ARMY LOGISTICIAN

JANUARY–FEBRUARY 2007

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Logistics in the Deep Future

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Deployment and Distribution Command and Control

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Prediction and Cooperation

Energy on Demand

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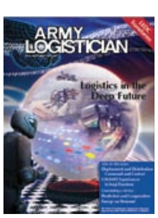

Cover: Logisticians of the future transformed Army will face challenges different from those faced by today's logisticians, and they will need different tools to surmount those challenges. The Army Logistics Innovation Agency's Futures Group has identified five themes for innovation that could help revolutionize future logistics. This issue presents the last two in a series of articles about these potential advances. "Energy on Demand," beginning on page 28, explores future options for providing energy to Soldiers where and when they need it. "Prediction and Cooperation," starting on page 34, discusses possible future tools and methods for predicting, communicating, and meeting logistics needs. *(Art by Eric Proctor of the Sensors and Electron Devices Directorate of the Army Research Laboratory.)*

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

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ALOG NEWS

JFCOM AND TRANSCOM SET VISION FOR CLOSER PARTNERSHIP

The commanders of the U.S. Transportation Command (TRANSCOM) and the U.S. Joint Forces Command (JFCOM) have signed a joint vision statement designed to help the two combatant commands work together more closely in improving Department of Defense (DOD) deployment and distribution operations. A strong relationship between these commands is crucial to enhancing joint deployment and distribution processes and programs because of the key roles they have been assigned within DOD. JFCOM is the DOD Joint Deployment Process Owner, while TRANSCOM is the DOD Distribution Process Owner.

According to the joint vision statement, "USJFCOM and USTRANSCOM will transform deployment and distribution into seamless, responsive, synchronized, and interoperable processes that enable rapid delivery and sustainment of joint forces and provide decision makers at all levels with the ability to make accurate, timely decisions for global force projection. . . . USJFCOM and USTRANSCOM efforts to deploy and redeploy U.S. forces are mutually supportive and parallel from end-to-end."

The joint vision statement includes five goals designed to improve interrelated actions to support the warfighter—

• Advance faster, more efficient, and more reliable deployment and distribution processes.

• Experiment with new concepts and make new expeditionary capabilities operational.

• Develop joint officers, noncommissioned officers, and civilians.

• Field modeling and simulation capabilities.

• Codify the Joint Deployment and Distribution Enterprise in doctrine and in techniques, tactics, and procedures.

In signing the statement, the JFCOM commander, Air Force General Lance L. Smith, observed, "What we're doing at USJFCOM is taking the full benefit of our partnership with TRANSCOM. We are melding existing and emerging concepts to develop capabilities and solutions that will directly benefit the joint warfighter. This statement represents the first step to a better environment that will allow the sharing and maturation of new ideas."

Air Force General Norton A. Schwartz, the TRANSCOM commander, commented, "We have a large number of common deployment and distribution activities in our Joint Deployment and Distribution Architecture. So the partnership between USJFCOM and USTRANSCOM will result in better alignment and better integrated processes."

DOD DESIGNATES TRANSCOM AS LEAD RFID AND AIT PROPONENT

The U.S. Transportation Command (TRANSCOM) was recently designated as the lead functional proponent for implementation of radio frequency identification (RFID) and related automatic identification technology (AIT) for the Department of Defense (DOD) supply chain.

The Under Secretary of Defense for Acquisition, Technology, and Logistics announced the designation in a 26 September memorandum that states, "This memorandum clarifies the role of the DPO [Distribution Process Owner] in executing an AIT implementation strategy and developing a centralized approach for use of these asset visibility technologies." As the DPO, TRANSCOM is responsible for the overall effectiveness, efficiency, and alignment of DOD-wide distribution activities, including force projection, sustainment, and redeployment and retrograde operations.

TRANSCOM uses AIT to achieve visibility of its shipments through an extensive active RFID infrastructure that is in place at strategic ports worldwide. Information on the arrival and departure of shipments is fed to TRANSCOM's Global Transportation Network, an automated command and control information system that provides an integrated system of in-transit visibility information and command and control capabilities.

"We are working toward development of a concept of operations to achieve end-to-end visibility using an integrated mix of AIT," said Air Force Lieutenant Colonel Amy Pappas, Chief of the Initiatives Branch of TRANSCOM's Strategy, Plans, Policy, and Programs Directorate, which is the command's lead element for AIT implementation. "And we'll work this effort in collaboration with our Joint Deployment and Distribution Enterprise partners, including the Office of the Secretary of Defense, the Defense Logistics Agency, the combatant commands, the military services, and other agencies. Our vision is to enhance transformation by focusing and synchronizing the right mix of AIT and corresponding logistics systems to support the DOD supply chain in an end-to-end integrated environment."

(continued on page 54)

Deployment and Distribution Command and Control

BY LIEUTENANT GENERAL ROBERT T. DAIL AND LIEUTENANT COLONEL DAVID E. JONES

The U.S. Transportation Command and the Defense Logistics Agency have partnered with the services to develop an expeditionary joint distribution capability. Synchronization among four organizations is leading to the achievement of Joint Theater Distribution.

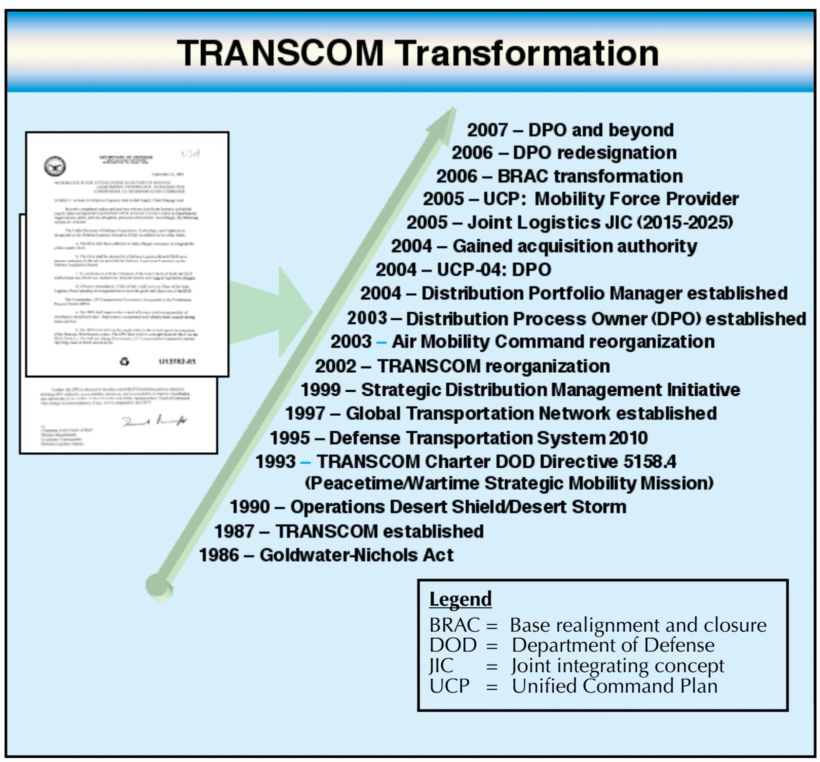
The Army has embarked on an ambitious program to transform the force while it fights the Global War on Terrorism. According to *The ARMY Magazine Hooah Guide to Army Transformation* by Dennis Steele, which appeared in the February 2001 issue of *ARMY*, "Army Transformation represents the sweeping measures [required] to accomplish the Army Vision, changing the ways that the Army thinks, trains and fights." This transformation includes not only changes in organization, training, tactics, and equipping of forces but also in logistics. Following the terrorist attacks of 11 September 2001, the need for a rapidly deployable force that could respond globally, in hours, to a wide range of missions became more than a goal—it became a necessity.

Today, the U.S. military is engaged on multiple fronts and at multiple levels across the full spectrum of the operational continuum. "Joint," under the textbook definition found in Joint Publication 1–02, Department of Defense Dictionary of Military and Associated Terms, "connotes activities, operations, organizations, etc., in which elements of two or more Military Departments participate." However, this definition seems overly simplistic in the post-9/11 era.

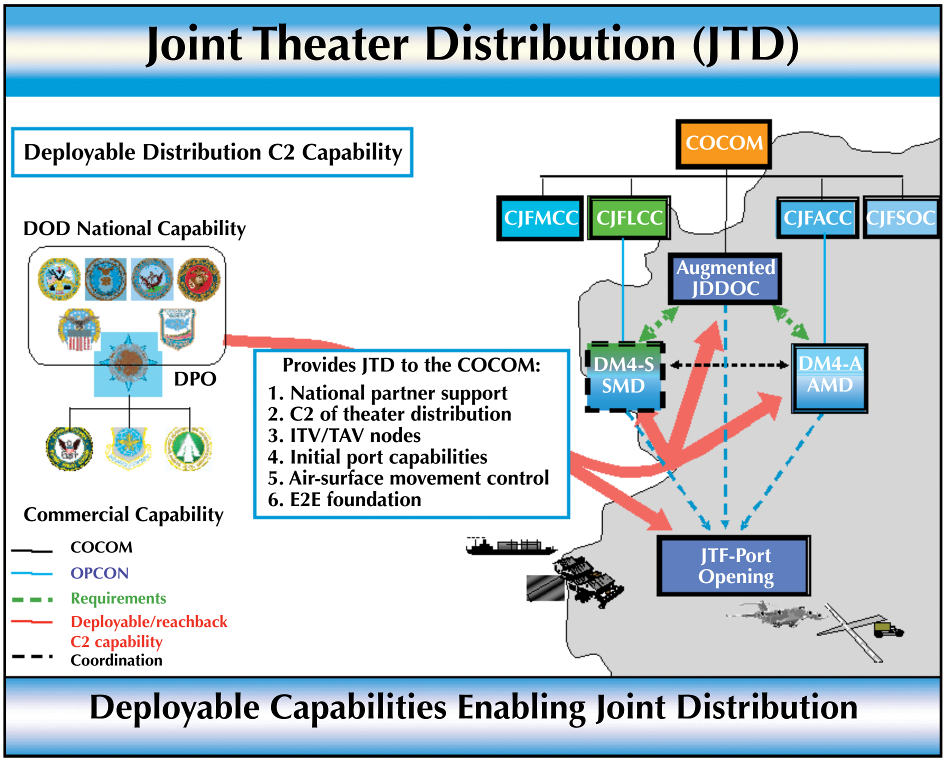
Take, for example, our military's response to Hurricane Katrina along the gulf coast in the fall of 2005. The military was called on to interface simultaneously with local, state, and Federal agencies while employing the full range of capabilities of the total force (Active, Guard, Reserve, and agencies). We had to deal with Government and non-Government relief organizations. Different levels of government in many jurisdictions made this a highly dynamic and complex environment for conducting effective civil support operations. If we multiply the complexity of hurricane relief operations by the operational environment of the Global War on Terrorism, it readily becomes apparent that we face the most challenging logistics environment in history.

As the United States has deployed and operated in different theaters in recent years, both the geographic combatant commanders (GCCs) and their respective service components have been confronted with the challenge of effectively synchronizing the deployment of forces and distribution of materiel. The importance of being effective while maintaining economy of force has been underscored for the services, and especially the Army, as they have responded to multiple threats and rotations. Joint Theater Logistics is a way to achieve capabilities that optimize theater logistics to support the GCCs.

The purpose of Joint Theater Logistics is to enhance the ability of the Joint Force Commander to improve warfighting capabilities through better logistics support. "Big Logistics," or "Big L," is broad in scope and



The U.S. Transportation Command (TRANSCOM) has evolved over two decades to become the Distribution Process Owner (DPO) for the Department of Defense.



Legend

AMD = Air mobility division
C2 = Command and control
CJFACC = Combined Joint Forces Air Component Command
CJFLCC = Coalition Joint Forces Land Component Command
CJFMCC = Combined Joint Forces Marine Component Command
CJFSOC = Combined Joint Forces Special Operations Command
COCOM = Combatant command
DOD = Department of Defense
DPO = Distribution Process Owner
E2E = End to end
ITV = In-transit visibility
OPCON = Operational control
SMD = Surface mobility division
TAV = Total asset visibility

Joint theater distribution is enabled by the four organizations shown at the right of the chart: the Joint Deployment Distribution Operations Center (JDDOC), Director Mobility Forces-Air (DM4–A), Director Mobility Forces-Surface (DM4–S), and Joint Task Force-Port Opening (JTF–PO).

encompasses numerous activities beyond synchronizing force deployment, sustainment distribution, and retrograde operations. "Big L" includes engineering, maintenance, health and personnel services, and a host of other force support actions. The focus of this article is narrower, concentrating on a subset of functions in Joint Theater Logistics and Joint Theater Command and Control.

Joint Theater Distribution

During Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF), we have witnessed the most dominating, rapidly moving, complex, and ultimately successful combined air, sea, and ground operations ever. Moreover, the agility exhibited both strategically and operationally by our military forces has been unmatched in history. What other country could have demonstrated the operations capability needed for success in OEF and OIF while also deploying elements of the Marine Corps to Haiti, responding to disasters at home and abroad, or aiding in the rescue of a Russian submarine half a world away? However, the execution of this agile response capability posed fundamental challenges for logistics support.

The U.S. Transportation Command (TRANSCOM), established in 1987, already had a long history of supporting all combatant commands (COCOMs) directly with worldwide force and sustainment movement. An important step in TRANSCOM's evolution occurred on 16 September 2003, when the Secretary of Defense designated the TRANSCOM Commander as the Department of Defense (DOD) Distribution Process Owner (DPO). This designation made him responsible for improving the overall efficiency and interoperability of distribution-related activities and for serving as the single entity to direct and supervise execution of the distribution system. Soon afterward, TRANSCOM gave birth to a rapid expeditionary joint distribution capability known today as Joint Theater Distribution (JTD).

