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ARMY AL&T

THE OBJECTIVE FORCE

DOMINATING THE FUTURE BATTLEFIELD

ALSO IN THIS ISSUE

FROM THE ARMY ACQUISITION EXECUTIVE

At War And Transforming To The Objective Force

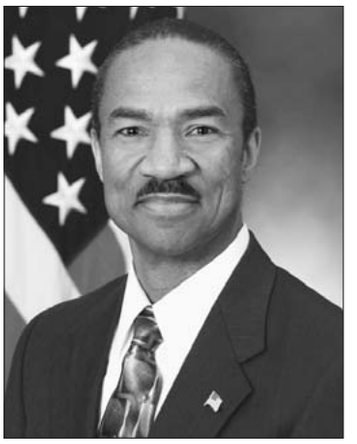
Today's Army is busier than it has ever been. Our soldiers are fighting and winning the global war on terrorism and defending our homeland. They are serving with distinction in Iraq, the Balkans, in Saudi Arabia and Kuwait, in the Sinai, and in Korea. And, even with a force deployed worldwide, we are transforming to the Objective Force—aggressively reaching forward to the future. We are changing the way we deploy, fight, sustain, and use information to become more strategically responsive and dominant across the spectrum of operations.

The Army has carefully balanced the risk between remaining ready for today's challenges and preparing for future ones. Our progress is unprecedented. To maintain readiness while building our future force, we are recapitalizing and selectively modernizing a portion of the current force. We are fielding the Stryker Brigade Combat Teams (SBCTs) at Fort Lewis, WA, for our Interim Force. In May, the first SBCT becomes operational. We also look forward to a successful Future Combat Systems (FCS) Milestone B Defense Acquisition Board decision in May.

The Army's transformation affects all that we do, thus we are changing the way we think. We are changing the way we fight. We are building a joint precision maneuver capability that can enter a theater of war at the time and place it is needed, maneuver at will to gain the advantage, deliver precise joint fires, and if necessary, close with and destroy the enemy.

However, we cannot accelerate Army transformation without transforming the way we do business. By revolutionizing the Army's business management practices, we are achieving the best value for taxpayers' dollars, conserving limited resources, and enhancing our potential to accelerate arrival of the Objective Force.

Here, too, we are making progress. Our FCS Program may prove to be the largest DOD acquisition effort to fully embrace the concepts of evolutionary acquisition and spiral development—leveraging the potential of rapid advancement within individual technologies by allowing for changes within programs as technologies mature. FCS is evolutionary in its design and incorporates periodic blocked improvements within its 18 manned and unmanned systems designed around a single, networked, integrated Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance (C4ISR) architecture. Our partnership with the Defense



Advanced Research Projects Agency ensures that FCS leverages that agency's DOD-wide perspective and resources to produce the best capability and value for the joint force. And, our lead systems integrator enables the best approach to selection from competing industry efforts. The Army is on track to achieve FCS first unit equipped in 2008 and an initial operating capability in 2010.

With FCS, our warfighters will be connected to interagency and multinational forces by the joint C4ISR architecture including networked communications, networked options, sensors, battle command systems, training, and both manned and unmanned reconnaissance and surveillance capabilities. These networked systems will dramatically enhance situational awareness and understanding and operational-level synchronization far beyond today's standards. The results of the investments will allow leaders to capitalize on sensor and processing technology to see, understand, and shape the battlespace before the enemy can react. This will increase combat force effectiveness and survivability even while dramatically reducing their mass and "footprint."

We realize that there will be no transformation of the Army without a transformation in logistics. We are incorporating the logistician's view into the design of our systems even before we begin to build platforms. Collaboration between the acquisition and logistics communities gives the Objective Force the rapid deployability and sustainability we demand—by design.

We are working to harness the power of knowledge, the benefits of science and technology, and innovative business solutions to transform both the operational and institutional Army into the Objective Force. By 2010, the Army's Objective Force—organized, equipped, and trained for ground dominance, cyber-warfare, and space exploitation—will provide the Nation the capabilities it must have to remain the global leader, the strongest economy in the world, and the most respected and feared military force, by our friends, allies, and enemies, respectively.

The Objective Force requires innovative changes and ingenuity in the way we take care of our people and manage the information and material that enhance readiness. Simply put, we cannot achieve Objective Force capabilities without leveraging the full potential of the technological advances that our Nation's industrial base and science and technology communities are developing. It is clear that we must continue to work hard together for the soldiers on point for our Nation.

Claude M. Bolton Jr.

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FEATURES

DEPARTMENTS

COVER

The Objective Force will result in U.S. Army forces that are lighter, more agile, and more lethal, yet capable of countering any threat posed by any adversary.

THE OBJECTIVE FORCE: A HOLISTIC APPROACH TO ARMY TRANSFORMATION

LTG John M. Riggs

Introduction

During the Cold War, the United States designed, trained, organized, and equipped its military forces to confront and deter the former Soviet Union. The end of the Cold War and the dissolution of the Soviet Union dramatically changed the nature and types of threats confronting the United States. Simply put, the United States no longer faces a peer competitor capable of matching U.S. military capabilities. The bipolar world of the Cold War has been replaced by asymmetrical threats from regional, transnational, and terrorist actors. And as the events of September 11, 2001, demonstrated, we are faced with adversaries who are willing and eager to bring the fight to our Nation's shores.

To meet this threat, the Army has embarked on a transformational effort that will remake the world's preeminent ground forces into a force whose capabilities and strengths will continue dominance across the full spectrum of conflict. Nearly 4 years ago, Army Chief of Staff GEN Eric K. Shinseki prophetically outlined how the Army would transform itself from the force that won the Cold War to a lighter, more agile, more lethal force—the Objective Force (OF)—capable of countering any threat posed by its adversaries. His vision highlights the soldier as the centerpiece and ensures that our Army remains capable of meeting any current threat while adding new capabilities and leveraging the tremendous advances in information and other key technology.

Transformation Effort

The first axis of the Army transformation effort is the selective modernization and recapitalization of our existing, or Legacy Forces. Our heavy and light Legacy Forces characterized by the Abrams tank, Bradley Fighting Vehicle, Apache helicopter, and 14 other critical systems were the cornerstone of our success in the Persian Gulf War and will continue to play an important role in our Nation's defense. We will selectively upgrade these forces with new engines and upgraded weapon systems and bring them back to zero hours and zero miles. These upgrades will ensure that equipment capabilities remain unmatched while we transform the rest of the force.

Concurrently with improving our Legacy Forces, the Army is fielding new, Interim Forces that will bridge the gap between the Legacy Force and introduction of the first OF unit in 2008. These forces, known as Stryker Brigade Combat Teams (SBCTs), will be centered on the Stryker family of wheeled fighting vehicles. Starting in 2003, the Army will field six SBCTs during the next 5 years. These new, lighter forces will, in combination with advanced air- and sealift capabilities, give the United States the ability to project military force more easily and more directly worldwide.

As the Army modernizes and recapitalizes the Legacy Force and fields the SBCTs, it is also developing our future Army—the Objective Force. The Army is pursuing an aggressive plan that builds forces and technologies to meet future demands without sacrificing training and readiness of today's warfighter. It is a detailed program of change that retains the mental and physical toughness that has always characterized our forces. At the same time, it harnesses new technologies of the information age to make us faster, more flexible, and more lethal.

Holistic Change

The Objective Force is not simply a new weapons program; it is nothing less than the complete transformation of today's Army to meet tomorrow's challenges. It is holistic change—Doctrine, Training, Leader development, Organizations, People, and Facilities. OF units will be more strategically responsive, deployable, agile, versatile, lethal, survivable, and sustainable across the full spectrum of military operations. They will support decisive maneuvers—horizontal and vertical, day and night—in all weather and terrain as dismounted or mounted combined arms teams with unyielding unit integrity.

In addition, OF units will be capable of destroying enemy formations at longer ranges with smaller calibers, greater precision, and more devastating effects. Innovative sustainment concepts and capabilities, improvements in reliability, maintainability, and sustainability; and reach operations will reduce demands for consumables and support such as water, fuel, and maintenance. This will result in a smaller logistical footprint and greater operational agility.

What is new about the Objective Force is the manner in which the Army can execute maneuver warfare. In the past, maneuver was largely linear, meaning ground forces met on the ground and attempted to outflank each other or break through at vulnerable spots. Innovations such as airborne assaults and helicopter landings added a new dimension to maneuver warfare, but once committed, these forces became light infantry, lacking the hitting power and survivability of the mechanized units. The Objective Force seeks to combine the best of both

heavy and light forces and employ them in innovative and unprecedented ways.

The value of OF precision maneuver is that units enter a theater at a time and place of the Army's choosing rather than at typical ports of debarkation like airfields and ports, thus rendering an enemy's anti-access strategies useless. Gaining this positional advantage is critical because it allows us to maintain a fire-and-maneuver advantage over the enemy. If enemies seek to mass forces against us, they can be destroyed by precision strike. If they seek to disperse, dig in, or retreat, we can maneuver in and destroy them piecemeal. The simultaneous creation of precision fire and maneuver, enabled by advanced information and decision technology provides us with an unparalled combat overmatch capability.

The equipment of OF units will allow for rapid target identification and accurate fires. Units can quickly fire and maneuver on any enemy with greater accuracy from greater distances. OF units will also move, shoot, and re-engage faster than the enemy, denying him rest or opportunity to regain the initiative and allowing us to rapidly transition to the next mission.

Information Technology

A critical element underpinning the Objective Force is the advancement of information technology. In past wars, having timely and correct information was always important. In future wars, it will be the difference between decisive victory and quagmire. The OF will use the power of information as a weapon against our enemies. We will see them first, make the right decisions before they do, and decisively engage and destroy them first. In short, we will make every engagement an ambush.

Harnessing information will give us knowledge superiority, which will be a characteristic built into all aspects of the OF. Information technology connects satellites, modern sensors, and advanced communications systems with advanced ground combat systems of the Objective Force. These units will be able to tap into a grid of space, ground, and airborne sensors that together form an integrated network. This network will include all Services and is constructed to ensure that the right information gets to the right unit at the right time.

Future Combat Systems (FCS)

The ground hardware centerpiece of the Objective Force is the FCS. Built as a system-of-systems, FCS will encompass manned and unmanned air and ground vehicles, including unmanned reconnaissance and strike platforms networked together to create an integrated team on the battlefield. To bring this vision to reality, the Army has moved away from the traditional acquisition process paradigm by employing a lead system integrator (LSI) approach.

The Army LSI team—led by Boeing and Science Applications International Corp. (SAIC)—will develop the architecture for the system-of-systems envisioned for the FCS. The team will also identify and evaluate potential concepts and technologies, conduct demonstrations, and select the most promising efforts for further definition. The work accomplished by the LSI team will ensure that the FCS Program is ready to transition from the concept and technology development phase into the system development and demonstration phase. The LSI approach affords opportunities to insert leap-ahead technology upgrades when they are mature, to incorporate best business practices, and to ensure an integrated effort from all concerned.

The Army has established a strategic partnership with the science and technology (S&T) community to bring the FCS from the research and development phase to reality. Through a spiral development process, innovations in commonality, modularity, and interoperability will provide technology insertions to ensure that technology development seamlessly meshes with the acquisition process. Approximately 97 percent of the Army's current S&T budget is devoted to bringing the FCS online in 2008. Additionally, the Army is working to decrease the sustainment demands of the FCS through the introduction of hybrid electric power, onboard water generation, embedded diagnostics and prognostics, modular systems, platform commonality, increased system reliability, and brilliant munitions. This will reduce the need for the typical "iron-mountain" approach to logistics involving large amounts of water, fuel, ammunition, and maintenance support.

Conclusion

The Army has completed the development of the conceptual underpinnings for the OF and the FCS. We are in the process of transitioning from the S&T phase to the research and development and procurement phase. The Army LSI recently announced a teaming agreement to build the FCS manned ground vehicle. Additionally, the final draft of the *2015 Objective Force White Paper* was recently published. This white paper details how the Objective Force will be used in 2015 as a critical combat multiplier for any joint forces commander. We have many milestones and inchstones remaining in making the OF a reality, but we have already made substantial progress and will continue on this path to success.

As mentioned earlier, Army transformation is not simply about fielding new weapon systems or innovative tactics. It is holistic in nature, a revolution in Doctrine, Training, Leader development, Organizations, People, and Facilities. At its core, however, remains the American fighting soldier. The most technologically advanced platforms and all the weapons in the world are useless without the intellect, dedication, and remarkable sense of duty of the American soldier. Transformation is about empowering soldiers to fulfill the Army's nonnegotiable contract to fight and win our Nation's wars.

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THE LEAD SYSTEMS INTEGRATOR: A TRANSFORMATIONAL MANAGEMENT APPROACH FOR THE OBJECTIVE FORCE

MG Joseph L. Yakovac Jr. and
COL William R. Johnson

Introduction

The Army's transformational vision, with its end goal of an Objective Force, is—quite simply—about change. Long before the tragic events of September 11, 2001, Army Chief of Staff GEN Eric K. Shinseki's vision recognized the change in threats to our Nation, the change required by our fighting forces to counter those threats, and the change required for the acquisition process to achieve the end goal in the shortest timeframe possible.

The end goal is an ambitious one that requires an equally visionary management approach—a trusted partnership between government and industry. The industry partner will function as the government's lead systems integrator (LSI).

Traditional Procurement

Traditionally, the procurement of a platform or system for the government results in award of a contract to a single prime contractor who builds what is possible and subcontracts the rest. The relationship between the government and its prime contractor has, more often than not, been one of "benign adversaries." It was merely a working relationship providing the necessary checks and balances to ensure that a system was brought in on time and within its budget. Quite often, however, as the project was moving into the field, new technologies and improvements emerged. Thus, a new and often lengthy procurement cycle was commenced to upgrade the contract.

LSI Approach

While LSI is a management approach, not a type of contract, it has a significant impact on how procurement happens within a program the size and scope of the Future Combat Systems (FCS). The LSI approach, which is being formally used for the first time in the FCS Program (with Boeing and Science Applications International Corp. (SAIC) as LSI), tackles head-on some of the assumptions and constraints of the traditional procurement approach. First and foremost of these is the challenge of designing and developing a large-scale system-of-systems program versus a single platform or system.

FCS is much more than new manned ground vehicles. A networked system-of-systems, the FCS is the backbone of the Objective Force. It will serve as the core building block within all maneuver unit of action echelons to develop the overmatching combat power, sustainability, agility, and versatility necessary for full-spectrum military operations. This system-of-systems has, at its center, an advanced communications infrastructure that is designed to be interoperable—across the Services, agency boundaries, and borders—to our allies around the world.

FCS Challenges

Overlaying the technology challenges of FCS is an equally demanding schedule requiring that the first unit equipped be ready in 2008, followed by an initial operational capability in 2010. Ambitious? Yes. Achievable? Absolutely—if all stakeholders and partners are working toward a common goal.

A primary LSI responsibility for FCS is to provide the big-picture, system-of-systems architecture oversight and vision. The LSI must keep this "40,000-foot-view" of all systems, subsystems, and components while managing a team of as many as 100 suppliers. Further, the LSI must keep team members and their constituencies engaged in striving toward the common end goal of an Objective Force.

One of the most significant achievements of this process will be the government's ability to get the best technologies to the field and

into the hands of soldiers more quickly than would be possible under more traditional approaches. The LSI can, and will, procure and incorporate new technologies as they emerge. Private industry has the ability to do this quicker and more effectively than the government. In fact, the FCS plan already includes the next round of Block II and follow-on upgrades. This spiral development ensures that the soldier is continuously provided the very best equipment.

LSI Responsibilities

The LSI is also the honest broker searching out the best of industry for the FCS Program. Quite obviously, no one company can provide the domain expertise needed for a program as broad and comprehensive as FCS or a vision as far-reaching as the Objective Force. Thus, the LSI seeks industry's best for each system, subsystem, and component. This is accomplished through a series of broad industry announcements (based on the government Broad Area Announcement process) and competitions. By encouraging competition and commonality across the program, the LSI will bring the best to the program while also achieving a certain degree of economy of scale.

The LSI also has the responsibility to ensure a level playing field that allows fair competition among potential suppliers. In the case of FCS, the LSI Web site provides an equal portal for all companies wishing to participate in the program, including their own. Both Boeing and SAIC have firewalls in place that require other divisions of their own companies to enter the portal via the same process as outside suppliers. This firewall approach is essential to the LSI process. For LSIs to truly become an extension of the government and its trusted partner, they must set aside their corporate hats and don a government one.

LSI Challenges

The challenges to an LSI approach are significant, requiring cultural changes for both government and industry. On the industry side, an LSI must step outside its corporate identity; this represents an enormous cultural shift. Yet achieving a true partnership with government and pulling together other industry team members will more likely be successful if LSIs function without corporate logos and branding across their work products. They must remember that they are no longer the corporation, but rather a representative of the government.

Cultural changes within the government are every bit as significant as those of industry. Relationships must be formed with trusted partners rather than benign adversaries. In addition, there must be open channels of communication with industry counterparts. Further, the government must relinquish parts of the procurement process (but not oversight) to its LSI.

It would be naïve and irresponsible to think that these cultural changes will happen easily or painlessly. Ongoing efforts are required from all sides to educate, internally and externally, the importance of these paradigm shifts. This education process is the responsibility of both the government and the LSI. Together, they must work to encourage other industry partners to accept the LSI role and support the common goal of meeting America's need for an Objective Force. There must be an environment of shared responsibility and "buy-in" on the part of companies involved.

LTG John M. Riggs, Director of the Objective Force Task Force, has exhorted industry many times on the need to work together. He also said that the American defense industry can do anything it sets its sights on achieving, but that the only way the Objective Force can become a reality, is for all of industry to set aside its squabbling and equally strive to achieve that goal. Similarly, the various government agencies involved must continue to work together, across territorial boundaries, to reach that same goal.

Conclusion

Several months into the FCS Program, the LSI approach is working well. There are, and always will be, bumps and hurdles to overcome. The serious dedication of all involved is essential to success. Because the LSI approach represents the potential for a new paradigm in all arenas, other Services and agencies are watching the process unfold. Meeting the Army's transformation goals requires new ways of thinking about how programs are procured and managed, and the LSI approach does just that.

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THE OBJECTIVE FORCE: TRANSFORMING TODAY'S CONCEPTS INTO TOMORROW'S JOINT WARFIGHTING CAPABILITIES

BG(P) Michael A. Vane and Dr. Richard J. McCallum

"Absent innovative thought and a willingness to integrate social advancements, triumphant warrior systems frequently become fossilized in their moment of glory."

John Keegan
A History of Warfare

Introduction

The timeless quest for combat speed and mobility has prompted many historic army transformations. Approximately 2,400 years ago, Philip II reformed the Macedonian army. Seeking to gain the battlefield initiative through speed and mobility, Philip instituted new acquisition and logistics procedures that drastically restricted the traditional baggage train that followed armies of that era. His combat successes were legendary in the Greek world. Philip's military legacy passed to his young son, who went on to conquer an empire and establish himself as Alexander the Great.

America's Army has launched once again a search for strategic speed and mobility. More specifically, the Army's transformation effort seeks to develop new fighting doctrine, organizations, and capabilities designed to ensure the creation of a strategically responsive, agile, and lethal Objective Force (OF). Tailored to become the 21st century's preeminent land power, the OF will perform a broad range of missions that will vary from the domestic challenges of homeland security to the complexities of decisive overseas warfighting.

On tomorrow's battlefield, the OF will deploy as a combined arms, full-dimensional maneuver force. Offensively oriented, the Objective Force will secure and maintain the combat initiative at the strategic, operational, and tactical levels of war. Now in its fourth year of development, the OF signals the Army's sustained commitment to become the cornerstone asset within every joint force commander's (JFC's) future campaign plan.

Charting The Joint Path

The Army is developing the blueprint for OF formations specifically tailored to support regional combatant commanders and emerging joint operational concepts. Synchronized with current DOD reform guidance, the Army's transformation efforts are responding to the goals articulated by the Quadrennial Defense Review, the Defense Planning Guidance, Joint Vision 2020, and the recently published National Security Strategy. Designed for rapid response and deployment, the Objective Force will have the capability to conduct operational maneuver across strategic distances and become the decisive complement to air, sea, and space operations.

Guided by an aggressive concept development and experimentation strategy, the Army will be fully integrated into tomorrow's joint force. The OF will fulfill force requirements for strike capabilities that encompass both precision engagement and precision maneuver. These Army units will create combat synergy within joint task forces by controlling people, resources, and large areas of land and by rapidly defeating opponents regardless of terrain conditions.

Evolution

The conceptual roots for the OF reach across the Atlantic Ocean into the historic hallways of General Headquarters, London, England. In the spring of 1918, British Army Major General J.F.C. (John Frederick Charles) Fuller became impressed with the immature technology of the internal combustion engine. Emphasizing the characteristics of speed, maneuverability, adaptability, and

self-sufficiency during the attack, Fuller developed his ideas in a proposal that became known as *Plan 1919*. Today's Army planners, like Fuller, seek to examine innovative technologies, formulate concepts, experiment with new capabilities, and catch a glimpse of future battlefields as modern technology again alters fighting capabilities.

More than 3 years ago, the Army's transformation journey required an examination of combat units according to their warfighting purpose. This analysis resulted in the development and recent publication of U.S. Army Training and Doctrine Command (TRADOC) Pamphlet 525-3-90. Focusing on the years 2010 through 2020, this proposed operational and organizational plan describes future formations within the framework of two organizations delineated by their combat purpose: Units of Employment (UEs) and Units of Action (UAs). The operational-level headquarters function will be embedded within UEs while UAs will perform tactical roles.

The UE will analyze the situation and shape and isolate the battlespace while synchronizing major operations and decisive land campaigns in support of joint operational and strategic objectives. This senior command and control unit will participate in all phases of joint operations, from initial entry through conflict termination and the transition to post-conflict operations.

The UE will be capable of providing command and control for joint and multinational forces as described by JFC's Standing Joint Force Headquarters concept. Additionally, UE Headquarters will have the inherent capability to interact effectively with interagency, multinational, nongovernmental, and private organizations.

OF units, as an essential component of joint operations, will be capable of strategic missions such as forcible entry operations to defeat critical targets and assist in assuring access for follow-on forces. By being capable of air- and sealift to unimproved ports along multiple paths, OF units will contribute to overcoming anti-access challenges and directly assist the JFC objectives through dislocation, disintegration, and destruction.

