax or mail this information to PERSCOM's Acquisition Management Branch. The fax number is (703) 325-9001 or DSN 221-9001. The mailing address is Commander, U.S. Total Army Personnel Command, ATTN: TAPC-OPB-E, 200 Stovall Street, Alexandria, VA 22332-0411. Be sure to include your full name and social security number with the updated information.

Army Experimental Test Pilot Board

A U.S. Total Army Personnel Command (PERSCOM) board will convene on or about Feb. 7, 2000, to select those aviators best qualified to participate in the Army Aviation Experimental Test Pilot Training Program. This board will review the qualifications of both commissioned and warrant officers. Commissioned officers selected to attend the U.S. Naval Test Pilot School (USNTPS) are automatically accessed into the Army Acquisition Corps where they will serve for the remainder of their careers. Warrant officers will continue to be managed by PERSCOM's Warrant Officer Division.

Applications must include the following:

- Official transcript of college credits;
- A copy of the aviator's most current DA Form 759, *Individual Flight Record and Flight Certificate-Army*; and
- Endorsements by an instructor pilot or standardization instructor pilot who will comment on the applicant's flying ability.

Individuals in a position to recommend and endorse an applicant are urged to make a thorough appraisal of that applicant's flying ability, operational experience, motivation, adaptability, and ability to communicate orally and in writing.

All experimental test pilot board applications must be received at PERSCOM no later than Jan. 15, 2000. Mail officer and warrant officer applications to Commander, U.S. Total Army Personnel Command, ATTN: TAPC-OPB-E (CPT Glenn), 200 Stovall Street, Alexandria, VA 22332-0411.

Experimental test pilot utilization assignments will be based on the needs of the Army. Initial tours will be served at the Aviation Technical Test Center at Fort Rucker, AL. USNTPS graduates will serve in experimental test pilot or organizational staff positions that directly affect the type, design, and configuration of Army aircraft.

For additional information or a sample memorandum explaining how to apply for the Experimental Test Pilot Program, contact CPT Eric Glenn at (703) 325-2800, DSN 221-2800, or e-mail **glenne@hoffman.army.mil**; or CW3 Randy Grunow at (703) 325-5251, DSN 221-5251, or e-mail **grunowr@hoffman.army.mil**.

Training With Industry For AAC Officers

Eight Training With Industry (TWI) positions are available for Army Acquisition Corps (AAC) officers in FY00. A list of the participating industries and their locations are shown in the accompanying chart. TWI is an Army program designed to provide officers with hands-on experience in specific industry environments. All TWI assignments start prior to Oct. 1 of the selection year and last 1 year.

To be considered for one of the TWI positions, officers must submit a DA Form 1618-R and a resume (no longer than two pages) to the point of contact listed below. Individuals must meet the same prerequisites as for the Advanced Civil Schooling Program except for the Graduate Management Admission Test/Graduate Record Examination requirement (see Army Regulation 621-1, *Training of Military Personnel at Civilian Institutions*; and the article "Advanced Civil Schooling For Officers" on Page 60 of this magazine). TWI candidates are selected by the AAC's informal, in-house Advanced Civil Schooling Review Board that meets each January. The next selection board will meet Jan. 10-14, 2000. The suspense date for submitting your TWI application to the Acquisition Management Branch, U.S. Total Army Personnel Command is Dec. 20, 1999.

The AAC TWI point of contact is Paula Bettes, U.S. Total Army Personnel Command, ATTN: TAPC-OPB-E (TWI Manager), 200 Stovall Street, Alexandria, VA 22332-0411; phone (703) 325-2760; DSN 221-2760; fax (703) 325-9001, DSN 221-9001; or e-mail **bettesp@hoffman.army.mil**.

TWI FY00 PARTICIPATING INDUSTRIES

INDUSTRY	LOCATION
Lockheed-Martin Electronic Missiles	Orlando, FL
Alliant Techsystems	Hopkins, MN
Dyncorp	Reston, VA
Boeing Defense & Space Group	Seattle, WA
Oshkosh Truck Corporation	Oshkosh, WI
GM, Allison Transmission Division	Indianapolis, IN
GM, Military Vehicles	Pontiac, MI
Motorola Space & Systems Tech Group	Scottsdale, AZ
Raytheon Systems Company	Tucson, AZ
General Dynamics Land Systems	Sterling Heights, MI
Lockheed Martin Missiles & Space	Huntsville, AL
Microsoft Corporation (51R positions only)	Redmond, WA
AT&T (51R positions only)	Bridgewater, NJ

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