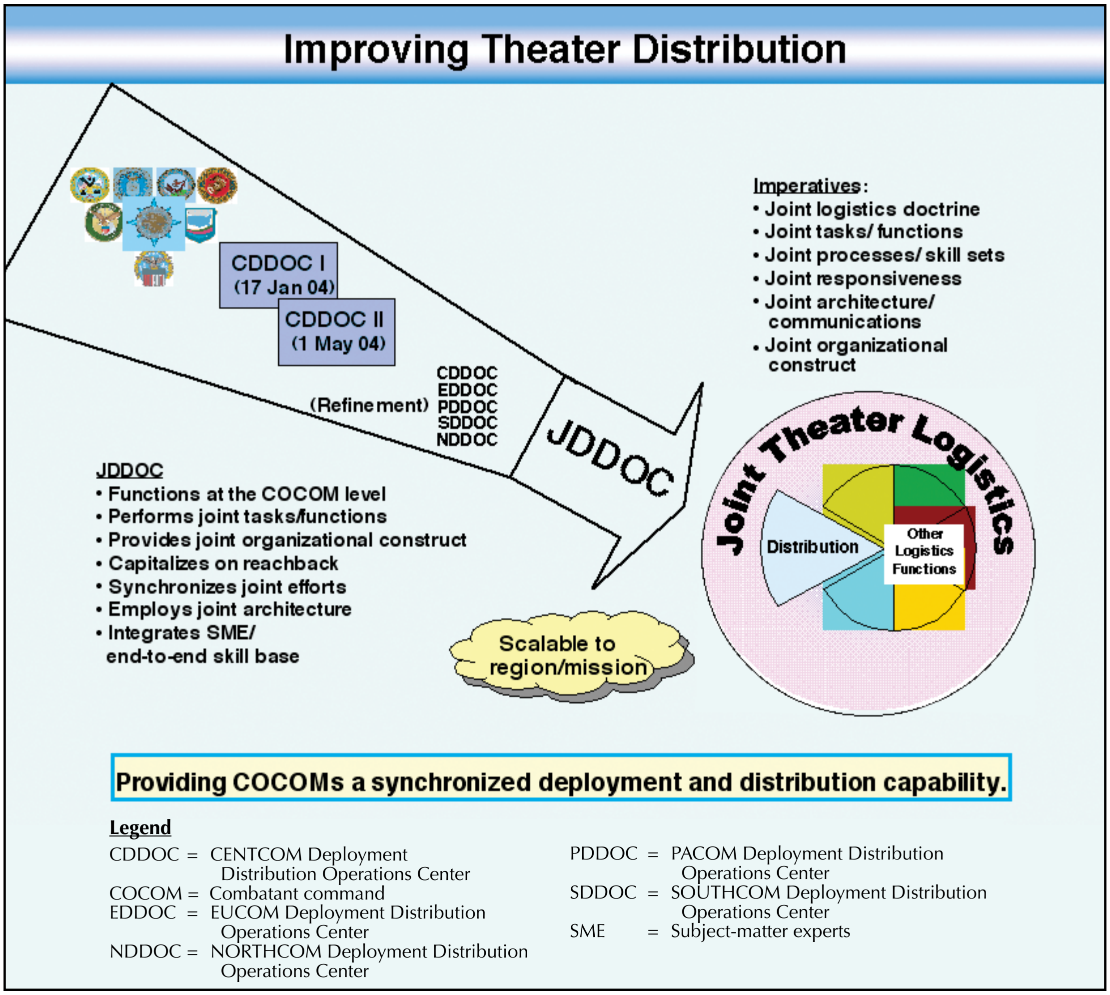
JTD is enabled by the synchronization of functions and tasks in four organizations that deploy into theaters under operational control (OPCON) to GCCs. These four organizations are the—

- Joint Deployment Distribution Operations Center (JDDOC).
- Director Mobility Forces-Air (DM4–A).
- Director Mobility Forces-Surface (DM4–S).
- Joint Task Force-Port Opening (JTF–PO).

TRANSCOM and its national partners provide the JDDOC; the services furnish the DM4–A and DM4–S; and the Air Force component of TRANSCOM (the Air Mobility Command) provides the JTF–PO. These new organizations generate joint output for the GCCs and are commonly referred to as "D2C2" (deployment and distribution command and control).

Joint Deployment Distribution Operations Center

The first D2C2 organization is the JDDOC. In response to the challenges of OEF and OIF, TRANSCOM, as the DPO, established a JDDOC to assist the U.S. Central



Joint deployment distribution operations centers (JDDOCs) in each geographic combatant command help to improve theater distribution and achieve joint theater logistics.

Command (CENTCOM) in organizing and synchronizing its deployment forward and distribution operations. Using the Joint Movement Center concept as a starting point, TRANSCOM, together with the Army Materiel Command, coordinated with CENTCOM and the Defense Logistics Agency (DLA) to develop a CENTCOM Deployment Distribution Operations Center (CDDOC).

Within 90 days of concept proposal, the prototype CDDOC had been manned, trained, and deployed to the CENTCOM theater of operations. Since it deployed on 16 January 2004, the CDDOC has played a major role in assisting the JTF to respond rapidly and manage and improve logistics support. The CDDOC's accomplishments and innovations have become mainstream practices in DOD while producing cost avoidances and savings for the services totaling over $1 billion.

The CDDOC developed a partnership with the Department of the Army, DLA, the Coalition Forces Land Component Command (CFLCC), Combined Joint Task Force-7 in Iraq, and the Military Surface Deployment and Distribution Command (SDDC) to package materiel on pure pallets for troops at far forward locations, establish container management teams in theater, and divert large items from air lines of communication to ocean shipping in order to free up scarce air assets for operational use.

Based on the CDDOC prototype, the JDDOC is a joint capability-based organization designed to satisfy the requirement to integrate strategic and theater force deployment execution and distribution operations within each GCC's operational theater. It is flexible and scalable so that each GCC can adapt the organizational structure to meet the needs of his operational theater or mission. The JDDOC directs national partners (combatant commands, services, Defense agencies, and commercial partners) and GCC service component common-user and theater distribution operations above the tactical level in the GCC's area of operations. Although it is not designed to execute materiel management functions, the JDDOC's ability to move forces and high-priority materiel across the area of responsibility and to establish forward operational storage locations to support all four service components is unprecedented.

The JDDOC's ultimate goal is to improve end-to-end distribution and to facilitate the GCC's ability to identify, monitor, and manage shipments at any point in the global distribution system. The JDDOC has now been created by the DPO in every geographic combatant command, including the U.S. Northern Command (NORTHCOM) during Hurricane Katrina. These experiences suggest that the JDDOC best serves the GCC when the GCC has directive authority for logistics.

Director Mobility Forces-Air

The second of the four JTD organizations is the DM4–A. After Operation Desert Storm in 1991, the Air Force realized that it did not have the right mix of skills and capabilities to integrate the air mobility mission (both airlift and aerial refueling) into the combined air operations center of the combined joint forces air component command. Over the next decade, the Air Force developed the air mobility division (AMD) to execute the air mobility command and control mission and to reach back into the Air Mobility Command at Scott Air Force Base, Illinois. This allowed the joint force commander to access commercial capabilities, employ strategic capabilities inside the theater, and

As long as our Armed Forces continue to be committed around the globe, our ability to deploy and sustain them will remain a top priority. We must continue to integrate the unique logistic capabilities of all our services in the most efficient manner possible . . . The route of sustainment—from point of supply to user—is the lifeblood of our combat power.

—General Henry H. Shelton,
Chairman of the Joint Chiefs of Staff,
April 2000

provide aircraft for air evacuation missions. The Air Mobility Command was designated as the force provider for the AMD mission; it established an AMD training program and a separate training program for colonels and brigadier generals assigned to lead AMDs. These leaders were called the Director of Mobility Forces-Air (DM4–A)

When the numbered air forces that function as the service components of geographic combatant commands (such as the 9th Air Force for CENTCOM) execute contingencies, they request and receive a DM4–A and a tailored AMD from the Air Mobility Command. The Air Mobility Command ensures that AMDs and DM4–As are trained to current standards of performance and know mobility procedures and the latest platform technology and command and control systems. The DM4–A and AMD augment the combined air operations center and serve until the mission is contracted out, the mission is closed out and they return home, or the Air Force Reserve is mobilized to support long-term operations. Again, one of the strengths of DM4–A is its scalability. The DM4–A is an Air Force organization that contributes to joint output. Recently, TRANSCOM provided a DM4–A and a smaller AMD to NORTHCOM for Hurricane Katrina relief and to the U.S. Southern Command for humanitarian relief in Haiti.

Experiences from OEF and OIF have underscored the importance of the relationship between the JDDOC and the DM4–A and AMD. Each organization leverages its collective expertise and its visibility of capabilities and requirements to execute the air mobility mission in the theater. The JDDOC has visibility of joint requirements at the theater level and is constantly receiving requirements from tactical-level forces of all services. It synchronizes the requirements and validates modal missions to the DM4–A for execution.

An early discovery about JDDOC operations was that the JDDOC, with its link to TRANSCOM, could begin to determine modes of transportation, recommend forward stocking, and implement theater channels and overland lines of communication using commercial capabilities. This has contributed substantially to reducing the U.S. military footprint, which, in turn, has helped achieve diplomatic and force protection goals in the Global War on Terrorism.

Director Mobility Forces-Surface

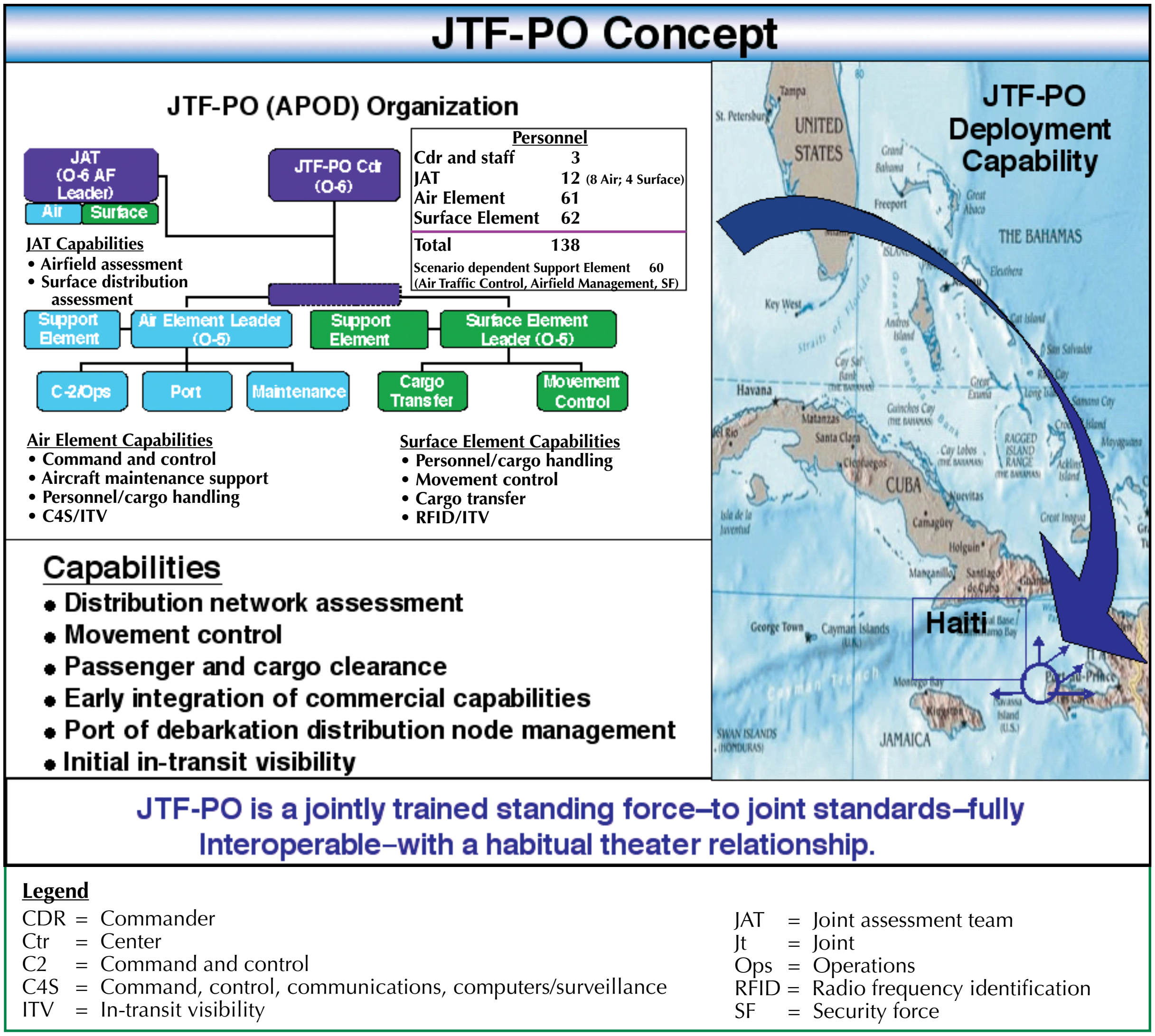
As the JDDOC and DM4–A were developing, two phenomena became evident. First, the Army had no equivalent to the DM4–A; in other words, no Army-trained entity could execute the same process for ground operations as the DM4–A did for air operations. This would include the use of commercial liner and surface shipping inside theaters. Second, DOD had no process for deploying on a moment's notice and operating aerial and sea ports of debarkation (APODs and SPODs) to joint standards with immediate connections to the theater JDDOC and DM4–A. In essence, our experience operating around the globe served as the basis for developing two additional deployable capabilities that, when combined with the JDDOC and the DM4–A, would be the building blocks of a joint theater deployment and distribution capability. These additional capabilities are the DM4–S and the JTF–PO.

Before transformation, the Army had a significant transportation structure in its theater support commands (TSCs) that performed both mode (means of transportation, such as air or ground) and terminal operations. The transportation structure included such organizations as the theater movement control agency (TMCA) and the transportation command element (TCE). The modular Army combat service support structure developed by the Army Combined Arms Support Command benefited the tactical Army, but it eliminated much of the movement and distribution command and control capabilities that TRANSCOM had come to depend on for end-to-end execution.