Completed research and analysis has also focused on the development of UAs. The UA will become the capstone combat element within the Army's Objective Force. It will be strategically responsive and provide overmatching lethality with advanced survivability against any threat. The Unit of Action will also be able to transition rapidly between tactical engagements with minimal organizational adjustment. By leveraging information technology advances, these units will be versatile and responsive to the JFC's assigned missions.

A vital component of the emerging UA is the development of the Future Combat Systems (FCS). It is the single critical system-of-systems solution to the UA as described in detail within the FCS Operational Requirements Document. However, the UA will encompass more than a new combat platform. By harnessing the synergy from acquisition, logistics, and technology reforms coupled with revised Doctrine, Training, Leader development, Organizations, People, and Facilities efforts, the UA will be prepared to significantly contribute to security policy goals that seek to assure allies, dissuade adversaries, deter aggression, and decisively defeat any opponent.

During times of security crisis, land-power becomes a vital force projection capability and one of the key pillars of America's military power.

A New Equation

Finding the new formula for war is neither quick nor easy. The rational calculus of military strategy requires a continuous, thoughtful correlation of ways, means, and ends. Each stage of progression in the art of war anchors on past experience while integrating modern social, political, and technological advances. As the march of scientific discovery continues unabated, there will be a direct relationship between the evolution of national security policy, emerging technology, and the transformation of America's Army.

The Objective Force will seek to achieve a situational dominance and decisionmaking momentum that will establish a new equation for the application of force. To facilitate this change, the Stryker Brigade Combat Teams (SBCTs) were developed as an intermediate step toward UAs. Many of the current adaptations the Army is making to field SBCTs are precursors to institutional and operational changes that will be reflected within the Army's transformation to the OF. The SBCTs will not only provide a unique Army capability that responds to near-term operational requirements, but will also become an experimental laboratory for testing concepts and fielding future advanced capabilities.

Tomorrow's battlespace will be distributed, noncontiguous, and more vertical than linear. Lines of communication will evolve into web-like network configurations. The Objective Force will be able to strike globally and achieve decisive results. These outcomes will be predicated on the ability to perform operational maneuvers from strategic distances

with simultaneous employment of combat-ready units on arrival.

Seeking to retain the combat initiative while avoiding the vulnerabilities and time penalty associated with traditional employment phases, the OF will avoid large, fixed-air terminals and seaports. On arrival, UAs will immediately be able to conduct operations. While sustaining simultaneous and continuous day and night operations, the Objective Force will either destroy the enemy or force opposing units to abandon protective sanctuaries and face destruction by precision fires.

Today's Forces

Today's forces generally fight linear, sequential engagements that are driven by system constraints rather than campaign design. At the tactical level, fire and maneuver frequently become distinct events. Lack of intelligence and situational awareness requires cautious actions in the early stages of an operation. This battlefield uncertainty often demands exploratory movement to contact against the enemy. Once an opponent is discovered, the integration of fire and maneuver frequently causes tactical pauses. These delays often reduce momentum while increasing casualties.

The Unit of Action will demonstrate a seamless integration of fire and maneuver. Using a complex network of fires in conjunction with precision maneuver, the UA will be able to achieve battlefield dominance from either stand-off ranges or close battle. Each UA will be able to execute multiple engagements simultaneously or in rapid succession across a large area of operation.

A Sense Of Urgency

Past success, unfortunately, does not ensure victory on tomorrow's battlefield. There is a sense of urgency to develop these leap-ahead concepts and capabilities. Because the past rhythm of the transformation cycle generally takes military organizations 15 or more years to execute, time is of the essence. A heuristic approach to future warfare, guided by the wisdom of past experience, will yield a sense of understanding as the first clues are deciphered and the hidden formulas for future victory discovered.

The rhythms of history and the cycles of war, without question, are altering where, when, and how America's Army will serve this Nation.

Conclusion

During times of security crisis, land-power becomes a vital force projection capability and one of the key pillars of America's military power. For more than a century, there has been a symbiotic relationship between America's world status and America's Army. In an increasingly uncertain security environment, Army forces will become an indispensable signal of American political determination. Tomorrow's challenges will vary significantly. On one extreme, rogue or failing states with common access to space and conventional weapons may become sophisticated opponents capable of integrating the complex realms of a surface-to-space battlefield continuum. Conversely, the menace may not be fleets or armies but rather the unsophisticated rifles and car bombs of determined terrorists. With a multitude of possibilities between these two extremes, the shape and outline of future warfare environments will require flexible, adaptable Army units. The Objective Force, organized with Units of Employment and Units of Action, will be capable of responding across this diverse array of military operations.

The rhythms of history and the cycles of war, without question, are altering where, when, and how America's Army will serve this Nation. It is only a matter of time until America's national resolve is again tested. When that challenge arrives, a transformed Army will be the commander's primary instrument for decisive operations. The development of Objective Force capabilities clearly demonstrates the Army's commitment to ignore the siren call that has fossilized so many historic battlefield victors. America's Army is aggressively seeking to transition from its Cold War, forward-deterrent posture to a strategically responsive member of tomorrow's joint warfighting team.

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HOW THE C4ISR NETWORK SUPPORTS THE OBJECTIVE FORCE

BG Michael R. Mazzucchi

Introduction

In the "Speaking Out" section of the November-December 2002 issue of *Army AL&T* magazine, I was asked how the Program Executive Office, Command, Control and Communications Tactical (PEO, C3T) was directly helping the Army's combat capabilities. In this article, I will try to explain how the command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR) network supports the Objective Force. The C4ISR network will consist of communications and computer networks linking remote unmanned sensors to manned sensors, which will provide information to widely separated commanders who manage both manned and unmanned weapons systems. This C4ISR network will enable commanders to support individual warriors in conducting war in a totally new manner.

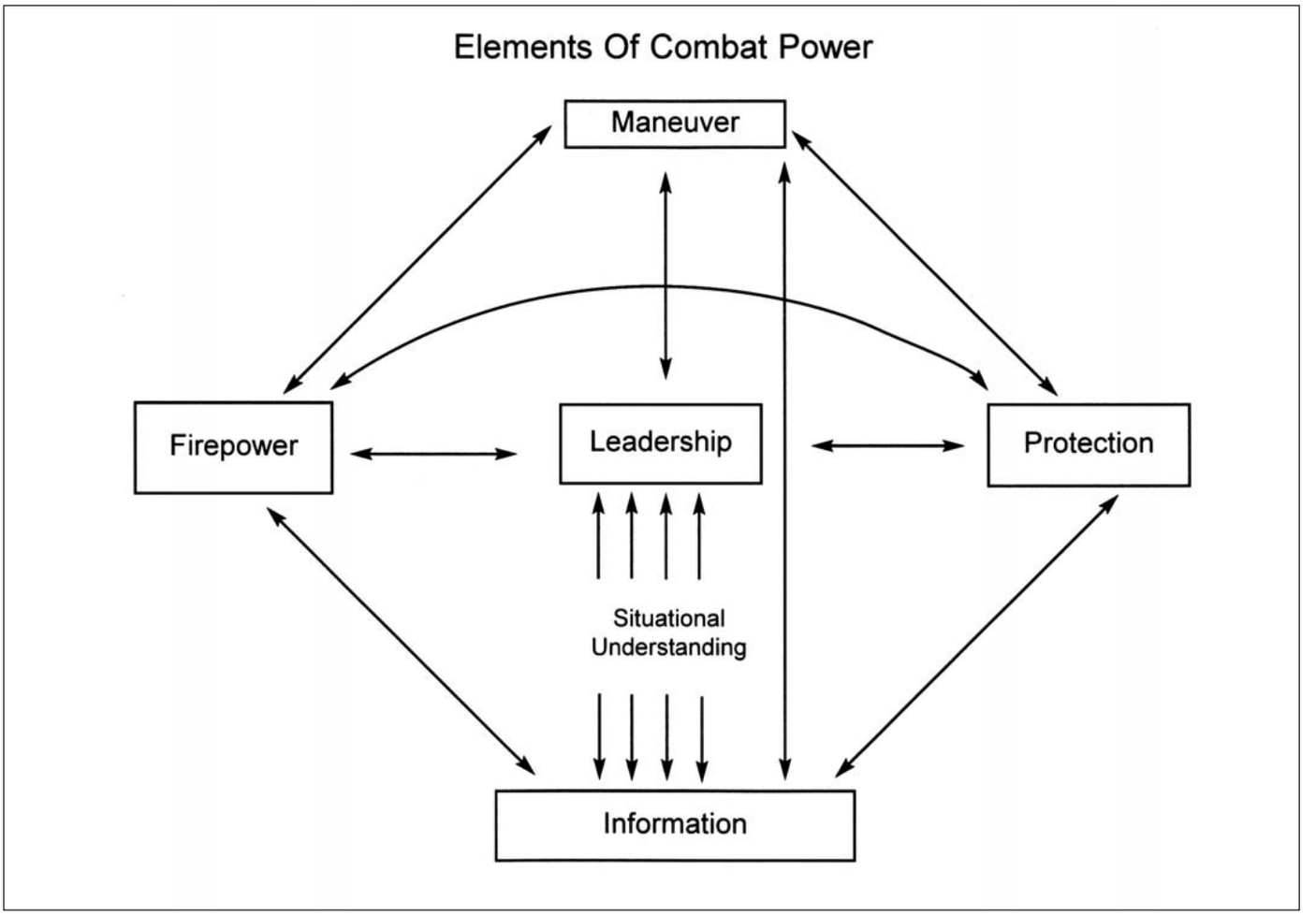
As stated in the Army Chief of Staff's (CSA's) white paper, the Objective Force is our future full-spectrum force: organized, manned, equipped, and trained to be more strategically responsive, deployable, agile, versatile, lethal, survivable, and sustainable across the entire spectrum of military operations from major theater war through counterterrorism to homeland security. This force must be able to conduct simultaneous, distributed, and continuous combined arms and air-ground operations in all terrains. C4ISR networks must provide commanders and their supporting staffs the ability to *see first, understand first, act first, and finish decisively* in all levels of war—strategic, operational, and tactical.

The Objective Force leaders and soldiers will operate in a highly dispersed battlespace, which will be operationally integrated through a secure, reliable, and sustainable information network. The information systems and the supporting sensor systems will provide dominant situational understanding that will enable combined arms units to conduct simultaneous, noncontiguous distributed operations. These systems-of-systems or networks will allow all battlespace entities—whether manned or unmanned—to work as a team, sharing information that permits them to act in a knowledgeable manner.

The battlespace entities could be tank-like armored vehicles or unmanned aerial vehicles; they could also be infantry squads or scout units. With the information provided by the C4ISR network, the Objective Force can achieve its operational goals to develop situations out of contact, to maneuver to positions of advantage, to engage the enemy beyond the range of its weapons, to destroy the enemy with precision fire and maneuver, and to tactically assault enemy capabilities or locations at the time and place of our choice.

The C4ISR network is the foundation that the current Legacy Force, Interim Force, and Objective Force will use to leverage the new combat and sensor platforms. It serves first as the "backbone" of the body that allows all sensors, shooters, and decisionmakers to hang off them as the "five senses" that tell the brain what is occurring, and finally as the "nerves" that give orders to the muscles allowing the brain to initiate action. The C4ISR Network allows our leaders to conduct rapid decisionmaking and to move from plan-centric to intent-centric operations,

The Objective Force leaders and soldiers will operate in a highly dispersed battlespace, which will be operationally integrated through a secure, reliable, and sustainable information network.



from physical rehearsals to virtual ones, and from static command post situational awareness to battle command on the move. These capacities change the execution of battle management decisively in our favor.

In the new Field Manual (FM) 3-0, the Army, for the first time, identifies information as an element of combat power. Information has always been vital to commanders; however, the change here is in the ability to design, test, field, and maintain a network of communication systems, computer systems, sensor systems, and surveillance systems unparalleled in both numbers and connectivity. As stated in the CSA's white paper: "... the information revolution, with the promise of accelerated breakthroughs for surveillance, understanding, and communication is expected to create a base of knowledge for military planning and execution unprecedented in scope, volume, accuracy, and timeliness. While the requirement for information superiority is not a new concept, information technologies make this simpler, easier, and more powerful than ever before. [See accompanying figure.] Combining this new kind of knowledge base with related improvements in mobility, precision, range, lethality, survivability, agility, and sustainability will have a dramatic effect on future military operations." Another way of looking at this is to observe that information technology has made the reach or availability of information and its richness or content much less expensive than ever before. For example, think of your daily connection with the Internet—the C4ISR network will provide the Objective Force commander, staff, and soldier with that type of information environment.

Evidence from the Army Warfighting Experiment (Task Force XXI), the Joint Warfighting Experiment, the recent Millennium Challenge, and from exercises such as Division Capstone I and II clearly points to increased combat power generated from advanced C4ISR systems. In the recently published U.S. Army Command and General Staff College book, *66 Stories of Battle Command*, there are great observations on how battle command at the National Training Center (NTC)

works against world-class opposing forces. While the stories do not reflect the actual C4ISR systems that will support the Objective Force, they do provide clear insight into what the new C4ISR systems and networks must provide to support the CSA's vision. MG (now LTG) William S. Wallace, then the 4th Infantry Division Commander, provided key insight when he said that sometimes we know more about the enemy than we know about ourselves.

Current C4ISR networks are beginning to provide complete information about the location of enemy forces to our commanders. The Force XXI Battle Command Brigade and Below (FBCB2) systems fielded to the 4th Infantry Division, and being fielded to the 1st Cavalry Division and the Stryker Brigade of the Interim Force, provide blue force situational awareness down to platform level. FBCB2 systems also provide blue force situational awareness from platoon leaders and their wingmen to the company and battalion tactical operations center. Through the Maneuver Control System, this same information is shared with the brigade, the division, the corps, and finally, through the Ground Command and Control System with theater and joint task force commanders. This begins to provide the relevant common operating picture called for by the Objective Force. New C4ISR networks will have the additional capability of passing combat power information such as the status of ammunition, fuel, and personnel to commanders and their staffs.

In another story from NTC, BG (now MG) Russel L. Honoré observed that the newly emerging doctrine of network- or intent-centric operations calls for more than the synchronization of forces—it calls for the orchestration of forces. To synchronize our forces, we must have C4ISR systems that help commanders and their staffs relate battlefield functions in time and space. To orchestrate them, we must expedite the more difficult process of mixing and matching combat power, not sequentially, but rather simultaneously. The orchestration permitted by the C4ISR networks can produce the simultaneous, noncontiguous, distributed operations called for in the CSA's white paper.

ABCS And C4ISR

Another example from a III Corps warfighter highlights the importance of C4ISR networks. In this exercise, the III Corps Commander, using the current Army Battle Command Systems (ABCS) networks and sensors such as Joint Surveillance Target Attack Radar System and the Predator, conducted a shaping operation. What was different in this operation was the orchestration of the artillery fire, the close air support (CAS), and the Apaches. Through the use of ABCS and supporting communication systems (all part of the C4ISR network), the commander was able to undertake this complex operation without signaling his intentions to the enemy. He did not have to lift the artillery fires to allow the CAS to go in, followed by the Apaches. Further, he could watch the artillery, his Air Force liaison could use the Situational Awareness Data Link to see the front line of troops, and he could watch in real time the air tracks of his attack helicopter. In this exercise, the C4ISR network was both the eyes and the nerves of the commander and allowed him to orchestrate this complex operation.

Conclusion

It is important to see how the C4ISR networks are impacting the principles of war and its conduct. It is also important to be aware that these networks are not changing the nature of war. The current and future C4ISR networks will allow the Objective Force to leverage information to achieve precision. This precision will allow us to mass effects rather than forces. Said a current Air Force Under Secretary: "Precision is the new mass." Maneuver and its companion firepower are also directly impacted by the C4ISR systems, which allow the commander to convey his intent more clearly and to thin the fog of war and reduce the friction inherent in all combat operations.

We also know from history that the first impact of new technology on combat is to improve the prevailing method of fighting. The impact of the C4ISR network on the Objective Force is much more dramatic because it will create a new way of fighting (described in the CSA's white paper and in the U.S. Army Training and Doctrine Command's newest operational concepts). What does not change is the nature of war, which has been and will remain a clash of wills. The will of both the leader and warrior continues to be the primary ingredient in successful warfare. The C4ISR network allows implementation of many of the Objective Force concepts, but the soldier must still execute them.

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THE OBJECTIVE FORCE SOLDIER

COL(P) James R. Moran

"Soldiers are the centerpiece of our formations."

GEN Eric K. Shinseki
Chief of Staff, U.S. Army

Introduction

Soldiers continue to be the Army's most important asset. The soldier is the foundation of Army transformation and will be the centerpiece of the Objective Force. To achieve the Objective Force vision, individual soldiers and small units must be provided unsurpassed leap-ahead capabilities. They must be seamlessly integrated into the Future Combat Systems (FCS) and digital battlefield. The ability to see first, act first, and finish decisively must be present at every echelon—down to the individual dismounted ground combatant. Accomplishing this will require a major technology investment in individual soldier equipment and effective requirements and acquisition management of the soldier as a system.

The Soldier As A System

The soldier system includes everything a soldier wears or carries on the battlefield. The need to manage individual soldier equipment requirements and acquisition as a system was first identified by an Army Science Board Summer Study in 1991. That need was again validated in a 2001 Summer Study. Historically, soldier system modernization has not kept pace with that of other systems such as tanks and aircraft.

Today's tanks and fighter aircraft are vastly more capable than those of World War II. However, today's infantry soldier is equipped and fights much the same way as the World War II soldier. Achieving the Objective Force vision will require state-of-the-art soldier systems that are effective across the spectrum of operations. To accomplish this, the Army has begun to manage soldier system requirements and acquisition as a system.

On the requirements side, the U.S. Army Training and Doctrine Command (TRADOC) established the soldier-as-a-system integration concept in November 2001. This integration concept consists of a management process, documented requirements, and soldier systems architecture. The integrated concept team (ICT) is composed of representatives from TRADOC schools and other Services and is chaired by the Commandant of the U.S. Army Infantry Center, Fort Benning, GA. At the working level, the TRADOC Systems Manager (TSM), Soldier and the Director of Combat Developments co-chair the soldier as a system ICT.

The soldier-as-a-system concept includes those items worn, carried, or consumed by soldiers. It also includes all items in the soldier's load and those items of equipment to accomplish unit missions (e.g., crew-served weapons and interunit radios). The ICT is working to validate the soldier-as-a-system concept and to identify immediate soldier needs and future soldier system operational capability requirements. The TRADOC ICT will address soldier system requirements across all areas of Doctrine, Training, Leader development, Organizations, People, and Facilities. Soldier-as-a-system requirements development will be an integrated effort to ensure connectivity, compatibility, modularity, and interoperability with other systems.

PEO, Soldier

On the acquisition side, Program Executive Office (PEO), Soldier was activated June 7, 2002, to provide centralized soldier system acquisition management. PEO, Soldier is the first organization with acquisition responsibility to develop, field, and sustain everything a soldier wears or carries. PEO, Soldier's mission is to arm and equip soldiers to dominate the full spectrum of peace and war, now and in the future. Developing and fielding an effective soldier system requires alignment, synchronization, and funding of multiple programs. PEO, Soldier manages 346 programs, organized under three project managers. Project Manager, Soldier Warrior consists of Product Manager, Land Warrior (LW) and Product Manager, Air Warrior. Project Manager, Soldier Weapons includes Product Manager, Individual Weapons and Product Manager, Crew-Served Weapons. Project Manager, Soldier Sensors and Equip-

Objective Force Warrior conceptual mock-up

ment consists of Product Manager, Multi-Spectrum Sensors and Product Manager, Clothing and Individual Equipment.

A key aspect of the PEO, Soldier-TRADOC soldier system partnership is a new focus on the immediate needs of soldiers deployed or preparing to deploy for real-world operations. An example of this is PEO, Soldier's Rapid Fielding Initiative (RFI), which recently fielded more than 20 equipment items to an entire brigade of the 82nd Airborne Division preparing to deploy to Afghanistan. (See the sidebar article on this page for more specific information on this initiative.)

Land Warrior And Air Warrior

Initial soldier system development focused on the dismounted infantryman. LW, the first soldier system, is a modular, integrated fighting system for infantry soldiers. State-of-the-art components and technologies are integrated into a lethal, survivable, mobile, and more aware soldier system. LW systems and components include a modular weapon system with thermal weapon sight, video camera gun sight, and multifunctional laser with digital compass; integrated headgear with helmet-mounted display and image intensifier; protective clothing and individual equipment; and individual soldier computer, radio, and Global Positioning System navigation system.

XM29 Integrated Airburst Weapon System

LW provides individual soldiers with secure voice and data communications that are reliable and will integrate with the Army Tactical Internet. LW Version 1.0, currently in testing, is the third significant upgrade to the system since 1998. Land Warrior improvements include the latest military and commercial technology developments and are based on lessons learned from rigorous experiments and realistic field exercises with real soldiers and small units.

LW Initial Capability will be fielded to the 75th Ranger Regiment beginning in 2004. LW will be fielded to the Army's Stryker Brigades and will include Stryker integration capabilities and other improvements. LW Advanced Capability will be fielded to the Objective Force.

Soldier system development for the helicopter crewman, Air Warrior, has completed developmental and operational testing and will begin fielding in 2004. Air Warrior is a new generation of integrated, mission-tailorable, combat-effective life support equipment designed to improve aircrew endurance, mobility, and performance. Air Warrior includes survival equipment, ballistic protection, and chemical and biological protection at reduced weight and bulk.

Lethality Enhancements

Several individual and crew-served weapon systems are being developed as lethality enhancements to the soldier system. The XM107 .50 caliber sniper system was already fielded to deploying units in response to immediate needs in the Afghanistan theater. The XM29 Integrated Airburst Weapon System will provide a precision airburst capability enabling accurate, lethal engagement of targets in defilade, behind walls, and in rooms. The XM29 successfully completed an advanced technology demonstration in 1999. The XM8 is a derivative weapon system of the XM29. It is a lightweight 5.56mm weapon that will improve performance by integrating rails and some sighting functions into the weapon. Commanders will have the

PEO, Soldier Rapid Fielding Initiative

The PEO, Soldier Rapid Fielding Initiative (RFI), which is briefly cited in the article that begins on Page 12, is an innovative acquisition process executed in partnership with the U.S. Army Training and Doctrine Command (TRADOC) and the U.S. Army Forces Command (FORSCOM) units. The RFI objective is to respond rapidly to the immediate needs of soldiers deployed or preparing to deploy for real-world operations.