Once the CDDOC deployed to CENTCOM, TRANSCOM saw the benefit of establishing a capability in the ground force that executed movement and distribution much like the air component's DM4–A and AMD did. Although the CFLCC had created a Movement and Distribution Cell (C3 for force movements and C4 for materiel movements) and had the TSC for materiel movements, these organizations were untrained in joint operations and lacked knowledge of the capabilities of TRANSCOM, the Air Mobility Command, or the commercial sealift industry. The Army had developed distribution management centers (DMCs), but it had no capability for bringing the full capabilities of national partners into the battlespace.

In August 2006, CENTCOM established the first DM4–S and surface mobility division (SMD) in the CFLCC in Kuwait. The DM4–S is a brigadier general, and the SMD includes Active Army, Army Reserve, and SDDC personnel. They were established within 12 months of concept approval.

The bottom line is that the DM4–S serves as the ground force's force projection "plug" to the capabilities of national partners. Moreover, the current DMC needs



The Joint Task Force-Port Opening (JTF–PO) is an Army and Air Force team that is trained, organized, and equipped to operate a significant aerial port of debarkation (APOD) 24 hours a day, 7 days a week, for up to 45 to 60 days.

to be linked with the SMD in order to connect with DLA to execute the movement of materiel.

TRANSCOM suggests that the DM4–S (with a combatant command C4 theater movement cell) replace the old TMCA/TCE structure and that it be incorporated into the TSC as one of its ground capability plugs and have a training relationship with TRANSCOM's Army component, SDDC. In contingencies, the DM4–S should be a brigadier general or colonel, depending on the complexity of the operation. These service component-specific leaders should be routinely identified and trained by SDDC to the same joint standards as a DM4–A and AMD. TRANSCOM would ensure that these capabilities were exercised in the joint exercise program.

Joint Task Force-Port Opening

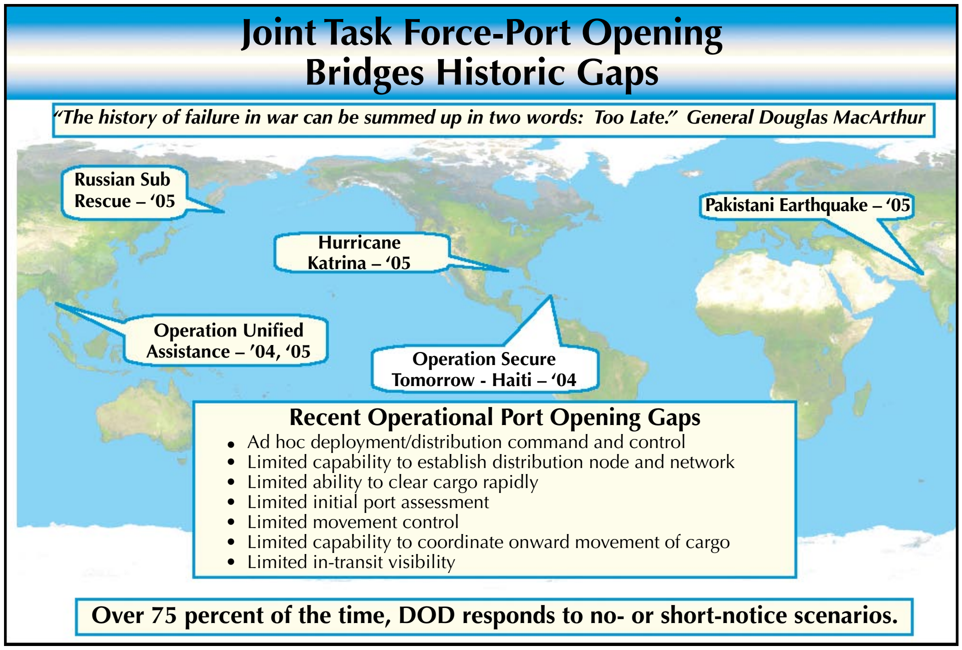
Last but not least, TRANSCOM as the DPO has rapidly developed an expeditionary port-opening capability in the JTF–PO. Conceived just a year ago, JTF–PO is the fourth of the D2C2 capabilities that generate joint output for the GCC.

After-action reports from recent deployments supporting contingency operations (both combat and noncombat) demonstrated that DOD lacked a joint standing capability to open and operate airports and seaports expeditiously. Historically, TRANSCOM has opened ports 75 percent of the time for noncombat operations such as hurricane relief, humanitarian assistance, and noncombatant evacuations. These operations have been conducted at the direction of the Secretary of Defense by GCCs outside of the request for forces (RFF) and deployment order (DEPORD) process. TRANSCOM can dispatch an APOD capability, but it lacks the Army movement control and onward movement capability needed to provide for full joint port operations.

This lack of "jointness" has impacted both combat and noncombat operations. When the United States landed six aircraft carrying Navy and Air Force equipment in Russia to help rescue trapped submariners, it did so operating in the blind. This experience showed that the United States needed a movement control capability with state-of-the-art communications equipment to coordinate the onward movement and call forward process at an APOD. As TRANSCOM participated in various operations and exercises over the past 2 years, this lesson continued to surface. The Air Force lacked the capability to perform arrival/departure airfield control group (A/DACG), onward movement, clearance, in-transit visibility (ITV), and command and control missions using APOD ramps.

TRANSCOM subsequently developed a concept for a joint standing task force in TRANSCOM that would deploy under the TRANSCOM commander's

This chart shows gaps in recent port opening operations that the Joint Task Force-Port Opening (JTF–PO) is designed to fill.



authority—the JTF–PO. This task force would be placed under the OPCON of a GCC. It would be trained, organized, and equipped to operate a significant APOD 24 hours a day, 7 days a week, for up to 45 to 60 days. The advantage of this Air Force and Army team is that the Army gets into the fight at the same time as the Air Force, not afterward. The JTF–PO solves the challenge of having the right mix of command and control, materials-handling equipment, and communications needed to link to the JDDOC and the DM4s immediately on arrival. The JTF–PO also would deploy with TRANSCOM global communications and national contracting capabilities so that, during noncombat operations, it could open, operate, and turn over APODs to TRANSCOM commercial contractors.

TRANSCOM deployed a prototype JTF–PO to CENTCOM's Bright Star 05 exercise and to NORTHCOM's Ardent Sentry exercise, both of which produced immediate favorable results. The Secretary of Defense recently approved a JTF–PO APOD standing executive order that directs 62 Army personnel assigned to a movement control battalion in TRANSCOM's Army component, SDDC, to act as an interim provider of this port-opening capability for 1 year. This JTF–PO team, which includes an Air Force contingency response group, is based at Fort Dix and McGuire Air Force Base, New Jersey. The JTF–PO force participated in a fly-away certification exercise with the XVIII Airborne Corps at Fort Bragg, North Carolina, in August 2006. The fly-away certification event is the key mission rehearsal exercise that will certify the JTF–PO's mission readiness. The TRANSCOM commander declared that JTF–PO had achieved initial operational capability at the conclusion of the Joint Exercise for CONUS [continental United States] Humanitarian and Disaster Relief and is scheduled to evaluate it for additional missions outside CONUS.

The face of the battlefield has changed. Based on recent events and exercises at the operational and strategic levels in the Global War on Terrorism, the U.S. military has realized that additional joint command and control capability is required to execute the joint deployment and distribution mission effectively in theaters around the globe. TRANSCOM's responsibility as the DPO is to manage the deployment and distribution pipeline in support of the warfighter. It takes Army forces and expertise to do this. They must be integrated into this process.

This is only the beginning. TRANSCOM and DLA have established an active and close partnership that has fostered several transformation initiatives designed to further improve expeditionary D2C2 capabilities. The two organizations have developed two logistics information systems—the Integrated Data Environment and the Global Transportation Network—to support rapid D2C2 deployments. DLA also has developed a deployable theater distribution center capability and will link this capability to the authority of the DPO (TRANSCOM). Theater Army organizations must be structured to provide and receive these joint capabilities. Future Army expeditionary and theater-opening concepts must take advantage of and incorporate these joint capabilities that could well precede Army forces awaiting the outcome of the RFF and DEPORD process. **ALOG**

Lieutenant General Robert T. Dail is the Director of the Defense Logistics Agency. He previously served as the Deputy Commander of the U.S. Transportation Command (TRANSCOM) at Scott Air Force Base, Illinois, and as the Director, J–3/J–4, at TRANSCOM. He has a B.S. degree in business administration from the University of Richmond, an M.B.A. degree from Boston University, an M.M.A.S. degree from the Army Command and General Staff College, and an M.S. degree in national resource management from the National Defense University. He is a graduate of the Transportation Officer Basic and Advanced Courses, the Army Command and General Staff College, the School of Advanced Military Studies, and the Industrial College of the Armed Forces.

Lieutenant Colonel David E. Jones is the Deputy Executive Officer for the Commander, TRANSCOM. He has a B.S. degree in business management from Clarion University of Pennsylvania and an M.S. degree in transportation management from the Florida Institute of Technology. He is a graduate of the Infantry Officer Basic Course, the Combined Logistics Officers Advanced Course, and the Army Command and General Staff College.

Breaking Paradigms: CENTCOM DDOC's Revolution in Deployment and Distribution

BY COMMANDER EDDIE MONTERO, USN

Although it is a small organization, the CENTCOM Deployment and Distribution Operations Center packs a huge logistics punch.

A revolution is taking place in the U.S. Central Command's (CENTCOM's) area of responsibility (AOR). This revolution is led by the CENTCOM Deployment and Distribution Operations Center (CDDOC), which is located in Kuwait. With its forward location, the CDDOC always has the warfighters in mind.

CDDOC's charter is based on a longstanding need for improved integration of strategic and tactical distribution. In January 2004, the answer to that need—the DDOC concept—became a reality with the establishment of CDDOC. Today, every combatant commander enjoys the expertise of units like CDDOC.

CDDOC is staffed by 67 dedicated, highly motivated individuals from the U.S. military services, the Defense Logistics Agency, the U.S. Transportation Command, the Military Surface Deployment and Distribution Command, and the Army Materiel Command. When compared to the forces surrounding it, CDDOC is not a large organization. However, it still packs a huge logistics punch. CDDOC's Director, Brigadier General David Kee, describes the unit as "the eyes and ears" of the CENTCOM J–4.

CDDOC brings together the best support that national partners have to offer. However, these partners must have more than functional expertise; they also need a deep understanding of the distribution process. It is imperative that every member of CDDOC understand how a decision made locally can have a ripple effect throughout the whole AOR. Although the CENTCOM AOR is the smallest AOR in geographical signature, it includes operations on three different fronts: Operation Enduring Freedom (OEF) in Afghanistan, Operation Iraqi Freedom (OIF) in Iraq, and Operation Horn of Africa (HOA). CDDOC has achieved many significant successes since it was created; several of those successes are discussed below. Operation of the CDDOC has revealed the need for changes in doctrine, and, as this article is being written, some of those changes are underway.

Theater Airlift Capability

The CENTCOM AOR has an unceasing need for airlift. Without adequate C–17 Globemaster III and C–130 Hercules aircraft, warfighters cannot sustain combat readiness and simultaneously meet the high demands of a combat theater. Ensuring the availability of sufficient aircraft is a major challenge for the combatant commander. Compounding this challenge is the demand to support other contingencies, such as the evacuation of U.S. citizens from Lebanon in September during the Israeli offensive against Hezbolla.

CENTCOM is meeting this airlift challenge head on by working closely with force providers to maximize the mobilization of the Air National Guard and Air Force Reserve aircrews. The CDDOC has partnered with the Air Force's Director of Mobility Forces-Air Mobility Division (DIRMOBFOR–Air) and CENTCOM's Combined Air Operations Center, to implement a "hub and spoke" concept of airlift to support OIF.

The hub-and-spoke concept uses C–5s and C–17s from the continental United States' flying "channel," or direct-delivery flights, to bring passengers and cargo to three central hubs in Kuwait and Iraq. From these three hubs, C–130s then are used to distribute cargo and passengers on regular "spoke" routes to outlying airfields with concentrations of U.S. and coalition troops. This method allows for greater efficiency in the use of aircraft and increases the pace of passenger and cargo throughput. As a result of the efficiencies gained by the hub-and-spoke concept, CENTCOM has achieved an average 44-percent decrease in the amount of cargo waiting to be shipped each month and an average 13-percent reduction in cargo held longer than 72 hours. Indeed, the hub-and-spoke airlift system has significantly enhanced CENTCOM's theater airlift capability.

Commercial Tender Aircraft

Personnel assigned to CDDOC's Air and Sustainment Divisions developed an automated system called

Aircraft like this C–130 Hercules (above) are used to transport large volumes of supplies and troops that are essential to fighting the Global War on Terrorism. Below, high-mobility, multipurpose wheeled vehicles are loaded into a C–17 Globemaster III aircraft in Southwest Asia for transport to Bagram, Afghanistan.

Commercial Government Air Program (CGAP), which allows the user to calculate the cost to transport a specific type of cargo. The need for this program became evident after examination of historical data on cost per pound and per pallet of cargo moving through the theater. In July, CDDOC sponsored a Commercial Air Tender Conference in Dubai, United Arab Emirates, that brought together several companies, including United Parcel Service (UPS); UTI/Continental Airlines; Dalsey, Hillblom, and Lynn (better known as DHL); and National Air Cargo, and gave them opportunities to bid on cargo being moved. Using CGAP, the commercial tender company with the lowest cost can be selected, and the cargo delivered.

It should be noted that CGAP is an automated tool, not a contract with any one commercial tender company. Cargo is moved by nonmilitary aircraft the same way any other company moves its cargo from one location to another. All cargo moved by this method frees up military aircraft for other priority requirements. The CGAP initiative specifically targets low-volume loads at low-service theater airfields. CGAP and the introduction of commercial tenders to the theater provide a way to reduce the number of military aircraft in the theater. Implementation also results in better use of military cargo aircraft, which reduces operating costs in theater. CGAP also expands the presence of commercial airline companies in an area needing economic growth and assistance.

During the first week of CGAP operation, cost avoidance reached a level of $200,000 a day. As more tenders participate in CGAP, more savings and cost avoidance will be realized. This is truly a win-win initiative.

Multimodal Optimization

CDDOC's Air, Surface, and Sustainment Divisions proposed a new concept called multimodal optimization. Multimodal optimization promotes efforts to reduce the number of convoys traveling in theater and allows for air and ground cargo to be moved more efficiently and economically. After meeting several times, the division chiefs became aware of the opportunity to take advantage of unused cargo capacity on existing convoy missions. Empty truck beds were not acceptable. The feeling was that, when trucks are on the roads, they should be transporting as much cargo as space permits.

Since this concept was put into effect last June, nearly $1 million in airlift costs have been avoided by using space on trucks that would have been on the road anyway on one-way missions. Multimodal optimization also opens up additional aircraft seats for passengers and provides greater flexibility in delivering time-sensitive cargo.

Director of Mobility Forces-Surface

Recently, surface asset visibility in OIF, OEF, HOA, and Kuwait was combined under the purview of the Director of Mobility Forces-Surface (DIRMOBFOR–S) so that CENTCOM's Coalition Forces Land Component Commander (CFLCC) can have his finger on the pulse of all available surface transportation assets. Following the principles of DIRMOBFOR–Air, theater-wide surface movement will benefit from integration and coordination using the surface tasking order concept, which is similar to the way air assets are managed under the air tasking order concept.

CDDOC participated with the CFLCC, the U.S. Transportation Command, and other national partners to make the DIRMOBFOR–S a reality. After months of intensive research, dialogue, and development, the concept was approved in June by the CFLCC. Under the CFLCC, DIRMOBFOR–S integrates and synchronizes all surface operational deployment and distribution requirements in theater. Embedded within this initiative is an effort that links transportation requirements using a "single ticket" process. This process allows a piece of cargo to be scheduled for movement from a national depot to a forward operating base under one request (ticket) instead of having to be rebooked at every aerial or sea port of debarkation and then wait for the next transport mission to materialize.

The DIRMOBFOR–S also will set guidance and policies for surface mobility operations, which will permit visibility and priority of all cargo using a movement request system. The DIRMOBFOR–S has been manned using an interim manning document until the joint manning document is approved.

The fact that personnel assigned to CDDOC come to the theater on 4-, 6- or 12-month orders means that new ideas are brought to the table constantly. The talented personnel of the CDDOC are not willing to embrace the "this is the way we have always done it" mentality. CDDOC is a confident organization that continues to challenge all processes and existing paradigms. It constantly "pushes the envelope" to reinforce the warfighter's confidence in the theater deployment and distribution process. In this joint environment, CDDOC finds itself at the right place at the right time and employing the right people to get the work done right the first time. **ALOG**

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Logistics Modernization Program: A Cornerstone of Army Transformation

BY KEVIN CARROLL AND COLONEL DAVID W. COKER

What began as a plan to modernize Army supply chain management has evolved into one of the largest, fully integrated supply chain and maintenance, repair, and overhaul solutions in the world.

Today, the Army is undergoing an exciting and dynamic transformation. While this transformation is driving the Army's evolution into an expeditionary force that is agile, versatile, and capable of meeting the challenges of the Global War on Terrorism, a similar revolution is occurring in the systems and processes that support and supply the warfighter.

The Logistics Modernization Program (LMP) is one of the programs that stands at the center of the Army's business transformation initiatives. The LMP is a cornerstone of the Single Army Logistics Enterprise—an enterprise business solution that will enable vertical and horizontal integration at all levels of logistics across the Army. By modernizing both the systems and the processes associated with managing the Army's supply chain at the national and installation levels, the LMP will permit the planning, forecasting, and rapid order fulfillment that lead to streamlined supply lines, improved distribution, a reduced theater footprint, and a warfighter who is equipped and ready to respond to present and future threats.

Logistics Modernization Program: History

Before the LMP was conceived, the Army Materiel Command (AMC) depended on ponderous, 30-year-old systems to manage its logistics operations and supply critical equipment and repair parts to the Soldier. These systems—the largest of which were the Commodity Command Standard System (CCSS) and the Standard Depot System (SDS)—evolved into a complex web of software solutions that were difficult to maintain and almost impossible to update to address the Army's rapidly expanding supply needs.

The lack of a single, unified supply system across the Army fostered an environment in which numerous organizations developed independent configurations of the CCSS and SDS, along with a wide variety of localized software applications designed to support those systems. As a result, the Army faced serious challenges in managing its supply chain and distribution infrastructure.

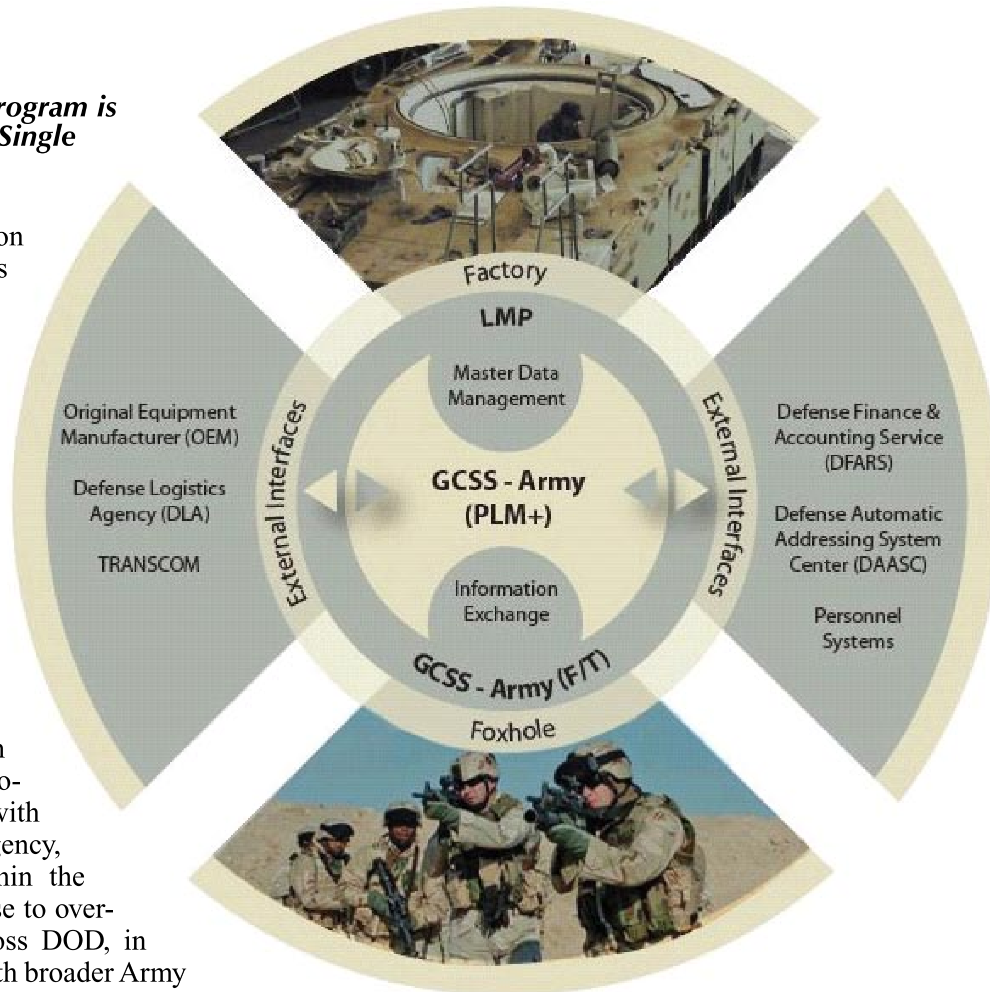
Because of the lack of financial integrity created by the lack of a single, unified system, it became clear that the Army would not be able to upgrade its legacy systems to comply with Federal directives such as the Chief Financial Officers Act of 1990 and the Federal Financial Management Improvement Act of 1996—laws that were enacted to increase the efficiency and visibility of financial operations across the Department of Defense (DOD). Along with these efforts, the Government Accountability Office published several reports that recommended consolidating DOD logistics infrastructure further and increasing privatization and outsourcing to bolster the efficiency of the Army's business operations.

A project can be created, funded, transmitted to the depot, rejected, renegotiated, retransmitted, and accepted by the depot in 1 day; most projects are accepted in a matter of minutes.

Instead of embarking on a massive, customized software development effort that would produce a software solution for current conditions, but that perhaps would not be flexible enough to meet the needs of the future warfighter, the Army decided to implement a commercial off-the-shelf-based, best-in-class enterprise resource planning (ERP) solution to revolutionize the Army's national-level logistics systems and business processes. This solution is the LMP.

Recently, operational control for the LMP was placed under the Program Executive Officer for Enterprise Information Systems (PEO EIS), whose office

The Logistics Modernization Program is one of the components of the Single Army Logistics Enterprise.



oversees large systems integration projects Army-wide. The LMP's principal beneficiary, AMC, provides expertise in current and desired supply chain business practices to create a winning leadership combination for the program.

The leadership structure of the LMP includes the Deputy Chief of Staff, G–4, Department of the Army; the commanding general of AMC; and the PEO EIS. The Deputy Chief of Staff, G–4, is the Logistics Domain Portfolio Manager. In addition to collaborating with the Secretary of the Army, the program's leaders also work closely with the Business Transformation Agency, an organization established within the Office of the Secretary of Defense to oversee business transformation across DOD, in order to align the LMP closely with broader Army and DOD modernization goals.

Logistics Modernization Program: Today

The LMP has been fulfilling warfighter requirements on a daily basis since July 2003. Today, the LMP manages $4.5 billion worth of inventory, processes transactions with 50,000 vendors, and integrates with more than 80 DOD systems. The LMP is deployed to 4,000 users at the Army Communications-Electronics Life Cycle Management Command (C–E LCMC); Tobyhanna Army Depot, Pennsylvania; the Defense Finance and Accounting Service; and a dozen other Army and DOD locations. When fully deployed, LMP will support more than 17,000 logistics professionals.

The LMP delivers real-time situational awareness and vastly improved decisionmaking capabilities, and it has significantly reduced logistics operational costs where it has been deployed.

The LMP is one of the world's largest ERP implementations, leveraging the technology of ERP industry leader SAP to fully integrate the Army's supply-chain activities. These activities include sourcing and acquisition, production scheduling, order processing, inventory management, transportation, warehousing, and customer service. As a result, the Army is better able to adjust its logistics operations quickly to meet evolving needs.

A Key Piece of a Larger Vision

The LMP does not stand on its own: It is the cornerstone of the Army's larger vision of integrating business processes across logistics systems Army-wide. This vision is the Single Army Logistics Enterprise (SALE).

The SALE vision is managed at the operational level by the PEO EIS. It has three components: the LMP, the Global Combat Support System-Army (Field/Tactical) (GCSS-Army [F/T]), and the Global Combat Support System-Army, Product Lifecycle Management Plus (GCSS-Army [PLM+]).

As a part of SALE, the LMP will provide the Army with national-level supply chain functionality, replacing systems that manage wholesale inventory control, planning, budgeting, and depot, arsenal, and ammunition plant operations.

GCSS-Army (F/T) will provide all combat support and command and control functions with a seamless, interactive information management and operations system. By replacing 13 current Army tactical legacy systems, GCSS-Army (F/T) will establish the tactical component of an integrated logistics system architecture for an enterprise-wide solution. GCSS-Army (F/T) will incorporate the functions now performed by the following systems and provide warfighters with a continuous flow of timely, accurate, accessible, and secure information—

- Standard Army Retail Supply System (SARSS).
- Standard Army Ammunition System (SAAS).
- Standard Army Maintenance System-Enhanced (SAMS–E).
- Unit Level Logistics System-Enhanced (ULLS–E).
- Property Book Unit Supply Enhanced (PBUSE).

GCSS-Army (PLM+) will serve as the technical enabler linking the field- and tactical-level system, GCSS-Army (F/T), with the national-level system, the LMP. By serving as a single data repository for logistics information, GCSS-Army (PLM+) will provide seamless interaction between the national and tactical levels. GCSS-Army (PLM+) also will provide a single data interface for logisticians.

Each of these efforts supports the objective of the Deputy Chief of Staff, G–4, to deliver materiel readiness to warfighters by focusing policies, processes, and resources in four key areas—

- Connecting Army logisticians.
- Modernizing theater distribution.
- Improving force reception.
- Integrating the supply chain.

By eliminating disparate sources of data previously contained in incompatible legacy systems, SALE also will allow the Army to view worldwide operations more easily and redistribute resources to meet evolving needs.

A Closer Look at the LMP

To date, the LMP has offered users benefits in three principal areas—

- It streamlines the Army's supply chain processes.
- It employs an information technology (IT) platform that delivers superior performance to its users.
- It supports the warfighters of the United States.

Streamlining Supply Chain Processes

The LMP offers the Army's logistics professionals a robust set of supply chain management capabilities that extend benefits to such functional areas as order fulfillment, demand planning and forecasting, maintenance program oversight, depot operations, and financial management.

Order fulfillment. The LMP greatly improves order fulfillment processes for AMC's item managers. For example, item managers can use the LMP to verify onhand inventory balances quickly using real-time information from more than one storage depot. They can confirm a requesting unit's geographic location and mission product code to ensure that the request is for a critically needed item. Then, with a simple click of the mouse, the managers can release all orders instantaneously, without going through the multiple processes and systems previously required by the legacy systems. In this way, the LMP effectively integrates all logistics supply chain operations from suppliers to customers, thereby uniting maintenance activities and inventories in one system and automating support processes for maintenance, repair, and overhaul at the depot level.

Demand planning and forecasting. The LMP integrates enhanced demand planning processes that support a range of forecasting techniques and alerts that immediately identify out-of-tolerance forecasts. For example, the LMP uses "traffic light" settings that alert managers to priority actions they need to take on their portfolio of materials in the manufacturing resource planning process. The LMP also has made it possible for current users at AMC to transition their major-item planning activities from an entirely manual process to an automated supply chain planning solution.

Maintenance program oversight. The LMP provides item managers and project leaders with enhanced oversight of maintenance programs. The system supports improved tracking of labor hours and dollars expended by repair program and integrates detailed, accurate forecasting capabilities for programs partially funded throughout the fiscal year.