How rapidly? For example, from Nov. 13-15, 2002, PEO, Soldier issued special individual equipment to an Afghanistan-bound Brigade of the 82nd Airborne Division. Needs were determined by the XVIII Airborne Corps and the U.S. Army Infantry Center based on lessons learned from units conducting operations in Afghanistan. The requirements-to-fielding process that normally takes years was accomplished in a matter of weeks.

Fielded equipment included the XM107 .50 caliber sniper weapon, thermal weapons sights, laser white light pointer, the Viper binocular laser rangefinder, improved rifle and machine gun optics, improved cold weather clothing, improved boots, advanced combat helmet, and M-Gator all terrain vehicles.

Coordination with TRADOC and unit commanders is ongoing, ensuring that unit- and mission-specific requirements will be met. The procurement and fielding methodology are designed to minimize the impact on the unit by working closely with unit staffs to ensure multiple items are fielded quickly and in a coordinated manner. This requires close, almost daily communication between the PEO and Army Staff (principally G-3, G-4, and G-8), along with TRADOC, FORSCOM, and the gaining Corps and Division.

Based on the success of the initial brigade RFI fielding, subsequent RFIs are planned for state-of-the-art soldier equipment using both available military gear and commercial off-the-shelf items. This Rapid Fielding Initiative shows how acquisition managers can use innovative requirements development and acquisition procedures to respond immediately to the needs of soldiers engaged in real-world operations.

ability to mission-tailor via changeable barrels (short, medium, and long). Early working prototypes of the XM8 have already been fired. The XM307 is a lightweight Advanced Crew-Served Weapon configured in both the .50 caliber family of ammunition and a new 25mm family. The 25mm family is capable of firing precision airburst and light armor penetrating munitions out to 2,000 meters.

OFW S&T Initiative

Objective Force Warrior (OFW) is the Army's primary science and technology (S&T) initiative to develop and demonstrate soldier system technology for the Objective Force. OFW technology developments will be included in the LW Advanced Capability System. The initiative will result in technologies that will enable unsurpassed, leap-ahead capability enhancements for Objective Force soldier systems. An integrated, system-of-systems approach is being employed focusing on individual warriors and small units.

The OFW goal is to create an overwhelmingly lethal, fully integrated individual combat system, including weapon, head-to-toe individual protection, netted communications with links to sensors and FCS command and control systems, soldier-worn power sources, and enhanced human performance. Technology focus areas include weight reduction, power enhancement, sensory enhancement, full-spectrum individual protection, collaborative and networked situation understanding, robotics, direct and indirect fires effects, and embedded training and mission rehearsal capabilities.

The OF Soldier

We all desire OF soldiers to possess unsurpassed, revolutionary capability enhancements in situational awareness, lethality, survivability, and other areas. Soldiers must have overmatch capability against any potential adversary across the spectrum of operations. They will be completely integrated within the FCS unit of action.

LW, the first soldier system

The OF soldier and small unit will operate with unprecedented situational awareness and understanding, will be linked to improved ground and air sensors, and will be seamlessly integrated with FCS communications and data systems. Shared situational awareness and decision support aids will enable small dismounted units to develop the situation out of physical or visual enemy contact and maneuver to positions of advantage. It is hoped that surprise contact and meeting engagements will be a thing of the past.

The lethality component of the OF soldier will be based on a family of lightweight weapons with advanced fire control and synchronized direct and indirect fires from the FCS. OF soldiers and small units will be capable of massing effects from a variety of organic and supporting weapons. They will also be capable of nonlethal engagement.

The OF soldier system will provide full-spectrum ballistic; environmental; and nuclear, biological, and chemical (NBC) protection integrated in an advanced combat uniform or ensemble. The ensemble will include advanced camouflage and signature reduction as well as physiological monitoring and medical self-aid capabilities.

Weight reduction and power enhancement are central features of OF soldier system development. The soldier's fighting load will weigh 40-50 pounds, compared to the 90-pound-plus loads carried by soldiers today. Developing and emerging power-source technologies are being exploited to provide lightweight, wearable, long-duration power sources. The OF soldier system will be capable of autonomous operation for 72 hours.

XM307 machine gun Advanced Crew-Served Weapon

The system will also include embedded training and on-the-move virtual planning and rehearsal capabilities. This will enable en route mission planning and rehearsal and quick response to mission changes and intelligence updates.

Conclusion

Soldier system capabilities will be the foundation of successful Army transformation. Achieving this will require comprehensive, effective soldier system requirements determination and acquisition management. All PEO, Soldier organizations will be part of a synchronized effort to produce the world's best soldier system. Team Soldier will support Army transformation with effective, state-of-the-art soldier systems that will be the centerpiece of the Objective Force.

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GEN John M. Keane

23RD ARMY SCIENCE CONFERENCE FEATURES TRANSFORMATION SCIENCE AND TECHNOLOGY

Dr. John A. Parmentola and Kelly S. Stratchko

Introduction

The 23rd Army Science Conference (ASC), held Dec. 2-5, 2002, in Orlando, FL, was the 2002 capstone event for the science and technology (S&T) community. The conference theme, *Transformational Science & Technology for the Army … a race for speed and precision,* emphasized the critical role of S&T in enabling Army transformation to the Objective Force.

Inaugurated in 1957 and sponsored by the Assistant Secretary of the Army for Acquisition, Logistics and Technology (ASAALT), this biennial event is the Army's premier professional forum for the S&T community to discuss the latest developments and emerging technologies and their impact on future soldiers. The ASC provides a unique opportunity to exchange and leverage ideas that are relevant to the Army's mission across the scientific and engineering disciplines. In addition, the conference publicly recognizes the important technical achievements of the scientists and engineers who have distinguished themselves through proven scientific and technical excellence by the work they perform for the Army. This was the first ASC that accepted papers relevant to the Army mission from industry, academia, and other government organizations, all of which competed for the ASC Best Paper Awards.

The ASC traditionally attracts intense interest and support from the Army S&T community. More than 1,250 people attended the conference—nearly triple the 2000 ASC participation—with the largest percentage of increases coming from academia and industry. The overwhelming success of the 2002 ASC is attributed to the expanded conference scope beyond basic research that encompassed all areas of S&T, the inclusion of academic and industrial participation, and a boosted effort to advertise this event.

Keynote Speakers

Among the many highlights of the conference was the first keynote address presented by GEN John M. Keane, Vice Chief of Staff of the Army. Keane praised the dedication and courage of those who unselfishly commit and sacrifice their lives to protecting our Nation. His address stressed the importance of changing the way the Army fights and deploys to revolutionize warfighting in the 21st century.

The next keynote speaker and conference host, ASAALT Claude M. Bolton Jr., discussed the conference's theme of speed and precision relative to transformation. Bolton emphasized the significant progress already made in a wide range of technologies applicable to guns, communications, and reduction of the logistics footprint to enable the sustainment of the Objective Force.

ASAALT Claude M. Bolton Jr.

Other Presentations

With transformation as the central topic, the conference provided additional opportunities to discuss other significant forms of transformation occurring in academia and industry. Dr. Steven B. Sample, President of the University of Southern California, eloquently predicted the roles of universities in our society in the 21st century. The agenda then turned to the topic of organizational change through lessons learned from industry. Daniel P. Burnham, Chairman and CEO of Raytheon, described the challenges he undertook in transforming Raytheon into a highly successful and efficient organization. He accomplished this through vision, leadership, and application of the six-sigma process.

The first day's speeches concluded with Deputy Assistant Secretary for Research and Technology Dr. A. Michael Andrews II outlining major S&T achievements since the start of Army transformation in 1999. These included advances in technologies for unmanned aerial vehicles; robotic vehicles; active protection systems; command, control, and communications on-the-move; networked missiles; and direct-fire lethality. He also discussed future Army investments in key S&T areas that will enable Army transformation to the Objective Force.

Second Day's Events

The second day included speeches and topical panels devoted to the Future Combat Systems (FCS). Roger A. Krone, Senior Vice President of Boeing, spoke on the evolution of the integrated battlespace, providing an insightful perspective into the future of this important area of Army transformation to the Objective Force. A robotics topical panel chaired by Director of U.S. Army Research Laboratory (ARL) Dr. Robert Whalin and co-chaired by Dr. William Ribich of Foster-Miller followed his speech. The morning session concluded with a command, control, communications, computers, intelligence, surveillance, and reconnaissance topical panel chaired by U.S. Army Communications-Electronics Command (CECOM) Director Robert Doto and co-chaired by GEN Paul F. Gorman (USA, Ret.).

The luncheon speaker, GEN Paul J. Kern, Commanding General, U.S. Army Materiel Command (AMC), emphasized the importance of scientific discoveries in shaping the future of the Objective Force and the urgency of transitioning new knowledge into practical application. He challenged the scientists and engineers in the audience to spend more of their time and creative thinking on understanding the implications and applications of their work for the soldier. Following Kern was LTG John M. Riggs, Director of the Objective Force Task Force, who described the way ahead for FCS and the Army's path to the Objective Force.

Third Day's Events

The third day's agenda included speeches, topical panels, and the awards banquet—a key event. First, MG William L. Bond, Deputy for Systems Management and Horizontal Technology Integration, addressed the challenges in achieving survivability for light-combat systems and how this requires a radical change in our approach to survivability. He pointed out that while armor will continue to play a role, there will be greater emphasis on other critical technologies to ensure acceptable levels of survivability. Following Bond was a speech on Objective Force Warrior by Philip Brandler, Director, U.S. Army Natick Soldier Center, and an immersive technology topical panel chaired by Dr. Michael Macedonia, Program Executive Office, Simulation, Training, and Instrumentation (PEO, STRI), and co-chaired by Dr. William Swartout, Technical Director of the Institute for Creative Technologies. The morning session concluded with a nanotechnology topical panel chaired by Dr. John Gassner, Chief Scientist, U.S. Army Soldier and Biological Chemical Command (SBCCOM), Natick Soldier Center, and co-chaired by Dr. Michael Sennett of SBCCOM.

A high point of the day was a luncheon speech by Dr. Ray Kurzweil, Founder and CEO of Kurzweil Technologies, and 1999

Dr. A. Michael Andrews II

recipient of the National Medal of Science and Technology. His primary message was that the future will be filled with extraordinary opportunities to exploit new technologies. He also made some interesting predictions, which are contained in his briefing posted on the ASC Web site at **http://www.asc2002.com**. Dr. Thomas M. Connelly Jr., Senior Vice President and Chief Science and Technology Officer for DuPont, followed with a speech on future manufacturing challenges, especially in the area of nanotechnologies for the soldier. DuPont is one of the Army's key partners in the Institute for Soldier Nanotechnology.

The evening awards banquet was the highlight of the day, honoring Army scientists and engineers with 2001 and 2002 Army Research and Development Achievement Awards. One hundred and forty-nine Department of the Army researchers were recognized for their outstanding scientific and technical accomplishments. The distinguished speaker for the awards banquet was Dr. Richard E. Smalley of Rice University, a Nobel laureate in chemistry, who spoke on the declining interest of America's youth in the fields of science, math, and technology. He proposed that our Nation focus on the goal of energy sufficiency, much like it focused on the space race during the Cold War, to engage our youth in science, math, and technology.

Best Paper Awards

Dr. A. Michael Andrews II presented the 23rd Army Science Conference Best Paper Awards. The awards honored the authors of technical papers presented at the conference that were judged worthy of special acknowledgement for their outstanding quality.

Three papers were judged by scientific peers as representing the highest quality research presented at the conference. Authors of two of these papers received a bronze medallion, while the author of the paper judged as representing the overall best in Army research received the Paul A. Siple Memorial Award. Awardees are as follows:

• The winner of the 2000 Paul A. Siple Memorial Award was Dr. Eric Wetzel of the U.S. Army Research Laboratory (ARL) for his paper, *Advanced Body Armor Utilizing Shear Thickening Fluids*. Wetzel's co-authors are Y.S. Lee, R.G. Egres Jr., and N.J. Wagner of the Center for Composite Materials and Department of Chemical Engineering, University of Delaware.

• The first bronze medallion was awarded to Dr. William E. Bentley of the University of Maryland Biotechnology Institute for his paper, *Microbial Cell Factories: Cell-to-Cell Communication Plays a Key Role*. His co-authors are Matthew P. DeLisa of the Center for Biosystems Research, University of Maryland Biotechnology Institute, and Dr. James J. Valdes of SBCCOM.

• The second bronze medallion was awarded to Mike Powell of MesoSystems Technology Inc. for his paper, *Ammonia-based Hydrogen Generation for Fuel Cell Power Supplies.* His co-authors are M.S. Fountain, C.J. Call, and A.S. Chellappa of MesoFuel Inc.

Fifteen papers were selected for recognition, and the authors and titles are as follows:

• Dr. Eric Wetzel, ARL, for his paper, *Advanced Body Armor Utilizing Shear Thickening Fluids*. Wetzel's co-authors are Y.S. Lee, R.G. Egres Jr., and N.J. Wagner of the Center for Composite Materials and Department of Chemical Engineering, University of Delaware.

• Dr. Michael Wraback, ARL, for his paper, *Fundamental Studies of Wide Bandgap Ultraviolet Optoelectronic Materials and Devices for the Objective Force*. Wraback's co-authors are H. Shen, G.A. Garrett, A.V. Sampath, C.J. Collins, S. Rudin, K. Aliberti, F. Semendy, and P.G. Newman.

• Dr. William Anderson, ARL, for his paper, *A Practical Approach to the Theoretical Prediction of Propellant Burning Rate*. Anderson's co-author is Martin S. Miller.

• Dr. Chad Roy of the U.S. Army Medical Research Institute of Infectious Diseases for his paper, *Inhalation as an Alternative Route of Delivery for Medical Countermeasures Against Biological Threat Agents*. Roy's co-authors are J.M Hartings and M.L. Pitt of the U.S. Army Medical Research Institute and M. Bray of the National Institute of Allergy and Infectious Diseases.

• Dr. Jeffrey Jorgeson of the U.S. Army Engineer Research and Development Center (ERDC) for his paper, *Improving Response Time and Model Precision for Tactical Dam Breach Analyses with the Tele-engineering Toolkit*. Jorgeson's co-author is Larry Lynch, ERDC.

• Mike Powell of MesoSystems Technology Inc. for his paper,

Ammonia-based Hydrogen Generation for Fuel Cell Power Supplies. His co-authors are M.S. Fountain, C.J. Call, and A.S. Chellappa of MesoFuel Inc.

• Dr. Latha Kant of Telcordia Technology Inc., for his paper, *Fault Localization and Self-healing Mechanisms for FCS Networks*. His co-authors are A.S. Sethi and M. Steinder of Telcordia Technology Inc.

• Dr. Raju Namburu of ARL for his paper, *Computational Electromagnetic Methods for Combat Systems*. His co-authors are Eric Mark and Jerry A. Clarke of ARL.

• Michael Scanlon of ARL for his paper, *An Acoustic Sensor on the Soldier Monitors Physiology, Voice and Other Sounds for Situational Awareness.* His co-author is Latasha I. Solomon of ARL.

• Dr. Bradley Schilling of CECOM's Night Vision and Electronic Sensors Directorate for his paper, *Three-Dimensional Imaging of Obscured Targets by Multiple-Return Laser Radar.* His co-authors are Dallas N. Barr, Glen C. Templeton, Lawrence J. Mizerka, and C. Ward Trussell of CECOM's Night Vision and Electronic Sensors Directorate.

• Dr. William E. Bentley of the University of Maryland Biotechnology Institute for his paper, *Microbial Cell Factories: Cell-to-Cell Communication Plays a Key Role*. His co-authors are Matthew P. DeLisa of the Center for Biosystems Research, University of Maryland Biotechnology Institute, and Dr. James J. Valdes of SBCCOM.

• Dr. Jeff Wolfenstine of ARL for his paper, *Nano-scale Anodes for Use in Li-ION Batteries.* His co-authors are D. Foster, J. Read, and W.K. Behl of ARL.

• Jennifer Fowlkes of the University of Central Florida Institute for Simulation and Training for her paper, *Optimizing Haptics Perceptions for Advanced Army Training Systems: Impacts on Performance*. Her co-authors are Paula J. Durlach and Julie Drexler from the U.S. Army Research Institute for the Behavioral and Social Sciences, Jason Daly and Roberto Alberdeston from the University of Central Florida, and Chris Metevier of PEO, STRI.

• Martial Hebert of Carnegie Mellon University for his paper, *Evaluation and Comparison of Terrain Classification Techniques from LADAR Data for Autonomous Navigation*. His co-authors are Nicolas Vandapel, Stefan Keller, and Raghavendra Rao Donamukkala of the Robotics Institute at Carnegie Mellon University.

• Dr. John Baras of the University of Maryland Electrical and Computer Engineering Department for his paper, *On-Line Detection of Distributed Attacks from Space-Time Network Flow Patterns*. His co-authors are A.A. Cardenas and V. Ramezani of the University of Maryland.

Final Day's Agenda

The fourth and final day was devoted to three important topical panels: biotechnology, advanced computing, and combating terrorism. The biotechnology panel was chaired by Dr. Robert Campbell of the U.S. Army Research Office and co-chaired by Dr. Michael Ladisch of Purdue University. This panel was followed by the advanced computing panel, which was chaired by Dr. N. Rahdakrishnan of ARL and Dr. Vipin Kumar of the University of Minnesota. The conference ended with the combating terrorism panel chaired by LTG William Tangney (USA, Ret.) and co-chaired by Robert Touhy of Hicks and Associates Inc.

Other conference activities involved academic, government, and industry participation in 15 parallel technical sessions; 75 technical paper oral presentations; and 300 poster presentations. Attendees viewed major technology displays at the conference, including the S&T Objective Force display that focused on transformational technologies and the high-performance computing display that showcased the latest computational tools and techniques essential to advancing Army transformation to the Objective Force.

Conclusion

Conference attendees unanimously agreed that the 2002 conference was the best ever. Army senior leadership, industry, and academia participation affirmed the critical role of S&T in Army transformation. The special efforts of the Army's S&T community and the support provided by AMC, ARL, the Army Corps of Engineers, the Army Medical Research Institute of Infectious Diseases, and the Army Space and Missile Defense Command were essential to making this an extraordinary event.

DR. JOHN A. PARMENTOLA is a Special Assistant for the Deputy Assistant Secretary of the Army for Research and Technology, OASAALT. He has a B.S. degree in physics from the Polytechnic Institute of Brooklyn and a Ph.D. in physics from the Massachusetts Institute of Technology.

KELLY S. STRATCHKO is a Program Analyst at ARL. She has a B.S. in business management from the University of Maryland University College.

Shown left to right are Claude M. Bolton Jr., Assistant Secretary of the Army for Acquisition, Logistics and Technology; Dr. William (Bill) McCorkle, Director, Aviation and Missile Research, Development and Engineering Center; Dr. Zita M. Simutis, Acting Director, U.S. Army Research Institute for Behavioral and Social Sciences; Dr. James (Jim) R. Houston, Director, U.S. Army Engineer Research and Development Center; and Dr. A. Michael Andrews II, Deputy Assistant Secretary of the Army for Research and Technology.

2002 ARMY RESEARCH AND DEVELOPMENT LABORATORY OF THE YEAR AWARDS

Joseph E. Flesch

Introduction

Since 1975, the Assistant Secretary of the Army for Acquisition, Logistics and Technology (ASAALT) has presented annual Research and Development Laboratory (RDL) of the Year Awards to Army organizations in recognition of outstanding technical and managerial programs implemented during the preceding fiscal year. Specifically, RDL Awards recognize the best research and development (R&D) programs and best-managed organizations that enhance the capability and readiness of Army operational forces and the national defense and welfare of the United States.

ASAALT Claude M. Bolton Jr. hosted the latest RDL Award ceremony held Dec. 2, 2002, during the Army Science Conference in Orlando, FL. He also delivered brief remarks, stating that during the past 3 years, the Army has been implementing a vision to become more strategically responsive and dominant across the spectrum of operations. Bolton noted that the Army is making smart investments, and the number one investment priority is the development of the Future Combat Systems and the enabling technologies necessary to achieve the Objective Force in this decade. He added that the Interim Force will help get us there, but it is the Objective Force that will guarantee the unquestioned, long-term military superiority of the United States. According to Bolton, this underscores the importance of Army laboratories in making the Objective Force a reality. Work conducted in Army labs will have a large role in determining the future of the U.S. Army, and teamwork is imperative. Bolton said that the Army faces tremendous challenges to develop and field an Objective Force by the end of the decade, but it can be accomplished with the support of Congress and with the help of great minds from Army research laboratories, American universities, and private industry working as a team. Bolton believes that the Army has the finest managers, scientists, and engineers in the world working for our future warfighters on this great endeavor. The organizations judged the best of the best for 2001 were honored with 2002 RDL Awards.

The selected laboratories demonstrate a commitment to excellence both in their technical programs and in the management of their organizations. Recipients were selected by an evaluation committee chaired by Dr. John A. Parmentola, Special Assistant for the Deputy Assistant Secretary of the Army for Research and Technology, Office of the ASAALT. Committee members were highly qualified individuals from the Army and DOD science and technology communities. The group evaluated both written nominations submitted through each organization's major command and verbal presentations from each organization's commander or director. Laboratory rankings were based on accomplishments and impacts; organizational vision, strategy, and plans; resource management; and continuous improvement.

Based on the review of accomplishments, the evaluation committee selected two 2002 award recipients, one in the Large Laboratory Category (600 employees or more) and one in the Small Laboratory Category (less than 600 employees). Additionally, the evaluation committee selected one large laboratory for a 2002 RDL Excellence Award in recognition of FY01 research accomplishments.

Large Lab Of The Year

The winner of the 2002 RDL of the Year Award—Large Laboratory Category is the U.S. Army Corps of Engineers Engineer Research and

Development Center (ERDC), headquartered in Vicksburg, MS.

Of its many outstanding technical accomplishments in FY01, ERDC was especially recognized for conducting breakthrough research on the physics of blast/structure interaction and for developing a physics-based computational model for simulating the interaction of blast waves with complex structures. This allows accurate analysis of the vulnerability of buildings to terrorist threats and the development of countermeasures to retrofit buildings to defeat the threat. The technology is being used to fast-track analyses to retrofit the Pentagon, embassies around the world, and other federal facilities. The resulting application of these anti-terrorism techniques to the renovated wedge of the Pentagon hit by the September 11, 2001, terrorist attack is credited with saving hundreds of lives. John Yates, Civilian Security Manager of the Pentagon, who survived the attack and appeared on the *60 Minutes II* show, "The Miracle of the Pentagon," which aired Nov. 28, 2001, stated, "It's a testament to the work the people in the renovation did and to the engineers. If it hadn't been done, if there had been no structural hardening, I can't imagine what the death and destruction would be. It would have been more catastrophic than what it is, ten times, a hundred times worse … I don't ask why anymore; I just say thank you."

ERDC was also recognized for outstanding management performance in 2001 for its investment in and implementation of communications technologies that enable a virtual organization. This provides enabling communications technology allowing its employees at disparate geographic locations to work together in support and performance of research. They integrated technologies such as video teleconferencing, high-speed networking, shared applications, and the Internet in support of virtual operations. By implementing this enhanced collaborative infrastructure, ERDC can rapidly leverage its widespread resources and those of other government agencies, academia, and industry to rapidly deliver solutions to crises anywhere in the world.

Small Lab Of The Year

The winner of the 2002 RDL of the Year Award—Small Laboratory Category was the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI), Alexandria, VA. ARI's mission is to maximize individual and unit performance and readiness to meet the full range of worldwide Army missions through advances in the behavioral and social sciences. ARI is the primary Army laboratory that focuses on the human dimension of warfighting—soldiers.

Of ARI's many technical accomplishments in 2001, it was specifically recognized for the development of innovative simulation-based aviator training. ARI's Simulator Training Research Advanced Testbed for Aviation (STRATA) is the only AH-64 Apache simulator that has all aspects of primary system failure and the backup control system. STRATA also operates the Army's only OH-58D Kiowa Warrior simulator. STRATA provides quick and effective aviator training that will positively impact and improve aviator training and mission readiness, enhance aviator safety, and reduce training costs.

ARI was also recognized for outstanding management achievement for its implementation of activity-based costing. ARI was the first Army R&D laboratory with an approved activity-based costing plan. The model supports transformation decisionmaking, pricing of customer work, and management of in-house research capacity. The model is a tool that provides the laboratory an understanding of the actual costs for R&D work based on the activities used to accomplish the work. In addition, implementation of activity-based costing increases the laboratory's ability to better estimate the full cost of work performed.

Excellence Award

The recipient of the 2002 RDL Award for Excellence—Large Laboratory Category was the U.S. Army Aviation and Missile Research, Development and Engineering Center (AMRDEC), Redstone Arsenal, AL. The mission of AMRDEC is to transform the Army to a more lethal, survivable, flexible, deployable, and affordable Objective Force while reducing its logistical footprint. AMRDEC is recognized for excellence in FY01, specifically for its rapid integration of the HELLFIRE laser-guided missile with the Air Force Predator Unmanned Aerial Vehicle. This gave the Predator the capability to identify, engage, and destroy targets of opportunity on the battlefield. The weaponized Predator has proved to be invaluable in destroying high-value targets while minimizing losses to friendly forces.

In the management arena, AMRDEC is recognized for excellence in 2001 for the collaborative efforts of its National Rotorcraft Technology Center (NRTC). This is an innovative and unique partnership with 3 federal agencies, 13 universities, and 9 principal and supporting members of the rotorcraft industry. NRTC obtains a 4-to-1 leverage of Army dollars using partnership dollars to advance and maintain U.S. supremacy in rotorcraft technology.

JOSEPH E. FLESCH is a Principal Project Analyst with AT&T Government Solutions Inc. He wrote this article while on a contract assignment in the Office of the Deputy Assistant Secretary of the Army for Research and Technology, OASAALT.

2001 AND 2002 ARMY RESEARCH AND DEVELOPMENT ACHIEVEMENT AWARDS

Dr. John A. Parmentola and Dr. Beverly C. Harris

Introduction

The Army Research and Development Achievement (RDA) Award recognizes outstanding scientific and engineering achievement or technical leadership throughout the Army's commands; laboratories; and research, development, and engineering centers. Each Army major command (MACOM) annually nominates individuals or small teams that have conducted innovative and outstanding research and development (R&D). The evaluation panel is chaired by the Director of Research and Laboratory Management, Office of the Assistant Secretary of the Army for Acquisition, Logistics and Technology (OASAALT), and consists of leading experts in the Army science and technology community.

R&D Achievement Awards

The 2001 and 2002 RDA Awards were presented by Dr. A. Michael Andrews II, Deputy Assistant Secretary of the Army for Research and Technology, OASAALT and Army Chief Scientist, at the 23rd Army Science Conference held Dec. 2-5, 2002, in Orlando, FL. The 2001 awards recognize work performed in calendar year 2000, and the 2002 awards recognize work performed in calendar year 2001. One hundred and forty-eight Department of the Army researchers were recognized for their outstanding scientific and technical accomplishments.

Award recipients distinguished themselves through their proven scientific and technical excellence. Their individual contributions will improve the Army's capabilities and enhance U.S. national defense and welfare. Their hard work and dedication bring great credit to themselves, their organizations, and the U.S. Army.

Winners of the 2001 RDA Awards listed under the Army MACOM, major subordinate command, or other activity where they are employed, are as follows:

U.S. ARMY MATERIEL COMMAND
Army Research Laboratory
James Despirito
Harris Edge
Dr. Anders Sullivan
Dr. Andrew Mark
Dale Shires
Dr. Nora Beck Tan
Dr. Dawn M. Crawford
Eugene Napadensky
Dr. James Sloan
Dr. Amanda L. Jenkins
Dr. Ray Yin
Dr. Mark Nixon
Dr. Robert J. Leib
Dr. Rosario C. Sausa
Dr. George W. Lemire
Dr. Wishvender K. Behl
Dr. Jeff Read
Dr. Jeff Wolfenstine
Dr. Nicholas F. Fell Jr.
Dr. Donald L. Foster
Dr. James B. Gillespie
Dr. Paul Pellegrino
Dr. Sam S. Zhang
Dr. T. Richard Jow
Dr. Kang Xu
Edward W. Kennedy
Stephen J. Schraml
Dr. Paul S. Gough
Dr. Michael J. Nusca

Natick Soldier Center
Arthur H. Carrieri
Carol J. Fitzgerald
Dr. C. Patrick Dunne
Quoc Truong
Dr. Eugene Wilusz
Kris Senecal
Richard W. Decker II

Armament Research, Development and Engineering Center
Dr. S. Bulusu
Michael Glennon
Robert Mysliwiec
Dr. Frank J. Owens
Bernard Rice
Maurice Scavullo
Dr. Samuel Sopok
Stephen Van Dyke-Restifo
Dr. Ernest L. Baker
Arthur S. Daniels
Richard Fong
Koon-Wing Ng
William Ng
John Underwood

Aviation and Missile Research, Development and Engineering Center
Milton E. Vaughn Jr.

Communications-Electronics Command Research, Development and Engineering Center
Dr. Dallas N. Barr
Michael E. Gruen
Jonathan S. Lei
John E. Nettleton
Dr. Leo A. Almeida

Dr. John A. Kosinski
John A. Manzione, P.E.
Dr. Bradley W. Schilling

Edgewood Chemical Biological Center
Janet L. Jensen
Dr. H. Dupont Durst

Simulation, Training and Instrumentation Command (Now Program Executive Office, Simulation, Training, and Instrumentation)
Cynthia T. Harrison
Douglas J. Parsons

U.S. ARMY CORPS OF ENGINEERS
Engineer Research and Development Center
Dr. Robert E. Davis

U.S. ARMY MEDICAL RESEARCH AND MATERIEL COMMAND
U.S. Army Medical Research Institute for Chemical Defense
B. Joseph McEntire
Dr. Nabih Alem
Fred Brozoski
Dr. Julie A. Wilson
Dr. Mary Kate Hart
COL Jonathan Berman
LTC Dennis E. Kyle
COL G. Dennis Shanks
COL Wilbur K. Milhous

Winners of the 2002 RDA Awards, listed under the Army MACOM, major subordinate command, or other activity where they are employed, are as follows:

U.S. ARMY MATERIEL COMMAND
Army Research Laboratory
Richard Andrejkovics
Jerome D. Gerber
L. Scott Miller
King Siu
Dr. Paul Shen
Dr. Michael Wraback
Dr. Stephen B. Bayne
Bruce R. Geil
Timothy E. Griffin
Charles J. Scozzie
Dr. C. Wesley Tipton
Dr. Jan L. Allen
Dr. Michael S. Ding
Dr. Richard Jow
Dr. Kang Xu
Dr. Sam S. Zhang
Dr. Nibir K. Dhar
Dr. Charles R. Hummer
Dr. Pat Kingman
Dr. John D. Powell
Elias J. Rigas
Walter N. Roy
Dr. Shawn M. Walsh
Davis P. Flanagan
Gumersindo Rodriguez
Alan R. Teets
Jerry A. Clarke
James A. Boehm III
Dr. Patrick S. Debroux
Jose M. Gonzalez
Dr. Won S. Kim
Richard A. Vega
Dr. Daniel M. Potrepka
Dr. Steven C. Tidrow

Natick Soldier Center
Robert Berlind
MAJ Peter Carrabba
David LeMoine
Dr. Ferdinando F. Bruno
Dr. Michael Sennett
Donald W. Pickard
Dr. Brian Corner
Il Young Kim
Dr. Calvin Lee

Armament Research, Development and Engineering Center
Dr. Ernest L. Baker
Arthur S. Daniels
Dr. Brian E. Fuchs
Donald A. Geiss Jr.
Gerard I. Gillen
Koon-Wing Ng
John W. Woods

Aviation and Missile Research, Development and Engineering Center
Dr. Mark B. Tischler
Michael R. Christian
Ralph H. Halladay
W. Scott Howard
Donald E. Lovelace

Communications-Electronics Command Research, Development and Engineering Center
George W. Au
Laura Cristo

Edgewood Chemical Biological Center
Dr. Charles H. Wick
Jennifer Bucher
Dr. Cheng J. Cao
Dr. Akbar S. Khan
Dr. Kevin P. O'Connell
Dr. Sanjiv Shah
Rebecca Tanner

U.S. ARMY CORPS OF ENGINEERS
Engineer Research and Development Center
Dr. Cary D. Butler
James C. Ray

U.S. ARMY MEDICAL RESEARCH AND MATERIEL COMMAND
LTC Larry A. Sonna
Jill Ferlan
Dr. Gregory E. Garcia
MAJ Karen Kopydlowski
LTC Julie Ann Pavlin
Dr. Sheila A. Peel
SPC Patrice Sellers

DEPUTY CHIEF OF STAFF, G-1
U.S. Army Research Institute
Dr. David M. Johnson
Dr. John E. Stewart

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BATTLEFIELD INFORMATION CONCEPTS FOR THE HIGHLY MOBILE WARRIOR

Matthew J. Zieniewicz, P.E.,
and Eric Goodman

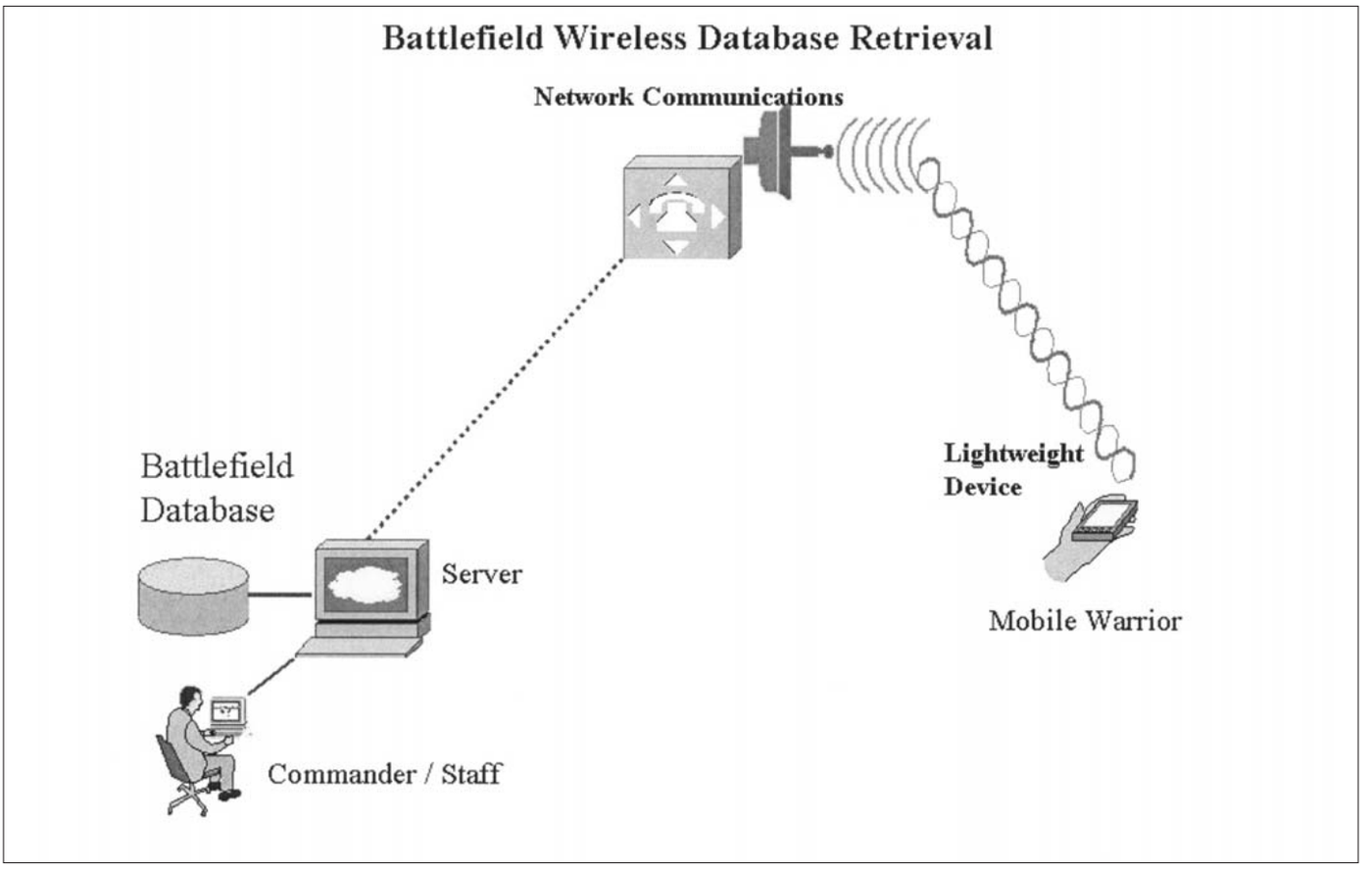
Introduction

With the advent of the Objective Force, future warriors will need to retrieve critical information in a timely manner while operating in a highly mobile environment. One method to accomplish this employs a small, secure, wireless, and lightweight device that can display relevant battlefield information in a useable format based on the current location. This can be done by leveraging and modifying commercial hardware systems and integrating military applications built to commercial specifications. The Research, Development and Engineering Center (RDEC), Communications-Electronics Command (CECOM), Fort Monmouth, NJ, is exploring advanced concepts such as these through both in-house and contractor research and development programs in support of warrior-based efforts. This article describes some of the ongoing advanced research projects that involve lightweight mobile devices for the battlefield.

The lessons learned from these research projects will provide valuable insight into new concepts and provide the groundwork for their application in future development and PM programs. One in-house effort explores the most efficient approach to retrieve battlefield data, such as the Joint Common Database (JCDB), from remote sources. There is also a current Small Business Innovative Research (SBIR) solicitation to develop a lightweight system that incorporates self-aware location-based services and decision aids with a long-range communications link. Both of these research projects will enable the Army to explore lightweight mobile concepts and decide the appropriateness of this technology in the acquisition of future fielded systems.

For a soldier on the battlefield, the information must be timely and accurate. Commercial technology can be leveraged, but does not currently meet all the requirements of a battlefield system. Several additional system requirements are imposed on the soldier beyond that of a commercial mobile information system. These additional requirements include security of the communications link, weight/power of the mobile station, ruggedness of the system, interoperability with legacy systems, ease of use, and visual organization. The combination of these conditions results in a unique system solution. The goal of the research efforts at CECOM for the mobile warrior involves developing an architecture for a system to retrieve and transmit current battlefield information over an intermittent secure wireless communications link to a lightweight device and to demonstrate portions of this architecture with prototype devices. (See figure on Page 24.)

Until recently, technology was not mature enough to allow for battlefield information to be presented to mobile, dismounted front-line commanders in a timely fashion. As the Army begins to field a wearable computing device to extend digitized command and control (C2) to the front-line soldier, CECOM is exploring even smaller and lighter devices for the future. An envisioned scenario has the dismounted commander retrieving military database information over a wireless link on a lightweight device in a timely manner. Just as a mobile salesman can retrieve daily appointments and sales order information, the future soldier will be able to retrieve critical information on the battlefield that will



allow him to win the battle quickly and with fewer friendly casualties.

Information Retrieval Issues

One project, an Independent Laboratory In-house Research (ILIR) effort in the C2 Directorate, involves examining the system architecture, software architecture, and latency issues associated with database retrieval and synchronization using lightweight devices in a mobile environment. Database retrieval in a military environment has four special conditions that make the problem of mobile information retrieval unique. Soldiers cannot dock computing devices at the end of the day and synchronize them over a wired connection to a large remote database. For this reason, all data communications must be over a wireless communications link with limited channel capacity. For the soldier, his information is time-critical. The soldier must be aware of the enemy's actions or location or he might die. The soldier may be out of communications range for extended periods of time and cannot wait until he exits a "dead zone" in communications coverage. Therefore, he must constantly have a subset of critical information with him at all times, indicating the timeliness and accuracy of this information. The soldier must be able to transmit and receive his information without it being compromised through eavesdropping. Failure of the soldier's mobile database retrieval system in any of these areas could result in, at a minimum, the soldier being unable to accomplish the mission and possibly that soldier or other soldiers being injured or killed.

The ILIR effort will explore methods to perform database retrievals and/or synchronizations with large remote databases over a wireless link. The impact of dead zones and periods of time without connectivity will be examined. A means by which critical information can be pre-cached on the user's device will be investigated. All of this will be accomplished within the size, weight, and power restrictions of a surrogate lightweight mobile device.

Synchronization

A key issue for our mobile system is mobile database synchronization with centrally located databases (i.e., JCDB). This problem can be approached in several ways. Full offline replication could be attempted but is not a solution for two reasons: data transmission time and limited storage capacity on the lightweight mobile device. Partial replication combined with some

means of communications connectivity sensing is one approach that is being explored. Another technique, push-pull of data based on time-stamping with some type of pre-caching critical data, shows the most promise based on initial analysis. Finally, an ad hoc query system with local storage is also being examined.

As part of this research effort, wireless packets will be captured to determine the actual traffic load on the communications channel for each scheme proposed. The load on the communications channel will be a key factor in the final system selection because channel capacities are limited on the modern battlefield. Storage and memory footprints on the lightweight mobile device as well as processing requirements will also be key elements in the final evaluation of the system architecture.

In the previous projects, several software and system architecture issues have already been addressed. There is also an SBIR effort to develop both C2 software and a unique prototype lightweight computing device. This effort will develop Web-enabled, location-specific, decision aid applications and host them on a lightweight device (such as a handheld platform) with long-range reachback communications capability. (See figure on Page 24.) The primary focus will be to develop location-specific military software applications that can retrieve relevant information from remote sources based on the user's current location. These lightweight-compatible applications should automatically retrieve (either push or pull) remote database information that is relevant to the warfighter based on current location and/or situation awareness.

Design Phase

Issues that will be addressed during the design phase include protocol transmission, transmission efficiencies, and unique approaches to push/pull information to a mobile warfighter with intermittent communications connectivity. Techniques to sense when communications capability is present and pre-send (push) information during these optimum times must be developed. This system will also be able to display color maps. The system will enable the warfighter to use an extremely lightweight device to extract real-time situation awareness and intelligence information from remote sources and databases and display this information on his portable device. At the completion of this effort, a small self-contained prototype system consisting of warrior-specific software loaded on several lightweight devices communicating over a long range through a link with a central server will be demonstrated and delivered. As part of this effort, data retrieval from XML files and databases representative of the JCDB will be explored.

The Army is migrating to a modern digital battlefield. Because commanders use lightweight data devices for their day-to-day work when not at war, they will expect the same information flow on the battlefield.

Conclusion

The Army is migrating to a modern digital battlefield. Because commanders use lightweight data devices for their day-to-day work when not at war, they will expect the same information flow on the battlefield. These ongoing projects at CECOM explore several means to accomplish this using simulated battlefield data. The projects will provide the valuable groundwork for fielding a portable data device capable of secure wireless database and information retrievals under battlefield conditions. These advanced exploratory efforts leveraging commercial technology at CECOM will ensure that the warfighter has the latest information technology incorporated into his battlefield systems to allow him to act first and decisively to win the battle.

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ARL-SLAD DEVELOPS NBCCS ONLINE HANDBOOK

Timothy D. Mallory

Introduction

The U.S. Army Research Laboratory's Survivability and Lethality Analysis Directorate (ARL-SLAD) has developed a new Web site (**https://www-slad.arl.army.mil/Internal/NBCCS/home.html**) for program managers (PMs), combat developers (CBTDEVs), and materiel developers (MATDEVs) specifically pertaining to nuclear, biological, and chemical contamination survivability (NBCCS). This online electronic handbook organizes and centralizes most of the known works on NBCCS, thereby making that information readily available to better enable programs to meet survivability requirements. This article provides a brief discussion of the various features and information contained on the Web site.

Construction of the Web site was suggested at the March 2001 meeting of the Nuclear and Chemical Survivability Committee Secretariat (NCSCS) to improve the Defense acquisition community's awareness and understanding of NBCCS. Drew Farenwald, Chief of ARL-SLAD's Nuclear, Biological and Chemical (NBC) Effects Branch, volunteered the resources of ARL-SLAD to construct and publish the Web site.