The LMP also supports greater collaboration among item managers, project leaders, and item repair facility managers, resulting in more accurate forecasting of maintenance demands and maintenance program execution. A project can be created, funded, transmitted to the depot, rejected, renegotiated, retransmitted, and accepted by the depot in 1 day; most projects are accepted in a matter of minutes. By contrast, these activities previously required 2 weeks to 1 month to complete using multiple legacy systems.

We're not unlike the private sector in looking at how much inventory we're carrying, where that inventory is and if it's at the right place at the right time. . . . And LMP is one of those tools that we see making this happen.

—General Benjamin S. Griffin
Commanding General, Army Materiel Command
Army AL&T Magazine, January–March 2006

. . . the Department [of Defense] has . . . been actively working to make its business operations as nimble, adaptive and flexible as the forces it fields in battle around the world.

—Paul A. Brinkley, Deputy Under Secretary of Defense for Business Transformation, and Thomas Modly, Deputy Under Secretary of Defense for Financial Management, Congressional testimony, 6 April 2006

Depot operations. The LMP offers Army users increased functional and end-user knowledge of the Army's depot operations and logistics processes. The system streamlines materiel and parts requisitioning processes and facilitates the movement of assets between the Defense Logistics Agency and depots. These capabilities shorten the time required to reconcile logistics activities among C–E LCMC, Tobyhanna Army Depot, and other customers.

Financial operations. The LMP effectively integrates financial and logistics operations, meets the requirements of the Chief Financial Officers Act, and aligns with the DOD's Financial Business Enterprise Architecture. The system merges four Army Working Capital Fund activities into one fund under a single company code organization.

The LMP permits the Army to reduce inventories significantly because logisticians are able to better plan and allocate resources. That ability, in turn, allows the Army to reduce the theater footprint in battlefield operations. Moreover, the LMP complies with the requirements of the Federal Financial Management Improvement Act and supports the full-scope audits of the Army Working Capital Fund needed to achieve a clean audit opinion.

IT Platform Delivers Superior Performance

The unifying component underlying all of the Army's logistics transformation initiatives is the pursuit of excellence in applying IT to meet strategic goals. IT is the key enabler for mission success in the 21st century, and the LMP has set high standards for IT performance and quality. This Web-based system is easily accessible worldwide and supports the DOD vision of building a global information grid that provides the right information at the right time to the right entity.

From the outset of LMP solution design and planning, the Government and its principal system integration partner, Computer Sciences Corporation, were determined to use technology components that would allow system performance to evolve without the need for significant architectural changes. The LMP also is technologically open, scalable, and secure. Because it uses a common personal computer and Web browser, the deployed LMP solution is accessible worldwide on a real-time basis through the DOD Unclassified but Sensitive Internet Protocol Router Network (NIPRNET). This provides users secure, yet flexible, access to logistics information.

As an indication of the excellence of its technical engineering methodology, the LMP has been awarded a SAP Customer Competency Center certification—a first for a Federal Government implementation of a SAP system. Only 3.5 percent of worldwide SAP implementations, and less than 1 percent of more than 20,000 SAP North America clients, have earned this distinction. The LMP also excels in seven major technology service categories that measure logistics sustainment capabilities—

Fast Facts About the LMP

- World's largest fully integrated supply chain and maintenance, repair, and overhaul planning and execution solution.
- Integrates with more than 70 DOD systems.
- Manages $4.5 billion in inventory with 50,000 vendors.
- Exceeds industry performance standards. It completes 98.5 percent of user transactions in less than 2 seconds. (The industry standard is 85 percent.)
- Complies with the Information Technology Management Reform Act (Clinger-Cohen Act) and is certified under the DOD Information Technology Security Certification and Accreditation Process (DITSCAP).
- Currently managed by the Army's Program Executive Office for Enterprise Information Systems (PEO EIS).
- First fielded in 2003
- At full deployment, 17,000 users.

• System availability. The LMP exceeds best-in-class standards with 99.98 percent availability. (Gartner, Inc., an IT consulting and research company used by many corporations and Government agencies, specifies a target of 99.50 percent for a best-in-class rating.)

• System response time. The LMP exceeds industry performance standards by completing 98.5 percent of user transactions in less than 2 seconds. (The industry standard is 85 percent.)

• Trouble ticket management. The LMP achieved a significant 45-percent reduction in functional-related trouble tickets since its deployment. (A trouble ticket is a method used to track the reporting and resolution of problems.)

• Interface transaction flow. The LMP successfully processes high transaction volumes without losing data or disrupting business processes. Less than 1 percent of Defense Automatic Addressing System (DAAS) transactions have been rejected since September 2005.

• Security access. The LMP successfully meets Government standards and regulations, granting system access within target timeframes in 98.5 percent of all cases.

• Movement of change requests to production. The LMP uses strict change-control processes to validate 100 percent of all change requests, ensuring that they are appropriately evaluated in the production environment.

• Automated processing. The LMP exceeds industry standards for batch-processing execution, successfully completing transactions in 99.95 percent of all cases.

These results demonstrate the extent to which the LMP delivers a comprehensive logistics information management framework that meets the needs of its constituents across the Army and DOD.

Supporting America's Warfighters

In streamlining many of the labor-intensive processes involved in using multiple legacy systems since July 2003, the LMP has been making a significant and measurable difference in the lives of troops conducting vital combat operations. The LMP is connecting the foxhole to the industrial base in a manner that would have been difficult to imagine only a few years ago. The result of LMP implementation is that the Army has a system that empowers its leaders to make strategic decisions about logistics operations in real time.

The LMP currently processes 8 million requisitions annually and enables the Army to realize the benefits of a centralized and standardized system. In this way, the LMP delivers a significant advantage in managing Army operations at home and on the battlefield. The LMP also helps the Army reduce inefficiencies and related costs along its distribution system. It reduces the accumulation of excess inventory, eliminates the duplication of requisitions, and increases efficiencies at theater distribution centers.

By replacing numerous nonintegrated information systems and limiting the data inconsistencies and data duplication that result, the LMP makes it easier for logistics professionals to comply with Army supply policies and procedures. By eliminating the need for extensive manual intervention, the LMP reduces the time, funding, and human resources needed to process the millions of transactions the Army initiates on an annual basis.

The Logistics Modernization Program is a pivotal component of the Army's drive to ensure that business systems and processes remain flexible and responsive to the needs of a dynamic and rapidly evolving expeditionary force. As a cornerstone of the Single Army Logistics Enterprise—the Army-wide vision for integrating logistics business processes from the factory to the foxhole—the LMP provides the functional and technical benefits that bring rapid order fulfillment, improved demand planning and forecasting, streamlined depot operations, and financial visibility to the Army's supply chain and ensure that Soldiers receive the right equipment and repair parts at the right time.

Every day, the Army is laying a foundation of flexible, scalable, and modernized systems and business processes that will allow logisticians to see requirements, control distribution, and guarantee precise, time-definite support. This is not a vision that can wait until some time in the future. Effective, efficient, and integrated warfighter supply and support are vital requirements now. The LMP is helping to make them a reality. **ALOG**

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Colonel David W. Coker is the Project Manager for Logistics Information Systems at Fort Lee, Virginia. He was the Project Manager for the Logistics Modernization Program when he cowrote this article. He holds a bachelor's degree in business administration and master's degrees in business administration, procurement/contract management, and national strategic resource management.

Standard Automotive Tool Set: More Than Just an Improved Common Set

BY CHARISSA NICHOLE GRAY

Unit mechanics must have their tools at hand to be able to keep unit vehicles operational. In the past, two tool sets provided most of these tools—Shop Equipment, Automotive, Maintenance and Repair, Organizational Maintenance, Common Number 1 and Common Number 2. These sets were not containerized and could come packaged in as many as 75 crates. Units had to purchase tool chests and cabinets for organizing the tools. The tools often became jumbled in drawers, making it difficult to find the ones needed to perform a task.

Recognizing the problems that the available tool sets presented, the Office of the Chief of Ordnance, under the leadership of Major General Mitchell H. Stevenson (now the commanding general of the Army Combined Arms Support Command), initiated the development of an improved, containerized tool set. Developed by the Product Manager, Sets, Kits, Outfits, and Tools (PM SKOT), the resulting set is known as the Standard Automotive Tool Set (SATS).

SATS Description

SATS is a containerized shop set system that consists of a core set and supplemental modules that can be added to support a unit's specific maintenance mission. It replaces the most common organizational and direct support tool sets. SATS provides a more deployable, mobile, and mission-capable tool load that supports Army transformation and two-level maintenance.

By providing the warfighter with a common tool set, SATS enables maintainers to perform two-level maintenance and repairs on all military vehicles and ground support equipment. It is easier to inventory, transport, and use than were the old tool sets. SATS offers the following improvements—

- Lifetime warranty on tools.
- Industrial quality tools.
- Elimination of 474 redundant and obsolete components (5 sets).
- Rapid inventory system.
- Secure, protected container.
- Rapid deployment capability.
- Responsive and rapid tool replacement procedures.

SATS Development

PM SKOT worked with users to determine which tools were not used, which ones were essential, and what tools needed to be added to the set. The process of evaluating the tools involved five tool reviews in which each tool in the Common Number 1 and Common Number 2 tool sets, the Mechanical Maintenance Tool Set, and the Automotive Maintenance and Field Repair Basic Tool Set and its supplement were documented and evaluated.

Tool reviews began in June 2000 with the Common Number 1 tool set. A team of technical maintenance specialists, representatives from heavy to light maintenance Army units, the Army Combined Arms Support Command, the Army Ordnance Center and School, the Army Armament Research, Development, and Engineering Center, and PM SKOT conducted the review. The user representatives provided input on which tools they never used, which tools they could not live without, and which tools they wished they had. The evaluation process was by no means a smooth one, and it required concessions from user communities. However, the overall result enabled PM SKOT to develop the core SATS: a tool set comprised of common tools found across the various automotive tool sets. Two field maintenance modules were designed to supplement the base SATS by providing the additional tools needed to perform heavy direct support maintenance missions.

One goal during SATS development was to organize SATS so that it was easier for maintenance Soldiers to inventory, transport, and use. This required reducing the space needed to store the tools and making them easier to find. With SATS, tools come to the user in tool cabinets that include PM SKOT's standard foam cutout organization system. This makes SATS much more user friendly than the old automotive tool sets.

By creating an organized tool set in a single container, PM SKOT also solved mobility problems. SATS can be transported by a single prime mover. It is more portable than its predecessors and can be deployed quickly with minimal preparation.

Advantages

Over 40 hours were needed to inventory the old maintenance shop sets. With SATS, that effort has been reduced to 2 hours—a substantial time saving. Because the tools are kept in drawers with foam cutouts that give the tools specific storage locations, inventory is as easy as opening a drawer and looking for empty slots. SATS comes with a laminated tool inventory guide and supply catalog. The supply catalog is organized to mirror the configuration of the SATS drawer and includes color photographs of each item.

Tools in the Standard Automotive Tool Set (SATS) come stored in a deployable container. The inset shows the storage configuration of the SATS container.

SATS is a durable, long-lasting system because the tools and equipment it contains are industrial quality and have lifetime warranties. The industrial-quality tools hold up better to the constant wear of maintenance activities, but, if they happen to break, the warranty ensures their replacement.

Another great feature about SATS is its flexibility. SATS can be tailored to each unit's specific mission by combining the core SATS and the appropriate version of the two field maintenance modules. The core SATS provides the two-level maintenance capability that units need to maintain their equipment. It consolidates tools from the Common Number 1, Common Number 2, Vehicle Full Tracked Tool Set, and Battalion Maintenance Team Tool Set.

When combined with the core SATS, Field Maintenance Module 1 provides the capabilities for heavy direct support maintenance found in Field Maintenance Sets A31 and A52. Field Maintenance Module 2 adds to the heavy direct support maintenance by adding capabilities found in Field Maintenance Supplement A62.

Transport

SATS transportation requirements are far fewer than those of the Common Number 1 or Common Number 2 tool sets, which, with supplemental sets, could require up to five prime movers. Whether transporting SATS by trailer or on a flatrack, only one prime mover is needed—even with the additional modules included.

By eliminating redundancy, PM SKOT made SATS into a streamlined and comparatively lightweight tool set, weighing 13,620 pounds and taking up less than 700 cubic feet of space (compared to a combined total of 39,750 pounds and 2,186 cubic feet for the replaced tool sets). SATS frees up precious space and weight, allowing units to either reduce their total transportation weight and cube requirements or take additional equipment.

Warranty

When a SATS tool breaks, the unit gets a new one. By using the PM SKOT warranty Web site to request a replacement, the correct tool is replaced, the warranty on that item continues, and the set configuration is not degraded. A unit can submit a warranty claim at http://pmskot.army.mil. Once the claim is validated, the item is immediately sent to the requesting unit's address.

SATS was released for fielding in November 2005. Fifty-three SATSs have been fielded, and nearly 20 more are scheduled to be fielded by the end of January.

SATS is currently being used in real-world scenarios at the National Training Center at Fort Irwin, California, and in Southwest Asia. Soldiers are happy to be receiving new tools that are easily inventoried and transported. The response from the units that have received SATS has been overwhelmingly positive. As constructive feedback comes in, PM SKOT will continue to evaluate the user's concerns and make appropriate changes. **ALOG**

Charissa Nichole Gray is a technical writer for the Product Manager, Sets, Kits, Outfits, and Tools, at the Army Tank-automotive and Armaments Command (TACOM) Life Cycle Management Command. She has a B.A. degree in English from New Mexico State University and an M.S. degree in organizational leadership from St. Ambrose University.

The author would like to thank the Standard Automotive Tool Set team for their contributions to this article.

A Visual Tool for Mitigating Vulnerabilities

BY LIEUTENANT COLONEL SETH L. SHERWOOD

Army units must deal with a wide range of vulnerabilities in garrison, during field training exercises, and while deployed. Identifying and mitigating these vulnerabilities are essential to creating the conditions needed for freedom of maneuver throughout the battlespace and completing the mission.

Leaders of the 4th Infantry Division Support Command (DISCOM) at Fort Hood, Texas, knew that failure to alleviate risks and vulnerabilities could adversely affect our formations. Therefore, we developed a unique process for mitigating risks during reset after a deployment, while preparing for an upcoming deployment to Iraq, and throughout the deployment.

Vulnerability mitigation must be explained in a way that both leaders and Soldiers can understand and put into action. Rather than use a narrative Word document, we used a chart to depict visually the vulnerabilities, risks, and mitigating actions associated with an operation or event. This visual depiction provided a tool for leaders and Soldiers to identify vulnerabilities quickly and mitigate their risk.

Vulnerability Assessment

Before deployment, and in the middle of its reset, the DISCOM transformed to the 4th Sustainment Brigade. The problems inherent in transformation were compounded by preparation for deployment. After we arrived in Iraq, we received subordinate battalions with which we did not have a habitual garrison or operational relationship. The separate companies and sections we received represented the full spectrum of units throughout the Army—Active Army, Army National Guard, and Army Reserve units—all performing their traditional or "in lieu of" missions. This wide range of units increased our need to assess vulnerabilities quickly and find ways to mitigate them throughout our formation.

We assessed the vulnerabilities of each operation as we gained experience and confidence in our mission and ourselves and spent more time in Iraq. This aided in the mitigation of risks and reduced vulnerabilities during all phases of our deployment and operational assessment.

Although we assessed our vulnerabilities for many operations and missions, I will discuss only the operational assessment of our relief in place/transfer of authority (RIP/TOA) operation. Within a 6-week period, the brigade headquarters and two battalion headquarters, including their companies, went through the RIP/TOA process. During each unit's RIP/TOA, we incorporated external and environmental vulnerabilities into our risk assessment.

Risk Assessment

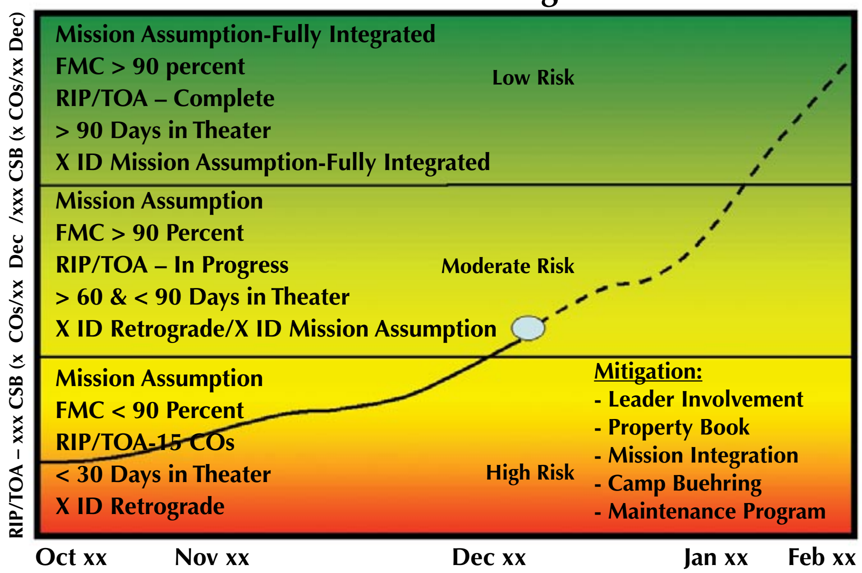
Initially, we assessed our risk as "high" across the brigade. Since all elements of the command were new to the Iraqi theater of operations and to each other, we closely monitored our progress throughout the RIP/TOA process.

Because we had to perform our mission immediately after we arrived, it became the responsibility of leaders at every level to implement mitigating factors that would lessen the inherent risks of combat operations. We constructed our vulnerability assessment charts to reflect color-coded levels of risk and vulnerability, the timeline associated with the vulnerability, the current risk assessment, previous and projected assessments, and mitigating actions. (See chart at right.)

The first step in our process was to identify clearly the vulnerabilities associated with a particular phase or operation. We depicted our vulnerabilities on the left side of the chart by showing increased proficiency and reduced vulnerability as we assessed an improved risk level. Vulnerabilities were tied into the level of risk our units experienced at a given time during an operation. Many of our vulnerabilities were associated with a lack of experience and inadequate time to learn and understand our mission and environment. Along with assessing our vulnerabilities, we assessed the progress of units in our area of operations as they advanced through their RIP/TOA phases and assumed their roles in the battlespace.

Next, we developed a list of mitigating factors associated with our vulnerabilities and depicted them on the right side of the chart. This proved valuable in stimulating thought. The chart served as a quick reference for leaders at all levels and helped ensure that they were on track in mitigating vulnerabilities. The factors depicted also gave leaders the ability to tailor their assessed vulnerabilities for each mission or operation.

RIP/TOA Vulnerability Assessment
X Sustainment Brigade



Legend
COs = Companies
CSB = Corps support battalion
FMC = Fully mission capable
RIP/TOA = Relief in place/transfer of authority
X ID = X Infantry Division

Both brigade and battalion headquarters tracked mitigation progress for the time period depicted along the bottom portion of the chart. At the brigade level, we usually assessed ourselves each month. Our subordinate units generally traced their assessments by week. By assessing ourselves, we were able to update our status quickly and see if our mitigating factors not only were working but also were implemented at the company and platoon levels.

Our actual assessment of the risk level associated with a particular vulnerability was part art and part science. First, we determined all factors that were involved in the operation, including the mitigating factors that were in effect and how the length of time the assessed unit had been in country related to its mission proficiency. Then, after carefully determining how well our mitigation was working, we determined our risk level.

We denoted the current overall assessment with a bubble in the appropriate section on the chart. A solid line showed where we had been, and a dotted line showed our predicted assessment of future risk. We plotted our predicted assessment based on what we felt to be the trend of risk. We kept in mind the proper placement and execution of mitigating factors, including units operating in our area of operations and their effect on our mission.

On our chart, gradation of color showed changes (both good and bad) associated with the risk involved for a particular mission. For example, red moving to amber denoted that the risk moved from high to moderate, amber moving to green indicated moderate risk, and green signified low risk. We split the chart into three sections to break up the color codes and signify the risk level. For example, if an assessment was at the high end of moderate risk, we labeled the risk as amber/green.

The greatest challenge we faced in mitigating risk was keeping the bubble in the green, or low-risk, area by implementing mitigation measures to reduce vulnerability. Throughout the deployment, we constantly evaluated our mitigation criteria and where we stood in relation to our vulnerabilities. Constantly reevaluating ourselves prevented us from becoming complacent once we assessed our risk as green, or low. Another key advantage of the assessment tool was that it gave us the ability to see ourselves, the enemy, and our environment in spite of constantly changing tactics, techniques, and procedures.

Visual Information Sharing

By creating a visual risk assessment tool that painted a picture, the brigade was able to evaluate risks quickly and determine ways to mitigate the associated vulnerabilities during each phase of reset and deployment. Our chart was user friendly, which made it easier to identify and observe our progress. We found that leaders at all levels were more likely to refer to the vulnerability assessment chart rather than to a Word document. We also found that charting vulnerabilities and mitigation actions makes it easier to assess a unit's risk during an operation or phased event.

Leaders at all levels of our formation found our vulnerability chart an extremely useful, succinct, and efficient way to share information about vulnerabilities, risks, and mitigation during all operations. Rather than use a narrative that simply addresses risks and gives a rating, units should consider using a chart similar to the one we developed to tie together all aspects of the risk assessment process. **ALOG**

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CSSAMO Experiences in Operation Iraqi Freedom

BY MAJOR JEROME P. BROCK

When the 16th Corps Support Group (CSG), 3d Corps Support Command, from Hanau, Germany, deployed to support Operation Iraqi Freedom in October 2005, its Combat Service Support Automation Management Office (CSSAMO) fell in on a logistics Standard Army Management Information Systems (STAMIS) infrastructure that did not take full advantage of modern Army networking capabilities. Within the first 6 months, we modernized the unit's logistics automation operations in order to give the commander access to more accurate and timely maintenance and supply data on which to base his decisions.

Legacy Systems

Soon after arriving in Iraq, we discovered that the units under our task organization were transmitting their logistics and supply data by floppy disk or email. They were doing so despite the potential of the systems at their disposal—the Unit Level Logistics System-Ground (ULLS–G), Standard Army Maintenance System (SAMS) –1 and –2, and Standard Army Retail Supply System (SARSS)—to transfer data by file transfer protocol (FTP). They did not use FTP because most locations, especially the motor pools, had no network connectivity and very few locations had operators who had experience with the FTP process. This lack of FTP capability had profound negative consequences.

ULLS–G, SAMS–1 and –2, and SARSS are somewhat antiquated in that, other than FTP, the only way to transfer data between them is by floppy disk. Unfortunately, these systems will not read data from universal serial bus (USB) flash memory drives. The units that were using email exported the data to floppy disk, copied the data from the floppy into an email, and sent it. The recipient reversed the process.

When data are transferred between ULLS–G and SAMS–1, ULLS–G provides SAMS–1 with direct support (DS) maintenance requests and the status of organizational work orders. SAMS–1 also provides ULLS–G with the status of the unit's open work orders. The use of FTP eliminates the need to use unreliable floppy disks, a fact that cannot be overemphasized. When using FTP, information flows in both directions during the same session.

Floppy Disk Pitfalls

When a floppy disk is used for data transfer, ULLS–G writes data to the floppy disk, the operator carries the disk to the SAMS–1 location, and SAMS–1 reads the disk and writes status information to it. The ULLS–G operator carries the disk back to his computer, which reads the disk. All of this travel takes time and exposes Soldiers to unnecessary risks.

Floppy disks also are highly unreliable. This is especially true in a sand-filled environment. System operators tend to keep their floppy disks loose in a desk drawer, on their desks, or in their pockets, which results in sand contamination that causes the disks to become unreadable. This causes a data loss and a corresponding loss of accurate transfer of maintenance and supply data, which, in turn, leads to incorrect, incomplete, and erroneous generation of data by the SAMS–2 for the 026 report, Equipment Deadlined Over XX Days by Battalion. In Iraq, the inaccuracy of the report severely degraded the 16th CSG commander's ability to manage maintenance effectively.

The in-theater STAMIS computers suffered the usual problems of manually applied antivirus definitions and operating system patches approved by the Product Director, Tactical Logistics Systems (PD–TLS). Because it was too difficult, and potentially dangerous, for CSSAMOs to keep antivirus definitions and operating system patches updated by physically "touching" every computer, most base system administrators were unwilling to allow STAMIS computers to be included on their networks. As a result, STAMIS computers were not maintained at the maximum level of authorized protection.

Networking Plan

To maximize the usefulness of in-theater STAMIS computers, we developed a networking plan that would transfer logistics and supply information and increase information assurance. To transfer logistics and supply information more efficiently, we would—

- Improve floppy disk reliability as an immediate fix.
- Provide network access to the STAMIS computers.
- Establish FTP data transfer between the STAMIS computers.
- Instruct operators on how to conduct FTP operations.

To increase information assurance, we would—

- Stand up an antivirus server and configure the STAMIS computers to regularly "pull" the updated definitions and perform regular antivirus scans.
- Stand up a Windows Server Update Service server to provide Microsoft patches to STAMIS computers.
- Control configuration.
- Back up data.

Information Transfer

Since the unreliability of floppy disks was causing problems, we needed a way to make them more reliable. We instructed the operators to keep their floppy disks in a Ziploc bag. The only time that a disk should be removed from the bag is when it is inserted in the computer for reading or writing. The bag significantly reduced the opportunities for sand particles to contaminate disks and render them unreadable. The positive effects were immediately apparent at a next-to-nothing cost and with no real impact on usability or convenience.

Providing network access to our supported units' computers was more challenging. Roughly half of the units had no network connectivity at their motor pools. To help establish network connectivity for logistics systems, the Army has been fielding Very Small Aperture Terminals (VSATs) and Combat Service Support Automated Information System Interfaces (CAISIs). However, these systems have not yet been fielded to the 16th CSG. Fortunately, the Georgia Army National Guard's 48th Infantry Brigade Combat Team (BCT) lent us several CAISIs, gave us access to their VSATs, and provided us with instruction on their configuration. Thus, we were able to get started while waiting to receive the CAISIs that we had requested from our higher headquarters, the 3d Corps Support Command.

Our first priority was to use the CAISI to provide network connectivity to our core SAMS–1 and SAMS–2 servers. The supply server (SARSS) already had access to a VSAT. After we established network access for both maintenance and supply servers, we attempted to configure the FTP so that the SAMS–1 computers could send their data by FTP to both the SAMS–2 and SARSS computers. We experienced the usual problems of getting accounts and passwords straight and helping the operators through proper FTP procedures. Very soon, though, the SAMS–1 servers were successfully performing daily FTP transfers.

The next step was to emplace a CAISI at those motor pools that had no connectivity to the base local area network (LAN). While some of our Soldiers were doing this, others were working with the units that had connectivity through the base LAN and coordinating with the SAMS–1 and SARSS operators in configuring the units' ULLS–G for FTP. As the first group of Soldiers completed a CAISI emplacement, the unit was handed off to the second group for FTP configuration. Forming these two specialized groups allowed us to make constant progress toward our goal.

Information Assurance

Although many aspects of information assurance could be improved in the day-to-day operation of STAMIS computers, we focused on only four: ensuring that the antivirus definitions were up to date, keeping the operating system properly patched, maintaining configuration control, and creating backups.

Ensuring that the antivirus definitions were up to date. This was the simplest of these procedures to implement. Using Symantec's LiveUpdate Administration Utility, we configured a non-STAMIS computer to operate as a server and retrieve current virus definitions automatically from an approved Department of Defense source. Each of our supported STAMIS computers was then configured to retrieve the updated definitions from that server. This allowed us to minimize the traffic across the bandwidth-constrained VSAT because the definitions made only one trip across the satellite, regardless of the number of STAMIS computers we used. The STAMIS computers also were configured to perform an automatic daily virus scan of their disk drives.

Keeping the operating system properly patched. Applying patches that have been approved by the PD–TLS was a longstanding problem. Unlike some other systems, only approved patches can be installed on STAMIS computers. We chose to use a Microsoft-centric solution—Windows Server Update Service (WSUS). Unlike the previous iteration, Software Update Services, WSUS allows an administrator to set up various computer groups and approve patch installation on a group-by-group basis. This was exactly the functionality we needed. The most difficult part of setting up WSUS for STAMIS computers is the initial configuration of all of the patches that are currently approved for installation on a particular STAMIS. Once this is done, however, upkeep is simple. All an administrator needs to do is approve the newly authorized patch, and, the next time that each computer connects to the server, the patch is pulled down and installed automatically. WSUS also allows the administrator to check the last time that a computer was connected and verify that it has all approved patches.