The Web site design enables quick and easy access to various publications, handbooks, and technical reports pertaining to NBCCS. The Web site's layout, features, and navigation buttons are discussed below.

Policy And Regulations

Policy and guidance for NBCCS are contained in DOD Directive 5000.1, DOD Instruction 5000.2, and U.S. Army Regulation 70-75. Although these publications mandate general requirements in meeting NBC survivability, specific guidelines pertaining to NBCCS are given in the Quadrapartite Standardization Agreement 747, as adopted by the armies of the United States, the United Kingdom, Canada, and Australia. In addition, the Deputy Chief of Staff for Operations and Plans (DCSOPS) issued quantitative NBCCS criteria for U.S. Army materiel, which consists of three characteristics: hardness, compatibility, and decontaminability. The aim in producing systems with NBCCS characteristics is to ensure that there is no significant degradation (hardness) of the equipment's critical functions, and to enable its crew to complete the assigned mission (compatibility). A contaminated system and its crew can result in a permanent loss of mission, or might risk the crew's availability for combat until a decontamination procedure is performed to a safe level (decontaminability) that precludes crew casualties. Reinforcement of this policy by the DCSOPS was issued in a November 2000 memorandum requiring PMs, CBTDEVs, and MATDEVs to implement a rigorous approach to attain NBCCS.

Handbooks

To prepare an NBCCS program plan, users are encouraged to review the Web site's online handbook publications. These publications include the Materials Handbook, the NBC Survivability Handbook, and several military handbooks. Through familiarization with these handbooks, the goal is to establish the technical infrastructure of corporate understanding, commitment, and direction so that a comprehensive NBCCS program can be implemented. These handbooks contain examples of past experience involving field investigations and analyses of test results. These sources should be very useful in tailoring your programs and in helping to perform NBCCS evaluations of both fielded and developmental systems.

Presentations And Symposiums

In the early 1990s, NBCCS symposiums were sponsored by government, industry, and academia in the chemical and biological defense community and DOD components. The participants displayed a proactive approach in achieving NBCCS objectives and shared their progress in the design and testing of military components and materials. Users may be interested in the NBCCS information presented on several particular DOD programs. There are also briefings on policy, methodology, modeling and simulation, and laboratory results. This section also includes a slideshow entitled "A General Overview of NBCCS," which provides a basic understanding of NBCCS, presents examples, and explains its importance.

Technical Reports

The Web site contains technical reports of NBCCS assessments for various combat systems. The following programs or systems are included in these reports: Avenger, BLACK HAWK, Crusader, Javelin, Kiowa Warrior, Longbow Apache, Paladin, PATRIOT, Armored Gun System, Aviation Mission Planning Station, Hand-Emplaced Wide Area Munition, Multipurpose Integrated Chemical Agent Detector, and Single Channel Ground and Airborne Radio System. The Bibliographic Summary, contained in the Help section, lists these technical reports along with their abstracts and ordering information. Also, several technical reports are provided in electronic format and can be viewed online or downloaded from the Web site.

Journal And Magazine Articles

Numerous journal and magazine articles have been published discussing the goals, objectives, and importance of an NBCCS program. The Web site contains several articles that were released by the government to the general public to introduce NBCCS. These articles also explain the importance of why starting NBCCS early in the acquisition life cycle will yield cost savings and combat dividends as opposed to addressing it later. With this objective in mind, the attention to NBCCS by DOD contractors and those in academia and industry indicates that the NBC threat is serious and that with the proper technical guidance in design and manufacture of materiel,

NBCCS is achievable. Because of changes in policies and regulations, these articles take on a historical perspective. The online articles should provide users with a general philosophical understanding to implement a successful NBCCS program.

Analytical Results

The Web site also includes analytical results of laboratory studies. These results include immersion and permeation testing of polymers; absorption, desorption, and permeation tests of materials; and modeling for predicting degradation of mechanical properties of materials. The Bibliographic Summary, contained in the Help section, also lists these analysis reports along with their abstracts and ordering information. A few analysis reports are provided in electronic format and can be viewed online or downloaded from the Web site.

Help

The Help section of the Web site provides quick reference materials for locating publications, performing general inquiries, requesting test data and analyses, and reviewing NBCCS requirement statements used in operational requirements documents, test and evaluation master plans, and system specifications. A guidebook prepared by the U.S. Army Nuclear and Chemical Agency lists points of contact and testing facility locations. This information should be helpful in determining the best practices and approaches to use in preparing NBCCS program plans.

Links

Several hypertext "hotlinks" are provided that identify the primary technical expertise and programmatic support needed by PMs and those government agencies performing an NBCCS program. Links to external Web sites provide other useful information on chemical and biological defense training, doctrine, and equipment. Although the listing focuses on a few select areas, other DOD contractors and installations should also be explored. Consult these Web sites to find information about particular technical products or services. User involvement with these key resources is encouraged to meet current and future military procurement activities.

Contacts

The NCSCS is the primary focal point for NBCCS. Representatives from other government agencies participate in regular meetings. Users are encouraged to plan to attend NCSCS meetings in conjunction with the milestone decision review process. A contacts list of ARL-SLAD mission area managers is available to assist you during your review. Mission areas are established for ground, air, and missile defense; aviation; munitions; and command, control, communications, computers, and intelligence systems. Each of these areas has an NBCCS subject matter expert available to support ongoing programs.

Site Map

No Web site would be complete without a site map. This jump-point captures all content on the Web site and aids in rapid navigation. The site map enables users to find exactly what they are looking for in the least amount of time. The categories are consistent with the navigation button selections. Simply select an area of interest from the complete index.

Photo Gallery

The Photo Gallery section is organized as a collection of images taken during materials testing, field investigations, and system evaluations. The Photo Gallery provides a summary of images contained in the Materials Handbook (see the Handbooks section online). The potential damaging effects of contaminants and decontaminants on materials are notably observable in these images. During the execution of a system's program, it is hoped that the results of other tested materials will be added to this Photo Gallery. Some NBC defensive equipment is also provided. These images may aid you in selecting materials and equipment suitable for operations in an NBC environment. You are encouraged to contribute photographs and images from your programs.

Doctrinal Archives

This is a collection of several outdated, digitized Army Field Manuals (FM 3-X series). To ensure a state of readiness in NBC defense, a new set of publications is presently being written (FM 3-11.X series), which supersedes the original FM 3-X series. The new FM 3-11.X series of publications encompasses international aspects and is being closely coordinated with NATO and other allied countries. In 1996, ARL-SLAD created a computerized database of extracts taken from a portion of the FM 3-X series of publications and produced the NBC Toolbox, available both on CD-ROM and via the World Wide Web. For historical purposes, a backup collection of the NBC Toolbox (extracts from FM 3-3, 3-4, 3-5, 3-6, and 3-9) is contained in these archives.

Conclusion

ARL-SLAD has developed the NBCCS Online Handbook using the networking approach needed to achieve survivability. The secure Web site is accessible only by registered U.S. military and government domains by going to **https://www-slad.arl.army.mil/Internal/NBCCS/home.html**. Users are encouraged to apply this knowledge base to their systems. Future plans under consideration include producing the compilation as a CD-ROM product, upgrading the Web site with a search-engine capability, and using the content to develop educational training manuals and workshop exercises involving "distance learning," or as a topic in a systems engineering course. Undoubtedly, NBCCS is an important element of a system's survivability program. When judiciously applied across all DOD programs, NBCCS is a cost-effective approach to ensure that our 21st century soldiers finish their mission decisively.

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ASSESSING GROUND-BASED MIDCOURSE DEFENSE PRODUCTION READINESS

Steve Austin, Brandy Simmons,
Lucinda Stiene, and Heidi Wheeler

Background

The Ground-Based Midcourse Defense (GMD) Program, (formerly National Missile Defense) now includes a new process for assessing production readiness activities. The new process is called Production Readiness Assessment (PRA) and replaces the previous traditional formal review known as a Production Readiness Review (PRR). The PRA process was developed to provide periodic objective production readiness assessments and early risk identification. The PRA process was designed to be less intrusive, time-consuming, and costly than the PRR process. It also provides the structure to implement the integrated product team (IPT) concept to address transition to production

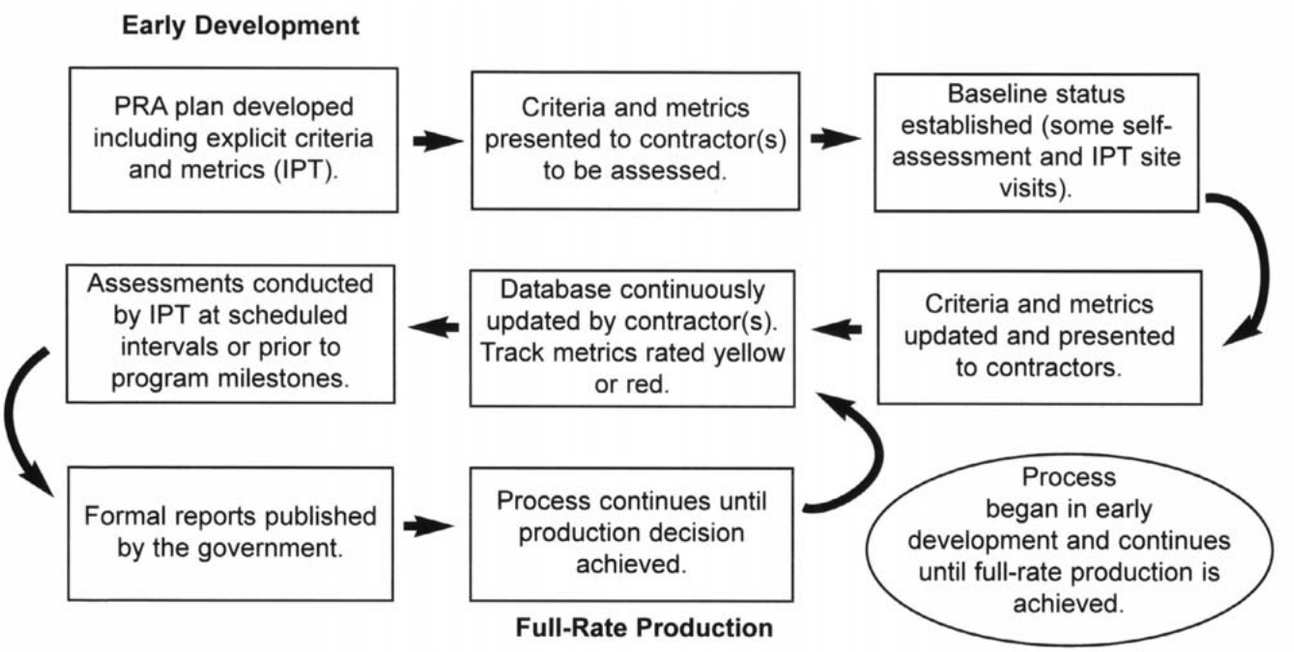

Figure 1.
PRA process flow

PRODUCTION READINESS ASSESSMENT

		$TIME_1$ = 0	$TIME_2$ = 6 MONTHS	$TIME_3$ = I YEAR	$TIME_4$ = 2 YEARS	$TIME_5$ =3 YEARS
CRITERIA	**METRIC**	**0.1**	**0.3**	**0.5**	**0.7**	**0.9**
Mfg. infrastructure	Capacity/ facilities planning	Initial planning not complete; production/ product flow not fully defined.	Production flow, sequence defined. Critical path has been determined.	Production flow analysis complete. Capacity projections established.	Facility layout plans approved. Rate projections refined and estimated capacities meet production requirements.	Production facilities in place and capacity meets production rate requirements.
Mfg. infrastructure	Schedule compatibility	Initial planning not complete; production/ product flow not fully defined.	Production flow, sequence defined. Critical path has been determined.	All major schedule activities defined. Coordinated schedule containing tool/fixture, process equipment, environmental stress screening, test, and government-furnished equipment activities defined.	Detailed production schedule established, refinement in process.	Firm production schedule in place based on completed transition to production effort.

Figure 2.
Portion of a PRA matrix

planning activities as an ongoing process. This approach is preferred to one that is a periodic event that only takes a snapshot of accomplishments that may not allow adequate time to cost-effectively mitigate risks.

A PRR was composed of a team of independent subject matter experts from functional areas such as design, production planning, and quality assurance. The team typically spent 2-3 days in the prime contractor and major subcontractor facilities reviewing accomplishments and planning for production. Findings and risks were documented in a formal report that was used in support of major program milestone decisions.

The PRA process used by the GMD staff was developed by the GMD Production and Quality Directorate composed of a team from the Production Engineering Division (PED) of the Aviation and Missile Research, Development and Engineering Center (AMRDEC) at the U.S. Army Aviation and Missile Command (AMCOM), Redstone Arsenal, AL. It is an iterative process using predetermined criteria to assess the progress of a contractor in achieving a stable design, proven manufacturing processes, and available/programmed production facilities and equipment resulting in a viable production capability with limited risk.

GMD consists of four major components: Ground-Based Interceptor (GBI); X-Band Radar; Upgraded Early Warning Radar; and Battle Management Command, Control, and Communications (BMC3). In 1999, a plan was developed that tailored the PRA structure to meet the needs of GBI, which was in the early stages of production planning. The PRA plan reflected a rating scheme that followed expected progress in relation to key program events. An initial assessment was conducted in January 2000 to exercise the plan, resolve any unforeseen bugs, and establish a baseline. A second assessment was conducted in April 2000, with a formal report submitted to the deployment readiness review panel. Based on the success of this early application, a decision was made to apply the process against all GMD components.

New Beginning

In October 2000, GMD organized a production engineering working group (PEWG) to manage production planning activities. Led jointly by the prime contractor's (Boeing) production operations and the GMD Production and Quality Directorate, the PEWG met weekly with representatives from each GMD component. The PEWG adopted the PRA process to consolidate the management of production activities throughout the program into a logical integrated process that would yield ongoing, real-time status of progress toward production readiness. Figure 1 illustrates the PRA process flow.

The AMRDEC PED staff provided training and promoted buy-in of all personnel involved in making the PRA process successful. The GMD components and system teams are composed of both government and contractor personnel. Each team developed a PRA plan that described its own tailored approach and included a matrix displaying the component's metrics and measures associated with standard criteria. The standard criteria that were evaluated included design, production planning, manufacturing infrastructure, manufacturing processes, subcontractor management, and quality assurance.

A matrix was laid out to include a predefined scale of 0.1, 0.3, 0.5, 0.7, and 0.9, which was tied to the program time line. The points in the scale represent uniform rating periods and specific dates. The metrics were assessed using measures that represent increasing progress toward production readiness. These measures depict the minimum expected progress for that metric in relation to the program time line. All progress measures for that given point in time should be in line with the predefined score for that rating period. This allows scoring to be done against a common point in time denoted by a set number on the overall scale. Figure 2 shows an example of a portion of a PRA matrix.

For each assessment period, a target score is established for each component to be measured against. The target score is agreed on jointly by the government and prime contractor after considering input from subcontractors. The highest score attainable during an assessment is the target score. Performance achieved beyond the target score is noted, but higher scores are not used because the consolidated score for each component is an average of the criterion scores, which in turn are an average of the metric scores. Because the objective of the assessment is to identify any risks upfront, restricting higher scores reduced the potential problem caused from mathematical skewing during scoring roll-up.

The success of the PRA process is very dependent on the relationships developed and exercised among government and contractor personnel. The PRA process must be supported by all involved to ensure accurate and credible results.

A color scheme is associated with each metric. If the metric score attained is equal to the target score for that period, the metric receives a green rating. If the score attained is less than the target rating by 0.2, the metric is rated yellow. If the score attained is more than 0.2 below the target rating, the metric is rated red. This color scheme is also used to rate criteria, based on the average score of each metric, and to rate the component's progress toward production readiness, which is an average of the criteria scores. By tying the color scheme directly to the scoring system, color ratings remain objective and consistent from one assessment period to the next.

To gather data, a series of self-assessment files were submitted for completion by subcontractors being assessed. The Technical Risk Identification and Mitigation System database from Best Manufacturing Practices Center of Excellence acted as a shell to input the GMD components' metrics and measures matrix and as the self-assessment file submitted to the subcontractor. Subcontractors assessed themselves based on the progress measure that they had achieved. For each metric, rationale and evidence for the self-rating was required. After completion of the self-assessment, the completed files were forwarded to PEWG points of contact.

Each assessment is based on the subcontractor's progress to achieve its target measure. Subcontractors are scored jointly by the government and prime contractor, based on information provided in the self-assessment and evaluation of their documentation and performance. Site visits were performed as needed, based on areas of concern in the self-assessments. Metrics rated yellow or red were noted as action items or candidate risks to be tracked and closed out.

A formal report was published by the government documenting results for the rating period in September 2001. A report will be completed annually and used to support program decisions and milestones. The publication of the formal report completes an iteration of the process and documents the progress made for a particular assessment period. GMD will continue to assess progress made toward the upcoming target score in the next iteration of the PRA process and work to resolve action items noted during the last assessment period.

The Production Readiness Assessment process depicts the progression made toward production readiness, which allows early identification and mitigation of potential risks to the production program.

Lessons Learned

The success of the PRA process is very dependent on the relationships developed and exercised among government and contractor personnel. The PRA process must be supported by all involved to ensure accurate and credible results. Representatives from each of the GMD Program components were involved in establishing the guidelines for conducting the PRA. These guidelines manifested themselves in the criterion, metrics, target scores, and measures established for each component. Subcontractors were involved in the process and provided input into how best to identify progress along individual schedule paths. Because each component in the development stages operates somewhat autonomously and tracks against its own detailed schedule, the target score can vary among components. For this reason, it was important to include some individually tailored measures to receive the maximum benefit from the assessments.

Component metrics and measures may require updates to remain compatible with the latest program structure. To provide greater insight into the subcontractor's progress, additional supporting questions for measures were developed. Also, future iterations should use common metrics and measures to the maximum extent possible across all components assessed.

Conclusion

The PRA methodology provides an objective evaluation of production readiness. The PRA process depicts the progression made toward production readiness, which allows early identification and mitigation of potential risks to the production program. It promotes a teaming environment, requiring both the government and prime contractor to work together to track progression and handle action items. This process is flexible and can be tailored to fit various program requirements.

The PRA process provided GMD with real-time information that can be used to manage the program, as opposed to PRRs that are conducted prior to a major milestone, not permitting adequate time for risk mitigation.

Self-assessments obtained throughout the PRA process yield problem identification without numerous costly investigative trips conducted by the government. The GMD Program results demonstrated that the PRA process provides a tool to track production readiness progress in an objective and cost-effective manner.

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Responding To Change…

THE U.S./GERMAN ENVIRONMENTAL TECHNOLOGY EXCHANGE AGREEMENT

Raymond J. Fatz

Introduction

The world has changed during the past 18 months. Despite the challenges created by the tragic events of September 11, 2001, and the world's response to the threat of international terrorism, stewardship of the environment continues to be a vital component of the Army's mission in the United States as well as in Germany. Indeed, in light of the increased threats of biological, chemical, and nuclear weapons as well as threats to civilian and military infrastructures (e.g., those supporting water and energy resources), addressing the common environmental challenges to the military missions of both countries has taken on new significance.

The Mutual Weapons Development Master Data Exchange Agreement (DEA) between the United States and Germany provides the framework for both countries to exchange data on environmental research and technology. The research and technology areas of interest are defined in four individual annexes: *DEA Annex 1311—Hazardous Materials, Material Substitutes and Air* (dealing with pollution prevention, waste minimization, material substitutes/recovery, and recycling); *DEA Annex 1520—Soil Contamination and Remediation*; *DEA Annex 1521—Water Contamination and Remediation*; and *DEA Annex 1522—Demilitarization and Disposal of Conventional Munitions*.

The executive agent (DEA general officer) for this DOD program is the U.S. Deputy Assistant Secretary of the Army for Environment, Safety and Occupational Health. The German DEA general officer is the Executive Director of the Federal Office of Defense Technology and Procurement (Bundesamt für Wehrtechnik und Beschaffung (BWB)). U.S. and German deputy general officers and assistant project officers (APOs) coordinate and oversee the activities undertaken through the environmental annexes. U.S. and German technical project officers (TPOs) and associate technical project officers (ATPOs) for each environmental annex are the technical leads and report through the APOs.

Technical planning meetings (TPMs) are scheduled biannually to exchange technical project results, evaluate progress toward goals, coordinate future goals, and foster relationships. The most recent TPM took place in Germany in October 2002, and the next is scheduled for early summer 2003 in the United States. Additionally, general meetings are held every 18 months, the most recent in June 2001 in Arlington, VA.

Meeting Challenges

World events have taken a toll on our endeavors, including international efforts that benefit the military missions of both the United States and Germany. In the midst of these challenges, environmental stewardship must continue to support mission readiness by complying with environmental laws, maintaining the availability of training lands, cleaning up and preventing pollution, improving soldier/family quality of life, and strengthening community relationships. Compliance and restoration continue to be vital components of the Army's environmental program. Continued investments in pollution prevention and conservation offer opportunities to reduce long-term operating costs and liabilities.

Responding To Change

There have also been many recent changes in the German and U.S. militaries requiring adjustment and flexibility to successfully proceed with DEA efforts. The German Ministry of Defense (MOD) and BWB

Figure 1.
The bench-scale test system used to show electrical migration with an ionic dye.

Figure 2.
DEA participants view the EK demonstration site at the NATO training range near Bergen, Germany.

continue to implement fundamental restructuring of their organizations. Environmental protection is a component of the BWB's capabilities and is incorporated into its acquisition process. There have also been changes in both the German and U.S. DEA leadership, which includes U.S. Air Force, U.S. Navy, and U.S. Army participation. To respond to these changes, members of the U.S. and German DEA leadership met in a June 2002 executive session to reinvigorate, guide, and direct technical officers for the TPM held in October 2002.

Moving Forward

The DEA leadership at the June 2002 executive session stressed the importance of focusing on the future. In planning for the October 2002 TPM, U.S. and German TPOs were directed to focus on current needs and to establish a requirements-driven agenda for their activities under each of the environmental annexes (that is, to identify real-world, environmental problems that must be resolved). They were also encouraged to maximize ongoing technology development as well as to use off-the-shelf technologies. Additionally, they were tasked with identifying and developing projects that will match needs, expertise, and resources across borders. The intent is to maximize benefits and achieve cost-effective investments.

Demonstrating Success

Heavy-metals contamination is a problem at U.S. military ranges and at German sites. As part of the October 2002 TPM, participants visited the site of an ongoing DEA technology demonstration project using electrokinetic (EK) treatment of metals-contaminated soils. Initiated and conducted under the auspices of *DEA Annex 1520*, this German MOD-funded project is being successfully implemented at a NATO training range in Bergen, Germany. Technical expertise and review have been provided by the U.S. Army Engineer Research and Development Center in Vicksburg, MS.

A bench-scale test cell was used to demonstrate how the EK process works. Clean sand was placed in a test cell with positive and negative electrodes on each side of the test cell. An ionic dye was placed in the negative side of the cell and electrical power was turned on. The ionic dye migrated through the sand toward the positive electrode by the electricity alone (Figure 1). After the bench-scale test demonstration, participants went to the treatment site. Soil containing cadmium and chromium from the training area is placed in pools where the contaminants are removed by electromigration. Figure 2 shows participants viewing one of the treatment pools where alternating lines of positive and negative electrodes extend into the contaminated soil.

Establishing a proven methodology with reproducible results for future technology demonstration projects is a key goal of the DEA. Lessons learned to date from the EK project are crucial to achieving this goal. These lessons were discussed at the TPM and will be applied by the DEA annex technical planning officers to the demonstration of other

The U.S. and German military establishments share common goals of reducing environmentally related operating costs, fielding systems with minimal or no adverse environmental impacts, and balancing available resources against validated needs to achieve cost-effective investments.

transferable technologies. A final report on the results of this EK demonstration project is expected by the next general meeting of the DEA, tentatively scheduled for fall 2003 in Germany.

Building On Success

The EK demonstration project clearly demonstrates the effectiveness of hands-on sharing of expertise and resources to achieve a common purpose: solving a real-world, environmental problem associated with military operations. While EK technology has been employed in the United States for a number of years, the refinement of the technology through this DEA-sponsored demonstration project could result in improved environmental cleanup strategies both in the United States and abroad.

There are many common challenges associated with environmental stewardship for both the U.S. and German military missions. These challenges have created the potential to achieve significant cost savings from jointly demonstrated and validated technologies. This demonstration and validation approach is especially valuable in the current climate of close regulatory scrutiny and increased demands on shrinking technical and budgetary resources.

Work is proceeding in each of the DEA annexes to identify specific problems and projects for joint demonstration. Once these have been identified and prioritized, experts and resources will be brought together to identify locations for possible remediation and technologies for demonstration. Once agreement is reached on these items, it is important to identify the mutual technical criteria that the demonstrated technologies must meet to achieve acceptance. Industrial, academic, and other potential sources of expertise for the demonstration and validation process will be identified.

A great deal of communication, coordination, and cooperation between the proponents and technical experts on both sides of the Atlantic is required. This will maximize the benefit and value of technology demonstration projects for both countries under the DEA. To that end, there is increased use of the Defense Environmental Network and Information eXchange (DENIX) to facilitate and enhance the exchange of information between U.S. and German DEA executive officers, TPOs, ATPOs, and approved outside experts who are permitted site access.

Conclusion

Over the years, the U.S.-German DEA for environmental technology has provided the opportunity to increase knowledge through the sharing of information and expertise. The DEA has also helped build strong professional relationships between environmental technical experts and those responsible for meeting 21st century environmental challenges. The U.S. and German military establishments share common goals of reducing environmentally related operating costs, fielding systems with minimal or no adverse environmental impacts, and balancing available resources against validated needs to achieve cost-effective investments. Activities conducted under the DEA will continue to enable the harnessing of each country's technical capabilities and to capitalize on their respective strengths to maximize environmental benefits and maintain mission readiness.

Additional information on the specific focus areas for each of the DEA environmental technology annexes is available from the U.S. TPO for each annex. Go to the DENIX Web site, **www.denix.osd.mil/** (type **DEA** in the Search box), or contact Plexus Scientific Corp. at (703) 845-8492.

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AVIATION SECURITY THROUGH TECHNOLOGY

Lorrinda Retrossa and
Bruce Thomson

Introduction

The Army's Aberdeen Test Center (ATC), Aberdeen Proving Ground, MD, is a key player on an interagency team working to enhance U.S. airport security through technology. ATC's Maritime and Experimental Fabrication Teams have been working with DOD and other government agencies to produce a device to secure luggage that contains an explosive threat.

When the Federal Aviation Administration (FAA) began installing explosive detection systems in U.S. airports in 1995, it faced a problem: What should be done with luggage identified as a possible threat? The FAA tasked the Naval Surface Warfare Center's Carderock Division with finding a container that could isolate any luggage identified as suspicious by the newly installed system. The FAA specified that the protective containers would need to accept luggage up to 20 by 28 by 48 inches, contain an explosive detonation, and be easy for one or two people to move throughout an airport. The units would also be required to pass through 36-inch doors.

Containment Unit

The Navy's research found several commercially available units that met some but not all of these requirements. In January 1997, the FAA asked the Carderock Division to develop a container that would comply with all of its requirements. Using their expertise in blast containment, the Navy team designed its Threat Containment Unit. ATC then fabricated and explosively tested three prototype units. The first Threat Containment Unit to complete testing was sent to Hartsfield Airport, Atlanta, GA, in April 1997, where it has been used twice to transport a suspect bag to a remote site.

The Threat Containment Unit is a 78 by 48 by 34-inch steel box. Because sharp corners would likely fail under an explosive load, the unit's corners and edges are smooth. All welds in the unit were subject to 100-percent radiological inspection. Any flaws found during inspections were repaired and re-inspected. The unit weighs 1,600 pounds but can easily be transported by two people using a wheeled cart, which was also fabricated by the ATC's Experimental Fabrication Team.

Because ATC has had a relationship with the Navy's test sponsor for more than 20 years, the Navy was confident of ATC's expertise in fabricating the unit as well as in its ability to rapidly and thoroughly inspect the device using X-rays and to explosively test it. Each unit successfully contained all blast effects except for some minor venting of gases around the door seal.

The unit has gone through several design changes since it was first developed, and the most significant design changes involved the unit's door. Designers developed a bell-crank mechanism to make it easier for both humans and robots to open. They also modified the door to open a full 180 degrees instead of 90 degrees. During robot operations, testers discovered that the olive drab interior of the unit caused poor depth perception on remote video displays, so the designers changed the interior color scheme to provide better contrast. They also added more handholds to aid in opening the door and removing the suspicious contents.

Threat Containment Unit

Fabrication

ATC has fabricated 30 of the units to date and expects more requests in the near future. ATC's Engineering Unit is also reviewing costs and ways to optimize fabrication techniques. An Engineering Unit was recently established within the Experimental Fabrication Team to give the team a greater project management capability and to enhance their work. To support the project, ATC will also use computer-aided design and computer-aided machining, as well as an enhanced quality assessment and quality control program. The test center will also electronically archive project files, which will include cost estimates, drawings, project notes, notes on the machinery required, labor hours, and similar information.

Summary

The Navy's Carderock Division is responsible for the Threat Containment Unit's design, modifications, and installation, as well as for training personnel in its use. ATC is responsible for fabricating the unit, including forming, welding, and inspecting the steel shells and doors; fabricating the wheeled equipment needed to move the units within an airport terminal; and explosive testing. The Navy is also responsible for the unit's plastic liner and bag sled, foaming the unit's interior, painting it, and developing equipment to transport it by road.

LORRINDA RETROSSA is the Lead on the Threat Containment Unit Program. She was responsible for coordinating, fabricating, scheduling, and testing of the prototype unit. She is also a Senior Project Manager on several high-level naval ship programs.

BRUCE THOMSON is the Engineering Unit Leader within the ATC's Experimental Fabrication Team. He began his career with the U.S. Army as a Test Director with the Combat Systems Test Activity (now ATC) and previously worked for the Cold Regions Test Center at Fort Greely, AK.

Sharing Cubicle Knowledge . . .

THE ENTERPRISE LEARNING CENTER

Wendy J. McCutcheon

Introduction

With 78 percent of its workforce eligible for retirement in the next 5 years, the U.S. Army Communications-Electronics Command (CECOM) Acquisition Center at Fort Monmouth, NJ, decided that it must devise a succession plan that anticipates a significant drain of experience and knowledge from its workforce. In addition to this drain of experience and knowledge, the Acquisition Center's senior leaders acknowledged the demanding workload for which its remaining workforce would be responsible. While it was recognized that many individuals working within the Acquisition Center were very knowledgeable, it was evident that its employees were simply too busy to share their knowledge and experiences with their peers and coworkers. Therefore, much of that important knowledge was kept within an individual's immediate working area or cubicle and not available to those employees who were recently hired or who lacked such a wide breadth of experience. The Enterprise Learning Center (ELC) was developed in an attempt to share that cubicle knowledge throughout the Acquisition Center's workforce.

The ELC resulted from a concept that encompasses a variety of activities. Its primary goal is to have employees share ideas and information and to infuse the Acquisition Center workforce with an appreciation of collaborative teamwork. The activities include the Knowledge Center, the Procuring Contracting Officer (PCO) roundtable, ELC training, early acquisition strategy, the Acquisition Center monthly newsletter, and the Contracting Officer Mentor Program.

The Knowledge Center

The foundation of the ELC is the Knowledge Center. The Knowledge Center serves as the central electronic repository for all activities that are conducted by the ELC. The Knowledge Center was developed several years ago in partnership with the Program Executive Office, Command, Control and Communications Tactical (PEO, C3T), also located at Fort Monmouth, NJ. Use of the Knowledge Center has grown exponentially throughout the years. At its inception, the Knowledge Center averaged 28,000 hits per month. Today, the Knowledge Center averages approximately 100,000 hits per month. That's three times the use in less than 2 years! Included as part of the Knowledge Center is a feature called "Sametime," which allows an individual to use an instant message capability with other co-workers. This allows an individual to ask a question of a co-worker at another location within the Acquisition Center, to include its Alexandria, VA, and Fort Huachuca, AZ, facilities!

PCO Roundtable

PCO roundtables are conducted on a monthly basis. All PCOs within the organization are invited to attend. Those PCOs in our Alexandria, VA, and Fort Huachuca, AZ, offices attend via video teleconferencing. A new topic of discussion is chosen each month. The topic may be a current issue or a more troublesome, longstanding, process-oriented issue. The PCO roundtable discussion is generally led by an individual PCO who has current experience and is conversant in the topic. For example, when guidance was issued on commercial services in the summer of 2001, a PCO roundtable was conducted. In addition to dozens of PCOs, the CECOM Commercial Services Advocate attended this particular event. Many questions were answered and the latest information was shared. All three Acquisition Center locations shared valuable and diverse experiences as well as pertinent lessons learned.

Another source of PCO roundtable topics are reports issued by audit activities or the Offices of the Inspector General (IG). For instance, subsequent to a report issued by the IG regarding the requirements set forth in Federal Acquisition Regulation 15.402(a), a PCO roundtable was convened on the subject of "fair and reasonable" price determinations. This particular PCO roundtable permitted the exchange of a wide range of ideas and opinions on how best to meet this regulatory requirement. It also provided a nonthreatening environment for PCOs, who may have been confused by it, to ask questions and resolve situation-specific problems with which they may have struggled.

PCO roundtables also assist individuals by providing a peer to whom they may go when faced with an issue with which they have little experience. Minutes from each PCO roundtable are prepared and then posted to the Knowledge Center for use by a wider audience. Overall, the PCO roundtable provides an information-sharing forum that saves time, reduces frustration, and improves the quality of the Acquisition Center's work products.

ELC Training

Homegrown training through the ELC is yet another resource that has assisted our workforce to gain valuable, relevant knowledge. Every other month, training is conducted for the

Acquisition Center's contract specialists. The training is broken down into four 1-hour blocks of instruction. The training focuses on current or long-standing issues. Subject matter experts from both within and outside the Acquisition Center conduct the training. Such topics as commercial services, performance-based work statements, alpha contracting, and the principals of service contracting are presented. Materials presented at these sessions are then posted to the Knowledge Center. As the workforce faces such issues during the course of daily work, they are able to consult the Knowledge Center to find situation-specific information that will assist them in resolving problems, learning new techniques, or developing new acquisition strategies. The response to these classes has been positive, and all classes have been widely attended. Even some of our more experienced contract specialists feel they have left the sessions learning something new or with a new perspective on an old issue.

Early Acquisition Strategy

As many of our contracting officers faced new acquisitions, we discovered that some of the lessons learned, new initiatives, and common practices were not being adopted. We also found that many of our contracting officers were doing some good things that were not being shared with other contracting officers. This required us to develop a new process to infuse those ideas to assist our contracting officers. A group of contracting officers assigned to our Acquisition Business Process Group work to assist those contracting officers who begin a new acquisition. At the inception of an acquisition, the contracting officer contacts the Acquisition Business Process Group. A meeting is held with the acquisition team—individuals associated with the acquisition—to discuss the acquisition strategy. Those attendees often include the contracting officer, the contract specialist, an attorney, and the customer. At this meeting, the latest initiatives and lessons learned are discussed. The acquisition team is also directed to the Knowledge Center for templates that will assist them as they proceed through the acquisition. Such documents as sample letters, source selection evaluation plans, and briefings are included in the Knowledge Center. We have found that these templates have assisted the acquisition team by reducing the amount of rework. By conducting these meetings early in the process, we believe the current thinking is transfused, thus ensuring a more efficient process.

Acquisition Monthly Newsletter

An acquisition newsletter is published monthly in an effort to share cubicle knowledge. Each month, the newsletter highlights a different contracting officer. An article is written to spotlight the contracting officer's innovative work. It may capture the work on a recently awarded acquisition, an approach on a particular program, or good work with a customer. This newsletter also provides a forum to share personal information about the contracting officer. Noteworthy items concerning other members of the CECOM Acquisition Center as well as interesting tips are also addressed.

The newsletter is also posted to the Knowledge Center. Additionally, during the month, the highlighted contracting officer displays an "Uncle Sam" hat. This distinguishes the contracting officer as an individual who is making a difference. His name is added to the hat and is passed to a different highlighted contracting officer each month. Every month, the members of the CECOM Acquisition Center look forward to reading about the various contracting officers and their contributions to the Acquisition Center.

Mentor Program

The transition from contract specialist to contracting officer can be difficult. As such, the CECOM Acquisition Center developed a program that assists newly promoted contracting officers. Each contracting officer is assigned a mentor who can be a more experienced contracting officer, a group chief, or a sector chief. During the first year, the contracting officer has a designated person with whom he or she can discuss issues and problems. Many of the relationships that are formed continue well beyond the initial year. Efforts to expand this program, such as holding sessions specifically geared to the new contracting officers to assist them in the transition, are underway.

Conclusion

The Enterprise Learning Center is the first step in capturing and sharing some of the good ideas within the CECOM Acquisition Center's workforce. In the past several years, the ELC educated and assisted our less experienced workforce. Its success is the cornerstone of the Acquisition Center's initiative to support Project Exodus, an effort to capture critical experiential knowledge. The Acquisition Center looks toward the future to expand its Enterprise Learning Center activities in an effort to share cubicle knowledge and prepare our workforce for the challenges that they will face tomorrow.

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WEB-BASED SOFTWARE LOGISTICS

COL Theodore (Ted) Johnson and
Myron W. Obaranec

Introduction

Transforming the Army into a knowledge-based force requires unprecedented reliance on complex and interoperable software systems. The following hypothetical situation illustrates the complexity of making even minor changes to deployed systems during sustainment:

The Software Subsystem Lead Engineer is pleased. It's been three spirals in the evolutionary acquisition process, and finally the new Land Warrior power management software module has proved its value. With the new software upgrade, systems will run 20 percent longer on the same set of batteries. Tests have also proved the new software reliable. Soldiers can now perform their battlefield missions with fewer batteries. There's one problem, however, more than 2,200 systems are fielded to 4 different locations, with some units also deployed. Installing the software upgrade will require a traveling team to modify the systems and train soldiers. This could take more than 6 months.

This illustration depicts the complexity of sustaining individual units when software or other modifications are needed to address performance, safety, or reliability issues. Typically, updating software for field units is a complex, manpower-intensive, and time-consuming activity. A materiel-fielding team of engineers and trainers travels to the unit's location, installs software, and then trains the soldiers. As Army transformation proceeds, a more responsive and efficient model for software sustainment is necessary. Project Manager (PM), Soldier Systems, in partnership with the U.S. Army Communications-Electronics Command (CECOM) Software Engineering Center (SEC), is addressing this challenge. PM, Soldier Systems personnel plan to leverage Internet and commercial technologies to establish a Web-based software logistics system that meets the response needs of future Land Warriors and Objective Force soldiers.

Web-Based Software

Web-based software logistics includes processes and products that leverage integrated commercial technologies. It provides a responsive and flexible software sustainment system by eliminating reliance on paper, software media, and manual processing. Web-based software logistics reduces the manpower footprint, increases sustainment effectiveness, and enhances warfighter readiness. It also provides increased visibility and control at various levels of the software sustainment process. In addition, Web-based logistics provides a framework that is adaptable to existing and planned logistics support concepts and programs.

At the core of the Web-based software logistics system is the Global Support Center (GSC) application, developed by the CECOM SEC. The GSC includes:

- Electronic software downloads,
- A Virtual Help Desk available 24/7,
- Automated problem resolution database,
- Web-based multimedia training, and
- An interactive online user forum.

These features collectively increase the timeliness of software sustainment to the field while reducing manpower requirements. Field users access the GSC using the Internet and encrypted links, or through the Secret Internet Protocol Router Network (SIPRNET) where available. The GSC is a DOD information technology-certified and accredited application that reduces exposure to malicious code penetration and attacks. Since the GSC is Web-based, only a Web browser is required to use it.

One inherent problem with software maintenance is control and configuration management of revisions. The GSC ensures that reported problems and changes are controlled and organized, archived, and expedited through a configuration control and management process.

System Access

To access the GSC, Land Warrior or Objective Force soldiers complete an online application form via the Web, which is registered as part of the network. The GSC notifies the system administrator that a new registration is pending. The GSC administrator, working with the PM, Soldier Systems staff, validates the request. After approval, the system automatically e-mails the user ID and password.

Software Downloading

With Web-based software logistics, we eliminate a majority of the overhead manpower, and reduce the cycle time for delivering software to the field. Similar to the commercial world, the GSC software ordering and

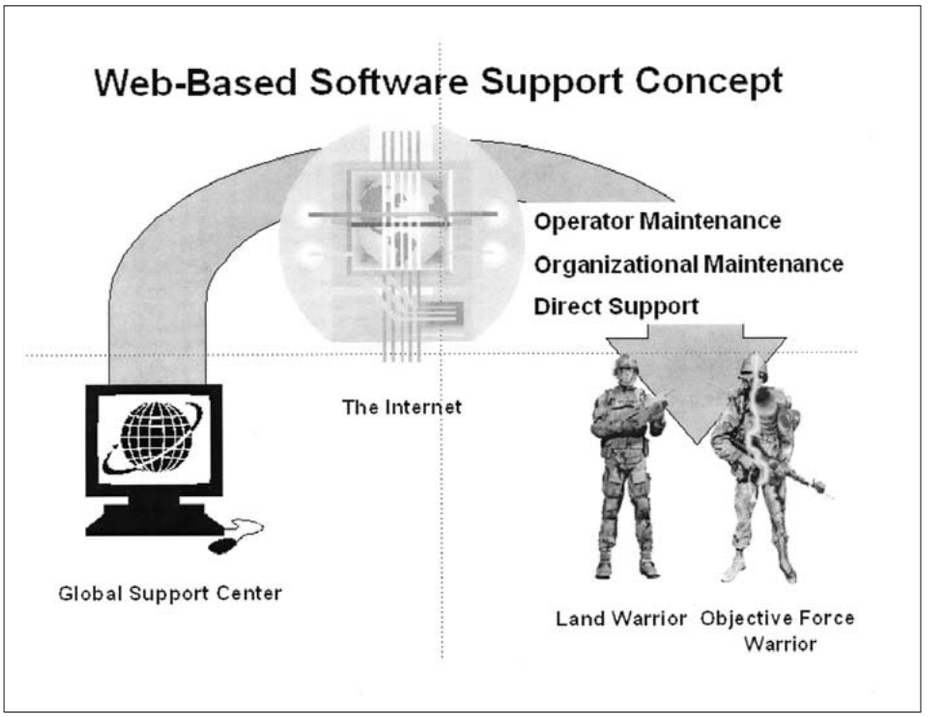
downloading system automatically provides software downloads upon request from authenticated users. The system can also "push" software releases to the field when necessary. Once downloaded via an encrypted link, the software can be accessed by the user via a secure password to decompress and decrypt it. The software ordering system includes version tracking for every download transaction. This database is used to automatically notify the field units when subsequent software releases are available.

The software ordering and downloading system can also be used for more than just software updates. For example, the system supports the ability to download digital maps. The CECOM SEC maintains an inventory of National Imagery Mapping Agency digital maps representing 98.5 percent of the world's surface. Formats include bitmap and vector-based graphics in several scales. A 650 megabyte digital map file (the largest type of map in the inventory) takes between 3.5 to 6 hours to download via a 56k Internet connection. High-speed connections reduce download time to minutes. This timeline enhances responsiveness to unit deployments and is significantly more efficient than current traveling team manual processes.

Web-Based Training

Given the geographical dispersion of Army Forces, providing centralized classroom training for software updates is difficult and impractical. With Web-based software logistics, the capability exists to deliver interactive multimedia training anywhere in the world 24/7.

PM, Soldier Systems and the CECOM SEC are in the initial planning stages for a library of multimedia training packages that include basic courses as well as refresher training. In addition, we expect to include video training packages with software downloads. The training package would include procedures for performing the software upgrade as well as "delta training" (describing the operational changes included in the new software release). Video clips with each new software release provide an efficient mechanism for training the soldier to load and operate the new software. With Web-based training, the Army reduces the need to send out training teams, allowing soldiers to train at their own pace. The online training library will provide field users with the opportunity to refresh and reinforce previous training at their convenience.