For both the antivirus server and the WSUS server, we chose to use a "pull" technology. That means that the STAMIS computers requested data from the server; the server did not "push" data to them. In a tactical environment, where the network may not always be fully operational and computers may not always be on, "pull" technology seems to be the better choice. It is important to note that our two servers really should be referred to as "services." We were actually running them both on one computer, thus limiting the hardware requirements for this solution.

Maintaining configuration control. Like any automated information system, STAMIS computers require strict configuration control. When we arrived in theater, all of the systems that we were to support had software on them that was not approved for that particular STAMIS. Specifically, most of the ULLS–G computers had Microsoft Office installed. While Office is part of the standard array of software used in the Army, its unapproved installation on a STAMIS computer presents problems. The CSSAMO either must conduct the necessary testing himself to verify that the patches do not hinder the proper operation of the STAMIS application or allow the software to go unpatched. Since the CSSAMO is not resourced to tackle the former and the latter is unacceptable, unapproved software cannot be permitted.

We also rigorously enforced the requirement that operators log in as regular users, not as administrators. Administrator login was permitted only to perform tasks that required it, such as adding a printer. This concept is known as "least privilege."

Creating backups. Finally, we instituted an initially hidden backup plan. Generally speaking, the most important part of any information system is the information itself. A computer can be replaced and all of the software reinstalled, but if the data files are not available, the data either are gone forever or must be recreated from other information sources. Since neither of these situations is acceptable, regular back-ups must be made. The backups must be saved on an external device, usually a USB flash memory drive. Actually, one backup is not enough. If an operator overwrites yesterday's backup with today's backup, he has no way to recover from a problem that goes back more than 1 day.

To avoid backup problems, we repeatedly notified the operators and their chains of command that they needed to back up their STAMIS data on a regular basis. Our hidden backup plan consisted of using the Windows Scheduler, a part of the operating system, along with Win-Zip, which was already installed on the STAMIS computers, to schedule a nightly backup that "zipped" up the data and saved it on a portion of the computer system not accessible by regular users. Each nightly backup file was given a filename that was the computer name followed by the current date. The significance of this backup is that we could recover from any data problem experienced by the computer, short of the hard disk becoming unreadable, by restoring the appropriate backup. We kept the existence of automatic back-ups from the operators for as long as possible so that they would not be tempted to stop making backups of their own, thereby robbing us of protection against hard disk failures.

Together, the four information assurance measures we established served as a layered defense. We kept the virus definitions updated, which identified viruses that attempted to exploit vulnerabilities; we kept our computers updated by installing patches, which mitigated known vulnerabilities in the STAMIS; we disallowed new software and enforced least privilege, which limited the damage caused by users and previously unknown attacks; and we required regular backups, which allowed us to recover in the event that a computer became compromised.

As a result of our information assurance efforts, we attained much greater accuracy of maintenance and supply data and in the reliability of the STAMIS computers used to process it. Thanks to the teams that handled connectivity and FTP configuration and the computer operators, all of our maintenance and supply system STAMIS computers performed regular, dependable data transfer by FTP. This was particularly remarkable considering the challenges presented by our harsh environmental conditions.

Because of our information assurance efforts, none of our configured STAMIS computers fell prey to a virus. The automated nature of our system allowed us to keep the computers fully updated without having to "touch" each of them physically. It would have been a logistics nightmare to go through the patching cycle if physical access had been required.

The hidden backup process paid immeasurable dividends on many occasions when operators brought in their STAMIS computers and admitted that they did not have current backups. We easily recovered the data from our hidden backup store. Had we been able to establish a central server, each STAMIS computer could have sent its nightly backup file to that server automatically, which would have allowed us to recover from even total destruction of a STAMIS computer. Unfortunately, bandwidth constraints made that server impossible.

As a final note, any plan is just that—a plan. Without the technically and tactically proficient Soldiers I was privileged to serve with in the 16th CSG CSSAMO, none of these results would have been possible. **ALOG**

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Instilling Innovation in Iraq

BY MAJOR JAMES J. MCDONNELL

The 10th Brigade Support Battalion (BSB), 10th Mountain Division (Light Infantry), was well prepared for its deployment to Iraq. However, it quickly became evident that the success of its mission would hinge on its flexibility, adaptability, and continuing desire to improve.

Previous achievements of the 10th BSB were chronicled in the September–October 2004 issue of *Army Logistician*. At that time, the BSB (then a forward support battalion) had returned to Fort Drum, New York, from a deployment to Kandahar, Afghanistan. In the year and a half that followed, the battalion simultaneously transformed, reset, and prepared for a second deployment.

As part of the Army-wide transformation, the 10th BSB grew to include a separate headquarters and headquarters company (HHC) and four forward support companies (FSCs). The companies were established to provide direct support to two infantry battalions, a cavalry battalion, and an artillery battalion. The battalion's A Company provided an organic transportation capability for moving personnel and equipment. During reset, several types of vehicles, generators, and other equipment were overhauled. The battalion also conducted a training program in anticipation of a rotation to the Joint Readiness Training Center (JRTC) at Fort Polk, Louisiana. All of these changes occurred in a 19-month period.

Deployment Planning

In March 2005, the battalion deployed to the JRTC as part of the 10th Mountain Division's 1st Brigade Combat Team. The JRTC environment resembled the unpredictable urban conditions that the battalion would encounter in Iraq. The BSB focused chiefly on providing ground resupply to outlying forward operating bases (FOBs) in the maneuver box. The battalion used what, at the time, were standard tactics, techniques, and procedures to ensure the safety and success of the convoys.

In April, key battalion leaders deployed to Iraq as part of a predeployment site survey. They conferred with members of the 210th Forward Support Battalion (FSB), who were deployed to Camp Liberty, Iraq, to support the 10th Mountain Division's 2d Brigade Combat Team. The site survey gave 10th BSB leaders a good idea of what to expect in Iraq and an opportunity to observe the best practices of units in the field. One such best practice was the 210th FSB's use of a gun truck platoon. This platoon was created "out of hide" by assigning an assortment of personnel to man M1114 up-armored high-mobility, multipurpose wheeled vehicles (HMMWVs). Establishing this platoon enabled the 210th to provide its own convoy security without having to depend on maneuver battalions.

As it would do many times, the 10th BSB adopted a proven concept and built on it. The battalion immediately formed its own gun truck platoon, dubbed the convoy security element (CSE). Using borrowed M1025 HMMWV armament carriers, the CSE trained for several days at a newly designed live-fire range at Fort Drum, New York. The training included a capstone exercise in which convoy commanders employed UH–60 Black Hawk helicopters to simulate a casualty evacuation.

On to Iraq

In August 2005, the 10th BSB deployed to Camp Buehring, Kuwait, with the 1st Brigade, which was "plugged in" to the 3d Infantry Division. (In January 2006, the 4th Infantry Division assumed command and control of the 1st Brigade until it redeployed.) The battalion moved into Iraq during the first week of September. Although its primary mission was to provide combat service support (CSS), the battalion was immediately tasked to provide a number of Soldiers to perform additional missions for the duration of the rotation. The BSB leaders were tempted to retain their stellar performers but did not because some of these missions required top-notch Soldiers.

One such tasking was to provide guards for the division holding area, a facility that housed recently captured detainees until they were released or sent to another detention facility. In all, 15 Soldiers were trained to serve as prison guards. The battalion also assumed responsibility for operating the Joint Land Attack Cruise Missile Defense Elevated Netted Sensor System balloon and camera. This system provided an "eye in the sky" that greatly enhanced force protection. Soldiers who were critical to the CSS mission learned to operate a system that previously had been unknown to them.

Beginning in the third month of deployment, the battalion released its Soldiers in 10-percent increments on mandatory 3-week environmental and morale leave (EML). EML is authorized for Soldiers serving a yearlong tour in a combat zone. This practice continued through the 11th month of the 10th BSB's deployment.

At any one time, approximately 300 Soldiers from the 10th BSB were performing nonstandard missions or force-protection tasks or were on leave. As a result, company commanders were compelled to be inventive when they employed their remaining personnel.

Force Protection

When the 199th FSB of the Louisiana-based 256th Infantry Brigade (Mechanized) departed Iraq, it conducted a relief in place with the 10th BSB. The 152d Maintenance Company, an Army Reserve general support maintenance company of Soldiers from Maine, Iowa, and Washington, was attached to the 10th BSB for 7 months. Although the 152d provided an additional maintenance capability, it was diminished somewhat because more than half of the company's 250 Soldiers provided force protection for high-occupancy facilities, such as the dining hall and gym, and manned perimeter guard towers. (When the 152d redeployed in March 2006, the 10th BSB assumed responsibility for these missions.)

Countermobility

Countermobility, traditionally an engineering task, was another nonstandard mission for the BSB. In October 2005, and later in December, the Iraqis had an opportunity to ratify a constitution and elect members to the National Council of Representatives. To ensure violence-free polling places, the 1st Brigade emplaced barriers throughout its area of operations in Baghdad to block the path of potential suicide bombers determined to wreck the electoral process. For the first time, the BSB performed the decisive operation (an operation that has a firm or conclusive resolution). Using the crane from M985 heavy, expanded-mobility tactical trucks (HEMTTs), the BSB emplaced thousands of 2-ton barriers that were approximately 3 feet tall and 10 feet wide. Palletized load system (PLS) truck tractors provided additional haul capacity.

When it became apparent that the BSB would continue to be tasked to emplace barriers to provide security at local council halls or to bolster traffic control points, the battalion secured five heavy equipment transporter (HET) tractors and four trailers from a departing corps support battalion (CSB). These HETs were used to move 8-ton barriers (the largest that were available) and to transport a 22½-ton crane that belonged to the 152d Maintenance Company. The crane gave the battalion the capacity to position barriers without depending on assets from the division.

Soldiers of the 10th BSB load barriers that will be emplaced throughout Baghdad to establish traffic control points for the Iraqi National Police.

When the HETs were fielded to the BSB, the support operations officer (SPO) arranged for the departing 87th CSB to conduct a driver and maintenance training program. Ten 10th BSB personnel participated in the 2-week training program, which culminated with the operator-trainees driving the HETs to Kuwait to support an equipment retrograde mission. Considering the challenges of driving a HET, the 2-week program was not long enough to train drivers properly. Therefore, training continued for weeks afterward, with the battalion's previously licensed HET operators supervising the instruction. The 87th CSB's maintenance training of 10th BSB mechanics included lessons learned in the harsh Iraqi environment.

In anticipation of the March 2006 departure of the 152d Maintenance Company, including its trained crane operators, the 10th BSB began an operator and maintainer training program so that the battalion would have trained operators and mechanics for the duration of its deployment. Using the 22½-ton crane on loan from the 152d and a crane on loan from the 4th Sustainment Brigade of the 4th Infantry Division, the 10th BSB was able to emplace barriers throughout Baghdad to establish traffic control points for the Iraqi National Police. These barriers significantly impeded the enemy's freedom of maneuver. Having the cranes and trained operators and mechanics also permitted the brigade to respond quickly to division taskings without seeking support from outside elements.

B Company mechanics had to learn—on the fly—how to maintain the battalion's new equipment. Although the 503d Maintenance Company's maintenance support team provided some assistance with tracked-vehicle maintenance, B Company was still responsible for maintaining them.

Emergency Recovery

The BSB had the standard emergency recovery mission for all vehicles traversing the 1st Brigade's area of operations. This involved the use of an M984 HEMTT wrecker and a PLS. If a vehicle could be towed, it went on the M984. If a vehicle could not be towed, it was winched onto a flatrack and placed on the PLS.

The 152d Maintenance Company's assets included an M88 medium recovery vehicle, which had a 35-ton lift capacity. The M88 was on standby atop a HET as part of the brigade's downed aircraft recovery team (DART). Because the division's DART was located a considerable distance from Camp Liberty, the 10th BSB used the M88 to recover a helicopter that had crashed in the area. The M88 also was used to recover a truck mired in the mud outside the wire. These events again demonstrated the 10th BSB's ability to support nonstandard missions.

Patient Evacuation

The 10th BSB's medical company also was affected by the changes that occurred in the battalion. The medics of C Company provided patient ground evacuation from its troop medical clinic to the combat support hospital in central Baghdad when air evacuation was impractical.

Normally, a light medical company uses an M997 frontline ambulance to transfer patients. However, those light-skinned vehicles were not permitted outside the FOB because they offered patients no protection from enemy small-arms fire. Therefore, C Company used two M113A3 tracked ambulances that it had received from the 199th FSB when the 199th departed. These tracked vehicles had additional protective features, such as bar armor to provide 360-degree protection from rocket-propelled grenades and cupola armor to provide security for the track commander. The 10th BSB conducted a driver training program that produced licensed operators of vehicles that previously had been unfamiliar to the Soldiers of C Company.

C Company Soldiers also received crew-served weapons familiarization training. They had not been trained previously because the company's modification table of organization and equipment did not include crew-served weapons. This training proved to be invaluable in providing force protection when C Company was called on to transfer a patient during a sandstorm.

Evolving Doctrine

FSCs are organic to a BSB but provide direct support to their assigned maneuver battalions. This could suggest that the BSB commander—the senior logistician in the BCT—could not marshal assets for a complex mission. However, during this deployment, the supported battalions were amenable to an occasional "slicing," or diversion, of support to a brigade-mandated mission. Therefore, the BSB surged assets from the FSCs (and the base companies) when the situation dictated, such as when the BSB established two traffic control points simultaneously in a sector. During that operation—

- HHC provided a convoy security element.
- A Company provided hauling and lift assets.
- The B and C Company commanders served as mission commanders.
- D Company provided on-call recovery support.
- E and F Companies provided additional hauling assets.
- G Company provided security as the convoys departed the entry-control points.