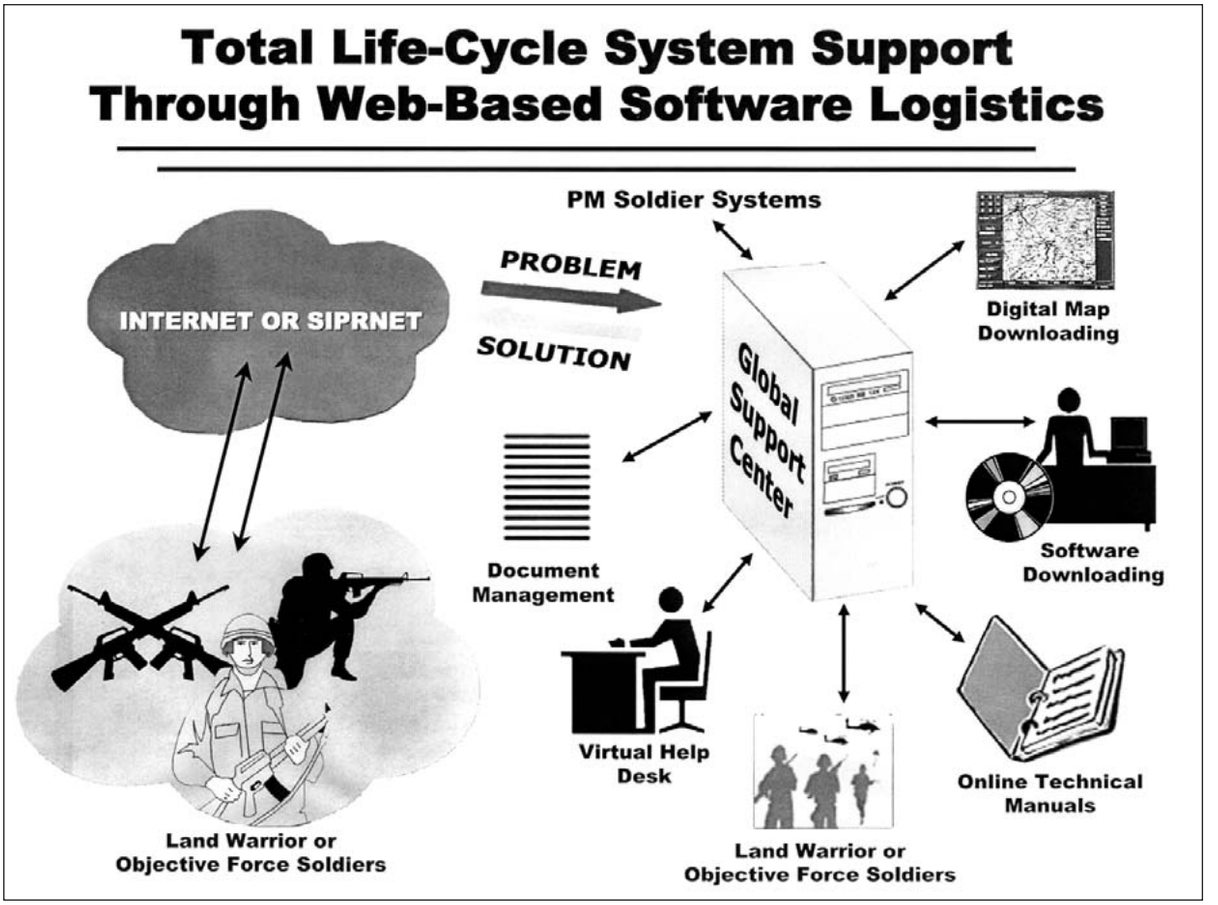
Virtual Help Desk

The Virtual Help Desk provides a collaborative environment for problem reporting and resolution that streamlines field support. By leveraging Web technologies, individuals can automatically track and distribute problem reports and solutions. In addition, collaboration is enhanced between subject matter experts (SMEs) and the soldiers in the field, regardless of their location. When a soldier encounters a problem, a search of the online database quickly determines if a solution to the problem already exists. If this is a new problem, the user submits a problem report to the GSC, and the appropriate SME receives e-mail notification. In collaboration with the soldier, the SME determines the solution or workaround, which is then posted in the database, where it is accessible to other field units. For emergency problems, the system automatically notifies the SME by pager or cell phone, providing near-real-time responsiveness. The Virtual Help Desk also includes a secure chat forum so users across the globe can collaborate on specific problems and resolutions.

The collaborative capabilities of the Virtual Help Desk can reduce the impact of software problems and help increase unit readiness. By automating the process and maintaining the problem-resolution database, warfighters have almost instantaneous access to solutions for known problems. Appropriate users receive automatic notification as new problems are encountered and resolved. Furthermore, this approach allows the capture of valuable corporate knowledge and reduces exposure to loss of specific expertise.

Online Technical Manuals

To further streamline the software sustainment process, the GSC



system provides soldiers with the ability to view and download technical publications. Types of documents contained in the GSC online repository include installation manuals, diagrams, and charts. Additionally, the system includes a Web-based document management and collaboration system to permit users to post documents to a Web site and notify other users when a new revision is posted. These capabilities, in conjunction with the Virtual Help Desk, provide soldiers in the field with critical information to maintain system readiness.

Planned Enhancements

The GSC is constantly being improved with new functionality and capabilities. Future enhancements planned for the GSC include:

• *Palm Pilot And Pocket PC Interface.* These enhancements allow mobile users to interact with the Virtual Help Desk. With on-the-move communications, SMEs will have the capability to respond to field users while away from their desktop computers. Field users will have the capability to search the problem resolution database while on-the-move.

• *Searchable Technical Publications.* A more robust and flexible search capability of documents and manuals allows the soldier to find relevant information more quickly.

Conclusion

As the Army proceeds with its transformation, the ability to synchronize software across multiple platforms while maintaining a high level of unit readiness is a challenge. Migrating to a Web-based software logistics model is imperative to help keep pace with the ambitious goals of the Objective Force. PM, Soldier Systems and the CECOM SEC are in the process of implementing this model. By leveraging Internet and Web-based technologies to provide digital software downloads, having access to SMEs 24/7, and having continuous access to multimedia training, PM, Soldier Systems provides timely software sustainment to warfighters.

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MAKING RELIABILITY A REALITY

Dr. David E. Mortin and Stephen P. Yuhas

Introduction

There has been a significant push to strive for very high levels of weapon system reliability, sometimes referred to as "ultra reliability." Recent *Army AL&T* articles have stressed the importance of increasing reliability well beyond legacy values. Draft reliability requirements for the Future Combat Systems (FCS) are 4 to 12 times current values, and numerous organizations are suggesting that even higher levels are needed. These high levels of reliability will not be achieved with legacy reliability design practices. Recognizing that very high levels of reliability are required for our future systems, the Army must make major changes to legacy design practices to make higher reliability a reality. This article discusses some of the changes that must occur if we are to make ultra reliability more than just a slogan.

Reliability Predictions

The reliability portions of our contracts often take considerable space addressing reliability predictions. A reliability prediction may have little or nothing to do with the actual reliability of the product and can, in fact, result in poor design practices. For example, when 9 contractors came in with separate radio designs and predictions, subsequent testing showed that the reliability predictions ranged from 30 to 3,900 percent of the actual values. Contractors and subcontractors who frequently quote predictions may not understand the engineering and design considerations necessary to minimize risk and to produce a reliable design. In many cases, the person producing the prediction may not be a direct contributor to the design team. The historic focus on the accounting of predictions versus the engineering activities needed to eliminate failures during the design process has significantly limited our ability to produce highly reliable products. High reliability is not obtained through reliability predictions.

Real Reliability Models

When most people think of reliability models, they think of reliability block diagrams; failure modes, effects, and criticality analysis; fault trees; and reliability growth. When directly used to influence the design team, or when used by the Army to manage reliability progress, these tools can be extremely useful to focus engineering and testing efforts. However, the most important reliability tools are the structural, thermal, fatigue, failure mechanism, and vibration models the design team uses to ensure that they are manufacturing a product that will have a sufficiently large failure-free operating period. A good contractor routinely conducts thermal and vibration analyses to address potential failure mechanisms and failure sites (i.e., a physics-of-failure approach to reliable design). These analyses can include the use of fatigue analysis tools, finite element modeling, dynamic simulation, or heat-transfer analyses. Without such engineering analyses, the risk of failure is very high.

Reliability Is Affordable

When reliability is designed into systems early, many potential failure mechanisms and sources of failure can be eliminated with little cost. However, as time goes on, the cost to fix failures that were not addressed earlier in the design phase can become very significant. Early analysis of the engineering design, combined with early low-level testing and substantial integration testing, can greatly improve the reliability of the product before designs are locked in, and well before any formal testing program.

Many individuals still equate high reliability to gold plating (i.e, using more expensive materials or exotic designs). High reliability is the direct result of a strong engineering design effort combined with smart testing and management focus. As an example of how small investments can make a big difference, a reliability structural and thermal analysis for a circuit board can be completed for as little as $15,000 plus the cost of highly accelerated life testing (HALT) if confirmation is required. Based on just one of the projects the U.S. Army Materiel Systems Analysis Activity worked on, more than $27,000,000 was saved by identifying problems with a single circuit card.

By one estimate, operations and support (O&S) costs represent 60 percent of total life-cycle costs. Reliability improvements directly influence the majority of the O&S cost contributors. Throughout the life cycle of a major weapon system, moderate improvements in reliability can result in savings of hundreds of millions to billions of dollars.

Testing

Even with today's failure mechanism models and engineering tools, there is still a need for smart and focused testing. Lower-level testing (e.g., HALT) is critical for precipitating failures early and identifying weaknesses in the design. Integration testing is critical for identifying unforeseen interface issues. Some programs include these lower-level tests; however, many do not or the tests are performed on only a small subset of the components.

Developmental testing (DT) serves as one of the last opportunities to fix remaining problems and increase the probability of system success. Some programs undergo very limited or no formal DT. When a system meets the

reliability requirement in DT, there is a 68 percent chance it will meet the operational testing (OT) reliability requirement. If the system fails in DT, there is only an 18 percent chance it will meet the OT reliability requirement. Significant program setbacks often happen when testing is reduced or eliminated to meet schedule or cost constraints. In some cases, the systems fail and have to repeat OT. In other cases, the price is paid in O&S costs for years to come. It is not uncommon for programs to have such short operational test durations that the contractor has to design to a reliability level several times higher than the requirement (almost ensuring failure) to demonstrate the reliability requirement.

Early low-level testing, along with focused higher-level testing, is key to producing products with high reliability. Without comprehensive lower-level testing on critical subassemblies, and without significant integration and developmental testing, there is little likelihood that high levels of reliability will be achieved.

COTS Equipment

Commercial off-the-shelf (COTS) equipment represents a great opportunity to improve reliability, reduce costs, and leverage the latest technologies. However, COTS does not imply that engineering analyses and early testing be abandoned. We frequently hear the expression, "that piece of equipment is COTS, so its reliability is what it is." Thermal, vibration, fatigue, and failure mechanism modeling, combined with early accelerated testing, can quantify and qualify the risk of COTS equipment failing in the military operating environment. We still have cases where a major COTS failure mode is discovered relatively late in the program.

Often COTS equipment data are proprietary; however, there are usually workarounds that can be used to develop data that can support sufficiently detailed engineering analyses. Relatively simple vibration and thermal analyses can detect potential "showstoppers." The showstoppers that have emerged because of inadequate early analysis have cost the Army millions of dollars and have significantly slowed the fielding of certain critical systems.

Incentives

For many procurements, the contractor does not have a strong incentive to make the product reliable. Even when reliability is mentioned in the Statement Of Work (SOW), the weight of reliability in the selection criteria is usually small. Contractors must bid low to be competitive, and when they have to trim their programs, reliability is often one of the first areas to go. To complicate things further, contractors typically make significant profit from follow-on replenishment spares. Unless the contractor sees value in directing and resourcing the design team to achieve high reliability, the Army will continue to field equipment with reliability values that fall far short of what commercial consumers typically experience.

Most contractors have the engineering staff and technical know-how to produce highly reliable systems. If the Army made reliability one of its high priorities in the SOW and specifications, and provided incentives, major Defense contractors would develop highly reliable systems. If this is not done, then reliability efforts will continue to consist of predictions and documents that do little to improve fielded systems.

Conclusion

There is little doubt that Army legacy reliability practices have produced low reliability values. Reliability efforts must be changed if the Army hopes to achieve the reliability requirements and footprint reductions envisioned for the FCS and other Army systems. For the most part, contractors have the capability to design equipment that achieves much higher levels of reliability than we see today—without huge increases in cost. However, today, they do not have the incentives to do so.

We must also become much more involved in the contractor's engineering efforts. This does not mean verifying that contractors have made reliability predictions that exceed the requirement. It means engaging contractors to see what their finite element, thermal, and vibration modeling is showing them; seeing that they understand what failure mechanisms are putting them most at risk; and examining their low-level testing programs. The Army needs to be a smart buyer.

To achieve ultra reliability, Army acquisition personnel and contractors must understand the difference between reliability predictions versus building reliability testing into the design phase of weapon systems. It is crucial that the Army specify that contractors perform lower level testing on critical subassemblies as well as integration and development testing. It is important, too, that the Army measure the risk of COTS equipment failing in the military operating environment. The cost of finding failures early is much less than paying inflated operating costs during the life cycle of a failure-prone weapon system. These changes in weapon systems design will ultimately lead to ultra reliable Future Combat Systems.

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STEPHEN P. YUHAS is the Reliability and Maintainability Director at the U.S. Army Evaluation Center. He holds a B.S. in mathematics from Pennsylvania State University. He has also completed extensive graduate studies in operations research/industrial engineering at Penn State and in statistics at the University of Delaware.

FIELDING FORWARD

MAJ John C. Matthews and MAJ Dana Goulette

Introduction

The events of September 11, 2001, caught America by surprise, our sense of security and safety shattered in the span of just a few hours. Our Army, in the middle of transformation, found itself deploying its current force to a land-locked country thousands of miles away to hunt down elusive terrorists—a task not on anyone's Mission Essential Task List.

Units from the 101st Airborne Division (Air Assault), Fort Campbell, KY, were the first large-scale conventional forces on the ground in Afghanistan. During Operation Anaconda, these forces confronted Taliban and Al Qaeda forces entrenched in some of the most rugged terrain in the world. In the early stages of the conflict, Special Operations Forces (SOF) used precision-guided munitions against buildings, troop and vehicle concentrations, caves, and suspected terrorist hideouts. However, they didn't have a reliable, lightweight targeting system specifically designed for use with these types of missions. Their current systems were too heavy and became a major hindrance in the extremely unforgiving terrain of Afghanistan. Project Manager, Night Vision/Reconnaissance, Surveillance and Target Acquisition (PM, NV/RSTA) and Product Manager, Forward Looking Infrared (PM, FLIR) at Fort Belvoir, VA, accepted the demanding task of filling this critical capability shortfall by deploying during wartime to field two systems, the Viper and the Long Range Advanced Scout Surveillance System (LRAS3), and to train warfighters on both.

The Viper

In just 71 days, PM, NV/RSTA, at the direction of the Vice Chief of Staff of the Army, provided 24 Viper systems to Task Force Rakkasan (3rd Brigade, 101st Airborne Division) in Afghanistan. The Viper is a combination of a commercial off-the-shelf item and current equipment in the Army inventory. The Viper system is simple to operate, man-portable, and provides observation and far target location capabilities for day and night operations. The system is capable of measuring three object distances at once. It also enhances fall-of-shot adjustments between round impact and the intended target, allowing forward observers to provide accurate target locations for the guided munitions.

The Viper consists of three major components:

- The Vector IV, produced by a Swiss optics manufacturing firm (Leica), which combines 7 by 42mm binoculars, an eye-safe laser range finder, a digital magnetic compass, and an inclinometer to create a system that provides target range, azimuth, and vertical angle measurements to the operator. The Vector IV is also capable of exporting this information to the AN/PSN-11 (V)1 Precision Lightweight Global Positioning System Receiver (PLGR).
- The PLGR is government-furnished equipment (GFE) with +96 software that provides self-position and calculates target location after data transfer from the Vector IV.
- Attached to the Vector IV by way of an adaptor is the AN/PVS-14 Monocular Night Vision Device. It provides the Viper with a night-operations capability using an ungated image intensification tube.

The Viper fielding team consisted of Assistant Product Manager (APM) MAJ John C. Matthews, PM, NV/RSTA; Systems Integrator CW4 James "Tim" Edwards, Precision Strike Division Army G-8; and a three-man training team from the U.S. distributor of the Vector IV. Between April 10-27, 2002, the team trained 60 fire-support soldiers with five 3-day courses, which accommodated 12 soldiers each. The team trained primary and secondary operators and their supervisors as well as provided refresher training.

LRAS3

In March 2002, the U.S. Army Special Operations Command (USASOC) asked PM, NV/RSTA about the possibility of being issued a limited number of LRAS3s for use by SOF units in Afghanistan. Because SOF units are not on the LRAS3 Basis of Issue Plan, PM, NV/RSTA, working with USASOC, obtained approval from the Army G-3 to divert four systems from units at Fort Hood, TX, to USASOC.

Managed by PM, FLIR, the LRAS3 consists of a Second Generation FLIR sensor with long-range optics, eye-safe laser rangefinder, day video camera, and a Global Positioning System with attitude determination. The LRAS3 allows for detection of long-range targets and 10-digit grid coordinates of any target within range.

The LRAS3 is being fielded to mechanized infantry and armor Scout platoons and Stryker Brigade Combat Team reconnaissance squadrons. The system can operate in the dismounted configuration or can be mounted on the M1025 series High Mobility Multipurpose Wheeled Vehicle or Stryker vehicle. USASOC representatives stated that the systems would be used in a force-protection role from static locations.

SOF soldiers initially indicated a desire to operate only in the dismounted mode and wanted to have the capability of using 110- or 220-volt AC power, a feature not available on fielded LRAS3s. Therefore, PM, NV/RSTA personnel worked with the LRAS3 prime contractor, Raytheon, to develop a power system similar to the classroom power system used during new equipment training to meet this requirement. However, when MAJ Dana Goulette, PM, NV/RSTA, and SFC Thomas M. Owens, U.S. Army Armor Center, deployed to Afghanistan in May 2002, they immediately learned that the units in theater had different plans for the system. The LRAS3 was not used in static positions for force-protection purposes, but rather in mobile reconnaissance and surveillance roles conducted in pickup trucks and 6 by 6 all-terrain vehicles.

From June 2-12, 2002, the LRAS3 team conducted "train-the-trainer" training in Afghanistan for two different units in geographically separate locations. Because the SOF operational

tempo was so demanding and unit sizes were small, getting people to the training was difficult. The LRAS3 team trained 18 trainers during this timeframe, recommended movement and employment techniques, and remained in country to ensure thorough understanding of the system. PM, NV/RSTA used the train-the-trainer approach because of the high caliber soldiers being trained and their need to be able to train replacement soldiers and soldiers in outlying firebases.

Observations

Not all units have the optimal equipment necessary for the wide variety of missions they may be asked to undertake. The reasons are many: budget constraints, production capacity, fielding priorities, weight and cubic volume considerations, etc. However, when the acquisition community can meet an urgent need, it must. This is especially true of project management offices (PMOs) such as PM, NV/RSTA and PM, FLIR, which oversee numerous individual product lines relating to night vision, reconnaissance, surveillance, and target acquisition. Army PMO personnel must have expertise, not just about their own systems, but also about other systems available worldwide. For instance, when the 101st voiced a valid concern about an operational shortcoming that could not be solved using an item already available in product lines, PM, NV/RSTA identified and employed Swiss binoculars with GFE hardware and software from other PMOs to rectify the problem.

In urgent-need scenarios, the acquisition community must deploy and field in theater. PMO personnel will gain an appreciation for the conditions and environment in which equipment is used. They will also become intimate with the skill levels of soldiers being trained. This interaction between the warfighter and the acquisition world benefits both, allowing the PM to ensure that training has been done properly while simultaneously allowing soldiers access to the PM for immediate retraining. Additionally, most PMs have conducted prior fieldings and can talk to the deployed unit about how other units are employing the equipment during operations.

Viper Binocular Laser Range Finder

Deployed SOF units did not possess a long-range night capability. This is a tremendous shortcoming in a desert environment like Afghanistan where we gain the most advantage from our advanced FLIR technology. One reason for this is the Army's practice of often issuing equipment based on the smallest common denominator (basis of issue)—one per soldier, one per squad, two per Special Forces A Team, etc. This mentality sometimes makes current product line items deemed too expensive, too heavy, or too bulky to pursue, leaving some units with deficiencies in capability. Some systems provide a needed functionality that could be issued on the order of two per battalion or a handful per brigade. For example, the LRAS3, currently being issued only in mechanized infantry and armor Scouts, would be a critical asset in a Forward Support Battalion in its force-protection mission.

Conclusion

Our job in the Acquisition Corps is to field effective and supportable systems to warfighters so that they may accomplish assigned missions. Because the conflict in Afghanistan requires units to adapt and conduct missions for which they are not specifically equipped, critical operational shortcomings have been identified. Although many reforms have improved the acquisition process, a rapidly changing world makes the task of fielding relevant systems to the Army more difficult than ever. The acquisition community must be responsive to these challenges and must be prepared to deploy forward and address these shortcomings in innovative ways.

Long Range Advanced Scout Surveillance System

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MAJ DANA GOULETTE, an Infantryman, is assigned to the Acquisition Support Center. At the time this article was written, he was the APM, FLIR (Ground Heavy) at PM, NV/RSTA. He has a B.S. in mechanical engineering from the U.S. Military Academy and an M.S. in operations research from the Naval Postgraduate School.

FROM THE DIRECTOR ACQUISITION SUPPORT CENTER

This issue of *Army AL&T* focuses on a topic that greatly impacts the Army, especially the Army Acquisition Corps—the Objective Force. If you haven't done so already, be sure to read the article on Page 2 titled "The Objective Force: A Holistic Approach to Army Transformation," which effectively illustrates the goals of the Objective Force. Understanding how this Armywide concept is progressing will help us successfully do our part as acquisition professionals. In addition, understanding this concept will help us develop a stronger connection with warfighters because we will have a greater awareness of what they need to successfully carry out their Objective Force mission. I cannot stress enough how critical it is for the entire acquisition workforce to establish and maintain this connection with the warfighter.

If this is your first time reading *Army AL&T*, be sure to pass it on to your colleagues so that they can become educated about our goals and purpose. I also encourage you to share this publication with your industry counterparts as well as any students and professors at your local colleges and universities.

I would also like to take this opportunity to thank all of those individuals who submitted applications for the Acquisition Career Experience (ACE) Program. This is a wonderful opportunity for undergraduates focusing on a career in acquisition to work in the field and learn from experienced professionals. For those interested in more information about this program, please go to the Acquisition Support Center's (ASC's) new Web site at **http://asc.rdaisa.army.mil**, click on **Career Management Division**, and then click on **ACE**.

Please note that the ASC Web site is continually being revised and improved to better serve you. Check it often or make it your default home page. One feature on this Web site that you will particularly want to review is the U.S. Army Acquisition Workforce Campaign Plan. This is a living document that will evolve regularly to meet the requirements of the acquisition workforce and the warfighter. If you have comments or suggestions regarding this plan, forward them to MAJ Marko Nikituk at **markonikituk@us.army.mil**.

During the period when this issue went to press, we held our 2003 Army Acquisition Workforce Conference in Atlantic City, NJ. Be sure to check out the highlights of this event in the May-June 2003 issue of *Army AL&T*.

COL Mary Fuller
Director
Acquisition Support Center

ATAP Selectees Named

The Army Acquisition Support Center is pleased to announce the newest participants in the FY03 Acquisition Tuition Assistance Program. These participants were selected by the October 2002 board and began their educational opportunity in January 2003. Congratulations to the following selectees:

Allgor, Doris
Austin, Deborah
Balderas, Aaron
Bruce, Sandra
Busha, Judith
Campbell, Richard
Curran, Tookie
Davis, Ronald
Fayaud, Gary
Gholson, Pauline
Harris, Stanley
Hauser, Joan
Heartley, Linda
Hobbs, Annette
Hoffman, Wayne
Hutchison, Michael
Klitzke, Donald
Marken, Shelley
Maxwell, Cassandra
Meade, Elyse
Paskman-Syms, Laura
Rodriguez, Maria
Smith, Edna
Spencer, Rosanne
Tragesser, Suzanne
Vann, Vernon
Walker, Vicki
Walters, Sherrie
Williams, Harold
Williams, Paulette

Applying For The Tuition Assistance Program

The FY02 Acquisition Tuition Assistance Program (ATAP) Competitive Selection Board met in October 2002 to select ATAP applicants who will receive funding to begin the program in January 2003. Of particular interest is the board's report on trends seen in application packages under consideration. Trends noted in the report represent the board's general consensus as to what can be improved in the applications as well as recommendations for strengthening future board packages. Note that the ATAP board is needs-based and that appropriateness of training is an important board consideration.

Ideal ATAP candidates are those who progress in their career fields by concentrating on statutory and education requirements. Statutory requirements include certification in the primary career field in addition to meeting the business hour requirement. In effect, the educational opportunity should meet not only the needs of the requesting acquisition professional, but also the needs of the Army.

The board noted that there was a diverse applicant pool and that candidates requested funding of ATAP opportunities from a single business course up to a master's degree. This indicates that ATAP opportunity information reaches a broad Army Acquisition Corps (AAC) audience.

The board also noted that most career fields were represented in application packages; however, the largest representation came from the contracting field. In addition, the board reported that education requested to meet certification requirements, coupled with evidence of high past performance and a balance of experience and training, were major factors in selection. Supervisory comments were also seen as very important and were used as a discriminator when making selections. Further, the board looked closely at résumés and was positively influenced by those that were well-written and addressed ATAP application requirements.

In contrast, detractors from applications included poorly prepared packages and information discrepancies. This was particularly true when comparing the Acquisition Career Record Brief (ACRB) to the required résumé. Note that while the ACRB is an essential snapshot of the acquisition professional's career, the résumé provides an excellent opportunity to outline the depth and breadth of work experience and training not seen on the ACRB. It is strongly suggested that each applicant take the time to ensure that gaps in information are closed on the ACRB and that employment history in Section IX on the ACRB match positions listed on the résumé. Inconsistencies may cast doubt on the validity of the submitted information.

The board also noted three issues that detract from an applicant's package. First, missing supervisory comments were detrimental to applicants' selection potential during the review process. Therefore, supervisors are greatly encouraged to complete this important field as a way of bolstering an applicant's chance for selection. Second, there were instances in which applicants lacked the required training that would lead to certification and yet were trying to seek education funding. Finally, educational requests that appeared inconsistent with career goals—and did not offer sufficient explanation—were not looked on favorably.

For those individuals required to have a Senior Rater Potential Evaluation (SRPE), the board noted that the SRPE should emphasize the applicant's future potential rather than current or past performance. Specific rather than vague comments are also encouraged. The ideal SRPE includes not only supervisory comments that address future potential, but also applicant comments that highlight the particular strengths that will contribute to future professional growth.

In summary, the board will learn about applicants through their application package. Because there is no opportunity to explain inconsistencies, a complete and detailed application package is highly recommended. For assistance in putting together your application, contact your regional Acquisition Career Manager or the National Capital Region Customer Support Office. Contact numbers are found on the Acquisition Support Center's home page at **http://asc.rdaisa.army.mil**. (Click on **Organization/POC**.)

Certification Requirements Update

Two new acquisition career fields are being added to the acquisition family in FY03: Facilities Engineering (FE), and Systems Planning, Research, Development and Engineering, Science—Systems Engineering and Technology Manager (SPRDE S&T). The certification requirements for these fields are in the Defense Acquisition University (DAU) Catalog at **http://www.dau.mil**.

The following changes have also been made to the certification requirements for other career fields:

• The certification standard checklist now requires CON 100 (Shaping Smart Business Arrangements) as a prerequisite for CON 101 (Basics of Contracting) to obtain Level I certification in contracting. However, if individuals completed CON 101 as of Oct. 1, 2002, they are not required to take CON 100 for certification purposes.

• The certification standard checklist for the Information Technology (IT) career field in the 2003 DAU Catalog incorrectly lists Software Acquisition Management (SAM) courses as part of the certification checklist for the IT career field. As of Nov. 15, 2002, SAM courses are desired but not mandatory. However, these courses are expected to be mandatory in the future (most likely starting Oct. 1, 2004).

• The certification standard checklist for the Program Management career field modified its Level I experience requirement to state that applicants must possess "1 year of acquisition experience." In effect, this opens Level I certification to all Acquisition and Technology Workforce members who have 1 year of acquisition experience and have completed ACQ 101.

• The certification standard checklist for the Test and Evaluation career field now indicates that there is a positive education requirement for Level I certification.

We will keep you posted as certification changes occur. If you have questions regarding certification, contact the Acquisition Career Managers at the National Capital Region Customer Support Office. Contact numbers are found on the Acquisition Support Center home page at **http://asc.rdaisa.army.mil**. (Click on **Organization/POC**.)

NCR CSO Offers Onsite Workshops

The National Capital Region Customer Support Office (NCR CSO) invites all organizations serviced within the NCR to take advantage of onsite visits to your location to discuss acquisition career management. The NCR CSO will provide a comprehensive overview on career management, including overall Army Acquisition Corps (AAC) initiatives and career-broadening opportunities. In tandem with the overview, or as a separate initiative, small interactive workshops are also offered that discuss the nuts and bolts of career management. This forum provides more detail on all aspects of career management and encourages a learning atmosphere where specific issues are addressed, with greater focus on the Acquisition Career Record Brief (ACRB) and Individual Development Plan (IDP). The NCR CSO will also tailor workshops to supervisors or around organizational needs. Overview and workshop topics include, but are not limited to, the following:

- AAC initiatives;
- Acquisition position list numbers;
- Continuous learning (individuals and supervisors);
- Establishing and maintaining the ACRB;
- Establishing and maintaining the IDP (individuals and supervisors);
- Certification requirements;
- Certification process;
- Applying for Defense Acquisition University quotas;
- Fulfillment;
- Equivalency;
- Acquisition and leadership training;
- Applying for a board;
- Acquisition, education, training and experience (AETE);
- Acquisition Tuition Assistance Program (ATAP);
- Competitive Development Group (CDG);
- Senior Service College;
- Leadership and development;
- Training With Industry;
- Corps Eligible (CE) membership requirements and application procedure; and
- AAC requirements and application procedure.

The NCR CSO offers follow-on sessions with workforce members to discuss specific items of interest relevant to the acquisition professional's career. The NCR CSO will work with you to provide exactly the site visit that your organization requires. For additional information about this opportunity or to schedule a site visit by NCR CSO Acquisition Career Managers, contact Anne Galway at **anne.galway@us.army.mil** or at (703) 704-0121.

From The ASC FA51 Proponency Officers . . .

Level II Certification News

FA51 officers should apply early for ACQ 201 (Intermediate Systems Acquisition) and PMT 250 (Program Management Tools), which are required for Level II certification in the Program Management career field. There are generally waiting lists for both of these courses, so officers who need them must plan ahead. Both of these courses are prerequisites for PMT 352 (Program Management Office Course), which is required for Level III certification in the Program Management career field.

AAC Flag

All Army Acquisition Corps (AAC) organizations authorized to obtain the new AAC flag should have done so by now. For additional information, contact MAJ John Lemondes at the e-mail address or phone number listed below.

New Contact Information

Many elements of the Acquisition Support Center (ASC) recently moved from Crystal City, VA, to Fort Belvoir, VA. Up-to-date contact information for ASC's FA51 proponency officers follows.

51A MAJ John Lemondes: (703) 704-0103, DSN 654-0103, or **john.lemondes@us.army.mil**

51R MAJ Marko Nikituk: (703) 704-0111, DSN 654-0111, or **marko-nikituk@us.army.mil**

51C MAJ Bill Boruff: (703) 805-5495, DSN 655-5495, or **william.boruff@us.army.mil**

NEWS BRIEFS

Japanese Forces Test Improved Munition At Yuma Proving Ground

On April 1, 2001, shortly after a cargo vessel carrying two self-propelled howitzers and their associated equipment departed Japan en route to the United States, the vessel sank to the bottom of the ocean. Approximately $56 million worth of equipment was lost. The trip to Yuma Proving Ground (YPG), AZ, where the 155mm Improved Conventional Munition (ICM) test was to be conducted, was postponed. The test would not take place until the Japanese Ground Self Defense Forces purchased two new howitzers and more equipment. Finally, in May, approximately 70 Japanese representatives arrived to begin operational testing on the improved munitions. The test concluded in September.

Members of the Japanese ground forces have frequently visited YPG to test munitions and a self-propelled howitzer system. The main reason they come to YPG for testing is because of the long ranges and the fact that Japanese ranges contain extremely limited airspace. "Japan does not offer us the airspace for safely firing at high elevations. Our country does not have large test areas like YPG, though it is extremely hot for us in the Arizona summer," said COL Takashi Kizu, Chief of Testing. "Another important factor is that there is little rain, which helps keep our testing on schedule," he added.

The 155mm ICM is a base-bleed projectile that achieves extended distances (about 30 miles). Test managers fired approximately 900 rounds of ammunition during the course of the test. ICM projectiles contain submunitions that can be configured either for anti-personnel or anti-tank purposes.

Like all tests conducted at the proving ground, safety is always the highest priority. "Safety is the number one factor in our tests. Every morning before tests begin, a meeting is conducted to re-enforce the safety of everyone involved. The YPG test director goes over the daily test plan and CPT Hiroshige Uchiyama translates the information into Japanese. However, in the event that a problem occurs, all necessary safety measures are taken into consideration and the proper personnel are called to assist in solving the problem," said Kizu.

Personnel who provide some of the problem solving and technical support include representatives from the U.S. Army Armaments Research, Development and Engineering Command, Picatinny Arsenal, NJ, and the Operations Support Command, Rock Island Arsenal, IL.

"We are here to technically support the test operation in our areas of expertise. We are available to assist when problems come up and help ensure that the tests are always being conducted within contractual requirements. We also serve as escorts for the Japanese because it is a requirement that foreigners always be formally escorted on a government installation," said Axel Torres, Co-production Project Officer from Rock Island.

The Japanese view these tests as high visibility activities. The Japanese government receives a daily update regarding the progress of the test. "We do this to ensure everything is on schedule and going along smoothly, and to reassure our government that we can succeed and meet the completion of the program's test date with no problems. Our goal is to succeed on our test project and to maintain an excellent relationship between the Japanese and U.S. government," said Kizu.

The preceding article was written by Yolie Canales, a Public Affairs Specialist at the U.S. Army Yuma Proving Ground.

CONFERENCES

Ground Vehicle Survivability Symposium

The 14th annual U.S. Army Ground Vehicle Survivability Symposium (GVSS) will be held April 7-10, 2003, at the Naval Postgraduate School, Monterey, CA. The symposium is sponsored by the Survivability Technology Area, U.S. Army Tank-automotive and Armaments Command's Tank Automotive Research, Development and Engineering Center (TACOM-TARDEC). The GVSS provides a forum to announce accomplishments and discoveries and to discuss issues regarding ground vehicle survivability technology areas. The conference will be classified up to and including SECRET U.S. ONLY.

For more information, contact Lisa Lynch at (586) 978-3108 or **lynch_lisa@bah.com**, or TARDEC's Jack Reed at (586) 753-2562 or **reedj@tacom.army.mil**.

Execution: The Discipline Of Getting Things Done

By Larry Bossidy and Ram Charan
Crown Business, 2002

Reviewed by MAJ John H. Grimes, an Army Acquisition Corps officer, serving at Oak Ridge National Lab as a student in the Training With Industry (TWI) Program.

Two well-credentialed operators and trainers combined years of wisdom and talent delivering the business text du jour, *Execution: The Discipline Of Getting Things Done*. Larry Bossidy, the former Allied Signal CEO, and Ram Charan, a long-time executive-level leadership consultant, wrote a business text that could actually be considered a novel study on the discipline of leading operating success.

Volumes outline the topics of leadership development, organizational innovation, and operational plans, but *Execution: The Discipline Of Getting Things Done* deals with getting things done from a systematic, behavioral, and multilevel strategic (not merely tactical) viewpoint. What further sets off the novelty of this book is its unapologetic bluntness—it calls a duck a duck and provides many vignettes from both the good and the bad. Naturally, the results-oriented text emphasizes performance.

While individuals can achieve personal success capitalizing on exposure and image alone, companies must actually perform for long life and success. The authors argue that this topic of performance is the single largest issue facing the business world today, and leaders and scholars seem to "have their heads in the sand" concerning it. The point is made that most organizations have a hard time facing reality when it comes to recognizing "the gap" that exists between expectations and outcomes.

The text is logically organized in three parts: the discipline of execution, the building blocks required to have it (building blocks are a fundamental hallmark prevalently used throughout the text), and the how-to part to make it so. In an effort to make execution an organizational culture (not merely a program), the presentation follows a systematic approach, addressing the three core organizational processes of people, strategy, and operations. Leaders are both responsible and accountable, and the execution of all three processes is presented as the responsibility of the organization's leadership.

The 270 pages of *Execution: The Discipline Of Getting Things Done* are uncommonly full of wisdom and good examples. Some insights include: effective coaches ask incisive questions, bringing out reality; you change the culture of a company by changing the behavior of its leaders; follow-through is the cornerstone of execution; strategies, owned and constructed by those who will execute them, must address the how-to or they will be immediate candidates for failure. *Execution: The Discipline Of Getting Things Done* is a true "user's manual" providing tools such as the Leadership Assessment Summary to help fill the leadership pipeline, sound recommendations to deal with poor performers, and proven techniques to connect strategies to people to operations. Tenacious follow-through and ardent accountability to standards are stressed throughout this book, unlike in any other contemporary business text I've read.

Overall, the book is refreshing in its newness of topic, and enlightening from the gravitas of the authors. This book could make execution and the gap between expectations and management's performance the key buzzwords of the day, returning vigor and accountability to strategic and operating plans.

During this difficult and critical period of transformation, the techniques and lessons on execution in this book form a worthy discipline for all Army leaders to pursue. *Execution: The Discipline Of Getting Things Done* is available on the Web for under $15. It should be read by all serious leaders and operators.

Secrets & Lies: Digital Security in a Networked World

By Bruce Schneier
John Wiley & Sons Inc., New York, 2000

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

Joint Vision 2020 describes one of the goals of the U.S. military as a real-time, Web-based, cross-Service logistical system. Even if such a system never exists, that goal captures the direction of U.S. logistics: increasingly available, increasingly powerful, and increasingly complex. For that reason alone, logisticians must understand the threats to and vulnerabilities of modern logistical systems. In his book *Secrets & Lies: Digital Security in a Networked World* (henceforth referred to as *Secrets & Lies)*, Bruce Schneier lays out the basic threat environment, but more important, describes the inherent vulnerabilities in networked systems.

Secrets & Lies is an excellent guide to understanding risk in networked systems. The author goes beyond general threats, inherent vulnerabilities, and a laundry list of

countermeasures. He demonstrates how these factors interact and explains how risk cannot be eliminated, but must be managed.

For that reason alone, the book is a worthwhile read. Schneier does much to dispel the notion that security can be attained through a single product or any simple solution. Although this sounds obvious, it is actually very insightful, especially considering the source. Schneier, a security technologist who has designed his own cryptographic algorithm, had argued in the past that cryptography could secure networks. In this book, he shows that it cannot—not by itself, not with poor implementation, and not without an entire security process in place that understands, mitigates, and accepts risk.

While an excellent introduction into the field of computer security, the book is no "Security for Dummies." Although Schneier avoids technical descriptions, he goes into much detail about how computers and networks operate to demonstrate specific points. His section on cryptography, for example, is excellent. Without delving into prime-number theory or highly technical detail, he describes the multiple roles that cryptography plays and the types of security it can provide to an organization.

The book is divided into three parts: The Landscape, Technologies, and Strategies. These focus on threats, vulnerabilities, and risk management, respectively. The vulnerabilities section is by far the longest. It is quite an eye-opener, starting very simply with vulnerabilities in single systems. It proceeds to describe increasingly complicated networks and the growing number of weaknesses, not only in the networks themselves, but also in the human processes that control them. This is the section that anyone working with a sensitive network must read.

There are a number of important messages in this book. First, security cannot be proved true, but only be proved false by demonstration. Second, complexity is the enemy of security, and any system that needs to be both complex and widely accessible is going to have inherent vulnerabilities. Third, security is a process reliant on many different countermeasures, but most important, the people involved in its creation, administration, and function. The strength of Schneier's work is that it avoids simple conclusions and does not give easy answers. Those who work with complex systems will appreciate his candor.

Contracting Activity Performance Metrics Created

Army Contracting Agency (ACA) Acting Director Sandra O. Sieber has identified the metrics that will be used to evaluate performance of the newly established ACA and its contracting activities at installation level. These measures are divided into four general groups and include one set for use by the Assistant Secretary of the Army for Acquisition, Logistics and Technology, two other sets for the Office of the Assistant Chief of Staff for Installation Management, and a fourth set for use by the Army staff.

Although each of the metrics will measure the efficiency or effectiveness of a contracting activity by a slightly different "yardstick," the results are expected to give an overall picture of the relative strength of installation contracting activities and to gauge the responsiveness to the needs of individual customers and supported activities. General categories will measure customer satisfaction, economies and efficiencies, government purchase card management, workforce professionalism, and support of socio-economic programs.

The ACA implemented the DOD Interactive Customer Evaluation (ICE) system to allow customers to submit real-time comments and receive rapid responses from managers. The ICE system requires no new hardware, software, or special passwords and is accessible from any computer with an Internet connection. ACA managers will be able to compare the performance of contracting activities across an ACA region or ACA-wide. Log onto **http://ice.disa.mil** for a tour of the customer module. Questions concerning ICE implementation by ACA should be directed to Bill Swan, ICE Site Manager, at (703) 681-1047 or DSN 761-1047 or **william.swan@saalt.army.mil**.

The ACA was established Oct. 1, 2002, to realign a significant portion of the Army's contracting resources and actions into one organization. The ACA is responsible for more than $5.5 billion in annual obligations and will be one of the three largest contracting activities in the Army. The ACA's primary goals are to synchronize contract management activities with the Installation Management Agency and to reshape customer support in a manner that is transparent to its customers.

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OR

Jim Welsh (703) 704-0104, DSN 654-0104
e-mail: **Jim.Welsh@us.army.mil**

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

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

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Purpose

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

Subject Matter

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

Length of Articles

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

Photos and Illustrations

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

Biographical Sketch

Include a short biographical sketch of the author/s that includes educational background and current position.

Clearance

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

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

Submission Dates

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

Submission Procedures

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

Farewell From The Editor

Challenging, frustrating, and great fun! On the eve of my retirement as Editor-in-Chief of Army AL&T, these are the words that best describe my feelings about my career with the magazine during the past 30-plus years. I want to stress that I initially joined the magazine staff in 1971 as a GS-5 Editorial Assistant and never in my wildest expectations envisioned being here this long, much less having the privilege of serving as the magazine's Editor. Like all jobs, mine had its ups and downs but, on balance, it was a great ride—one that I would take again without hesitation. Not wanting to bore you with the details of my many multifaceted experiences, I just want to convey a sincere "thank you" to the numerous outstanding contributors to the magazine who largely made it the successful product that it now is. I also want to thank all of the individuals in the Department of the Army—from the senior leadership to the bench-level scientists, engineers, and administrative personnel—who believed in the magazine and steadfastly supported its continued publication over the years, even during the leanest of times.

Finally, I want to express my gratitude to the Army AL&T editorial staff, past and present, who worked diligently to ensure that this publication always got out to its loyal readership error free and on time. With this—my final issue—I can state unequivocally—that the magazine is left in "good hands!"

Harvey L. Bleicher

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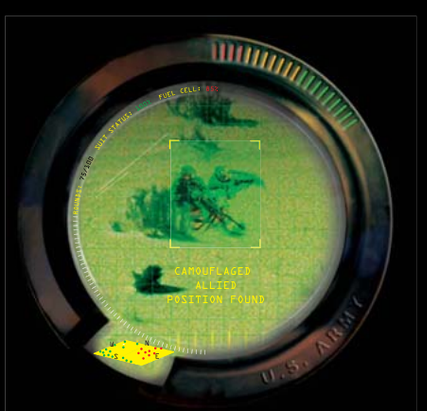

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