The CSE was designed to have a "24/7" support capability. However, in some instances, the entire CSE deployed to support a mission. During those times, D Company—the FSC for the cavalry battalion—provided backup emergency recovery and medical evacuation support. D Company had a modest CSE element because it was responsible for supporting an FOB that was located a long distance from Camp Liberty.

When this article was written, the doctrine on command and control of FSCs was still being developed. As the 10th BSB illustrated during its deployment, new FSC command and control doctrine must be flexible so that an inventive BSB commander can surge assets as necessary.

Transformation

Over the course of its deployment, the 10th BSB's CSE transformed from a unit that simply protected convoys to one that performed a host of other security tasks. For example, the BSB decided to level a mound of dirt at an intersection because improvised explosive devices (IEDs) hidden in the mound by insurgents could cause significant damage if they were detonated as vehicles slowed down to negotiate the turn. The CSE secured the area along the highway and, in coordination with engineer assets, cleared the area. Other CSE missions involved escorting newly graduated Iraqi police officers and providing cordons around guard towers that were being built by contractors.

The 10th BSB had the distinction of being one of the first support battalions to launch its own Raven unmanned aerial vehicle. Because the battalion was close to Baghdad International Airport, considerable time and effort were invested in getting authorization for a restricted operating zone for the Raven. Soon after receiving authorization, the battalion's pilots, who had attended a 2-week training session before deploying, routinely flew the Raven along convoy routes to provide pre-mission reconnaissance.

Systems and Processes

The BSB continually improved its systems and processes throughout its deployment. Because of the dynamic nature of the Iraq insurgency, the battalion could not afford to be complacent.

One of the BSB's initiatives was the development of a convoy mission brief using a conglomeration of other mission briefs. The mission commander presented the resulting "go/no-go briefing" to the battalion commander 24 hours before each mission. This briefing resembled a mission briefing. It began with an intelligence assessment of the effects of weather on both friendly and enemy forces and updates on the proposed convoy route. The mission commander then discussed his vehicles and their readiness status, the route security plan, and actions that would be required

This is one of five heavy equipment transporter (HET) tractors obtained from a departing corps support battalion. The HETs were used to move 8-ton barriers and transport a 22½-ton crane that belonged to the 152d Maintenance Company.

to meet the convoy objective. The S–3 reported on adjacent units and the availability of attack aviation. The briefing closed with a review of communications systems and radio frequencies before the battalion commander approved or disapproved the mission. No stone was left unturned before the convoy rolled out.

Over time, it became evident that some parts of the briefing were redundant or simply irrelevant to the upcoming mission, so they were omitted. Other concerns, such as coordination with land-owning units and combat aviation units, remained essential briefing topics. It also became evident that representatives of customer units, such as U.S. advisers to Iraqi units, should be on hand during the go/no-go briefings to ensure that missions such as barrier emplacements were coordinated properly.

The go/no-go briefing was only one facet of the mission preparation process. When the CSE returned from a mission, its up-armored HMMWVs were driven immediately to the maintenance bays. Operators and automotive, communications, and armament mechanics technically inspected the vehicles as part of a preconvoy inspection maintenance program developed by B Company. If a vehicle could shoot, move, and communicate, it was dispatched for the next mission. If those three criteria were not met, the fault was quickly job-ordered for repair. The same process was used for other vehicles that had deployed outside the wire. The intent was to ensure that the CSE was prepared for a no-notice mission.

The support operations officer coordinated with the on-post contractor to provide crane support to A Company in case barriers had to be loaded for an upcoming mission. The battalion S–3, in coordination with the mission commander, submitted the required graphics and paperwork to the brigade's aviation element to request attack aviation support.

IED Countermeasures

The BSB's maintenance warrant officers were at the forefront of innovation. They were aware that IEDs were the greatest threat to the maneuver battalions that patrolled in the sector. To counter the IED attacks, the warrant officers developed both active and passive countermeasures that undoubtedly saved lives.

Training

Because the 10th BSB was operating in a war zone, training was modified to reinforce lessons learned. For example, the S–3 secured a 25-meter, known-distance range four times a month for weapons training. The area was altered so that the training would replicate combat. The BSB Soldiers wore interceptor body armor, and they practiced going through green, amber, and red weapon statuses in preparation for a mission outside the wire. Rather than having to follow commands on a standard garrison range, Soldiers were told what the weapon status was, and they reacted accordingly. After the range fire was complete, the Soldiers performed buddy checks to make sure that no rounds were chambered in their weapons, just as Soldiers do when they return to the FOB after completing a convoy.

Taking advantage of a support relationship they had with a Special Forces detachment, the noncommissioned officers of A Company learned reflexive fire techniques from the detachment and subsequently trained other Soldiers in the company. B Company established a "bulldog competition," which determined the best weapon system operator based on firing from a variety of seldom-trained positions. These examples of "outside the box" thinking exploited the unique opportunities available for training deployed Soldiers.

Although the 10th BSB was trained and ready for its deployment to Iraq, its success was due largely to its ability to anticipate changes in its environment and develop innovative solutions to the problems these changes presented. In order to build on its success, the 10th BSB—or any logistics unit that deploys to Iraq—must maintain an innovative mindset.

The challenges encountered in garrison are less daunting than those faced in combat. However, leaders and Soldiers in either setting should seek innovative ways to accomplish their missions. Rather than sticking to a schoolhouse solution, they should examine what worked in combat. The training environment should resemble combat conditions in Afghanistan or Iraq as closely as possible. No battalion should ever become complacent, because the enemy and the battlefield situation are constantly changing. **ALOG**

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The author would like to thank Mary K. Blanchfield for her assistance in the preparation of this article. As a first lieutenant, she served as the operations officer for A Company of the 10th Brigade Support Battalion during its deployment to Iraq.

Energy on Demand

BY DR. KEITH ALIBERTI AND THOMAS L. BRUEN

The availability of instant, usable energy may revolutionize the way combat operations are supported in the future battlespace.

Editor's note: This is the fourth in a series of five articles on themes for future logistics innovation identified by the Army Logistics Innovation Agency's Futures Group. Each of the articles describes plausible future advances in technology and business processes that may significantly improve logistics effectiveness and efficiency. Together, they bring an advanced look at some amazing possibilities for Army logistics. The fifth article begins on page 34.

The generation, storage, and distribution of energy on the battlefield have always been essential to sustaining military operations. This is especially true today as evidenced by the challenges facing our forces in multiple training and operational situations across the globe. Army and Marine Corps units participating in Operation Iraqi Freedom (OIF), for example, have experienced shortages of supplies, including certain types of lithium batteries that power myriad communications and electronics systems. Fuel distribution in the early months of OIF was not a problem because the U.S. military had the luxury of extraordinary planning and rehearsal time. However, future battles in other regions may not offer the same preparation time or the same access to, and abundance of, energy sources.

It is important to point out that a recent study indicated that 70 percent of the convoys in Iraq transport fuel—ideal targets for our enemies. Transporting enormous quantities of fuel over vulnerable supply lines equates to an Achilles heel for an otherwise unmatched Army.

In an increasingly nonlinear battlespace, especially as portrayed in joint operating concepts for the 2015–2025 timeframe, meeting the needs of widely distributed, energy-hungry military forces will demand innovative solutions. The proliferation of high-energy weapons in the battlespace will only contribute to increased energy requirements and, without proper long-range planning, may handicap future forces. While solving today's logistics challenges is the most immediate concern, logisticians must plan ahead for the changes in doctrine, organization, training, materiel, leadership and education, personnel, and facilities (DOTMLPF) that will be necessary as a result of scientific and engineering advances in energy sources.

Shrinking the military services' dependence on fuel would reduce transportation requirements and decrease the number of Soldiers placed in harm's way. This could be achieved by, for example, increasing the efficiency of military equipment, thereby reducing energy usage and distribution requirements. However what if instant, usable energy were available at the point of effect (where and when it was needed)? We refer to this as energy on demand (EoD).

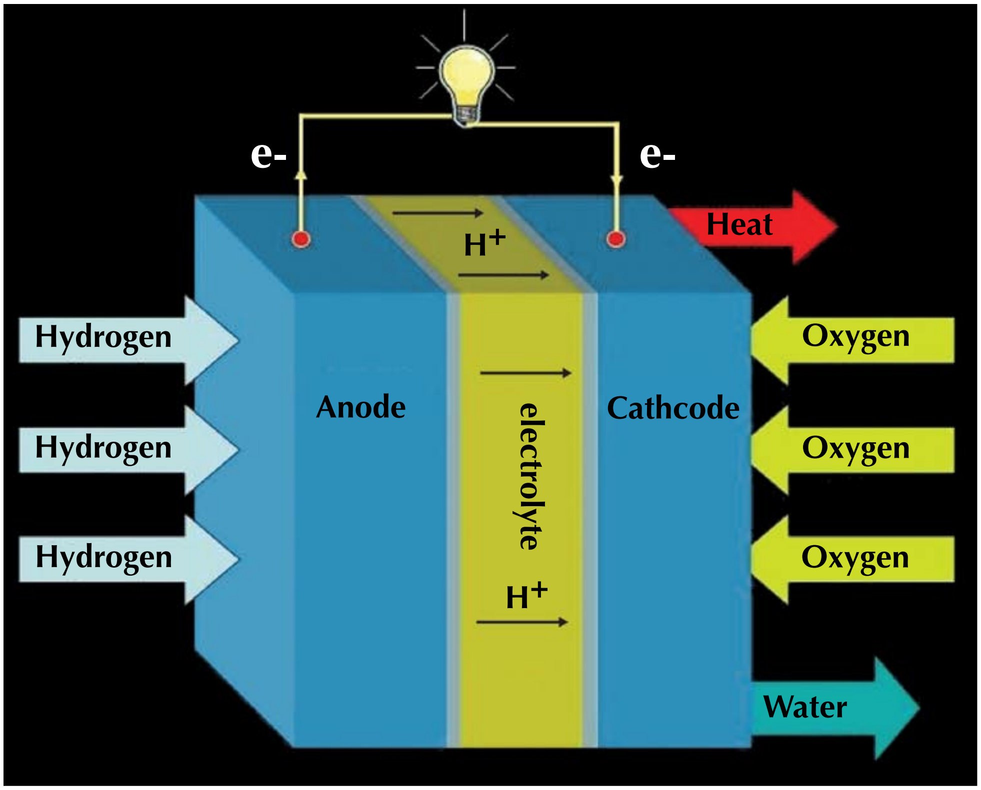
The goal of EoD is to reduce operation and sustainment costs dramatically and to minimize significantly the need to transport some types of energy sources to the battlefield. While the tendency is to think in terms of vehicular propulsion requirements, the future battlespace is likely to involve extraordinary energy demands for all types of military equipment and weapon systems. EoD presupposes maximum energy conversion efficiencies, ubiquitous energy storage, extreme energy densities (as compared to today's typical energy densities), onsite energy production and use, and networked energy distribution. (Energy density is the amount of energy stored in a given system or region of space per unit volume or per unit mass.) The idea is to produce platform and system energy in amounts that will support sustained combat operations under all conditions.

In this article, we talk about some of the exciting possibilities that scientific and technological advances toward EoD will have on future Army logistics. We present some basic concepts of energy generation, storage, and distribution and offer a glimpse of future networked energy grids that may revolutionize the way energy is distributed to support sustained combat operations under all conditions.

EoD Functions

EoD encompasses generation, storage, and distribution. Energy generation generally refers to the transformation of chemical energy, solar energy, biomass energy, and other forms of energy into electrical energy. Energy generation also seeks to maximize the efficiency of energy conversion.

Coupled closely with energy generation is energy storage, the goal of which is maximize energy density. Renewable energy generation from wind and solar energy sources, for example, is intermittent because of



Ideal hydrogen-oxygen fuel cell operation.
(Art by Eric Proctor of the Sensors and Electron Devices Directorate of the Army Research Laboratory.)

either atmospheric conditions or time of day. Advances in storing energy from such renewable sources will allow supply at the point of effect.

Energy distribution will play an increasingly important role in fulfilling the energy demands encountered on tomorrow's battlefield. Distribution will be achieved with smart grids that can meet the long-term energy needs of a deployed force and with flexible, plug-and-play, self-regulating microgrids capable of interfacing with each other. Military energy distribution grids of the future will maximize commonality and interoperability while emphasizing battlefield flexibility and distribution.

Energy Generation and Storage

Fuel cells. Fuel cells are devices that convert the chemical energy of a fuel (such as hydrogen, natural gas, methanol, or gasoline) and an oxidant (such as air or oxygen) into electricity. In principle, fuel cells operate like batteries. However, unlike batteries, fuel cells are designed for continuous replenishment of the reactants consumed. Continuous long-term operation is feasible as long as a fuel and an oxidizer are supplied to the cell.

Fuel cells, like batteries, have two electrodes (metal plates)—a positively charged anode (fuel electrode) and a negatively charged cathode (oxidant electrode). In addition to the electrodes, fuel cells have an ion-conducting material called an electrolyte sandwiched between the electrodes. The electrolyte carries charged particles from one electrode to the other. Finally, there is a catalyst that speeds up the reactions at the electrodes.

Currently, six types of fuel cells either exist or are being researched. Fuel cells are classified by their electrolyte material because this material determines what chemical reactions take place in the cell, the catalysts required, the operational temperature of the cell, and the fuel required. For military applications, each of these factors must be taken into account to find fuel cells suitable for certain applications. Types of fuel cells include proton exchange membrane, direct methanol, alkaline, molten carbonate, phosphoric acid, and solid oxide.

Fuel cells work by producing an electrical current. To understand the basics of fuel cell operation, consider a fuel cell that works with hydrogen as a fuel. In the illustration above, hydrogen atoms are directed toward an anode that splits the atoms into protons and electrons. The protons enter the fuel cell at the anode while the electrons are directed through a circuit. The protons travel through the electrolyte to the cathode. At the same time, oxygen enters the fuel cell at the cathode, where it combines with the electrons and protons to form water. Note that the electrolyte plays a crucial role: It allows the passage of protons to prevent adverse chemical reactions from taking place in the cathode. Heat and water are byproducts of this reaction and can be captured for other purposes. This type of fuel cell will generate electricity as long as it is supplied with hydrogen and oxygen.

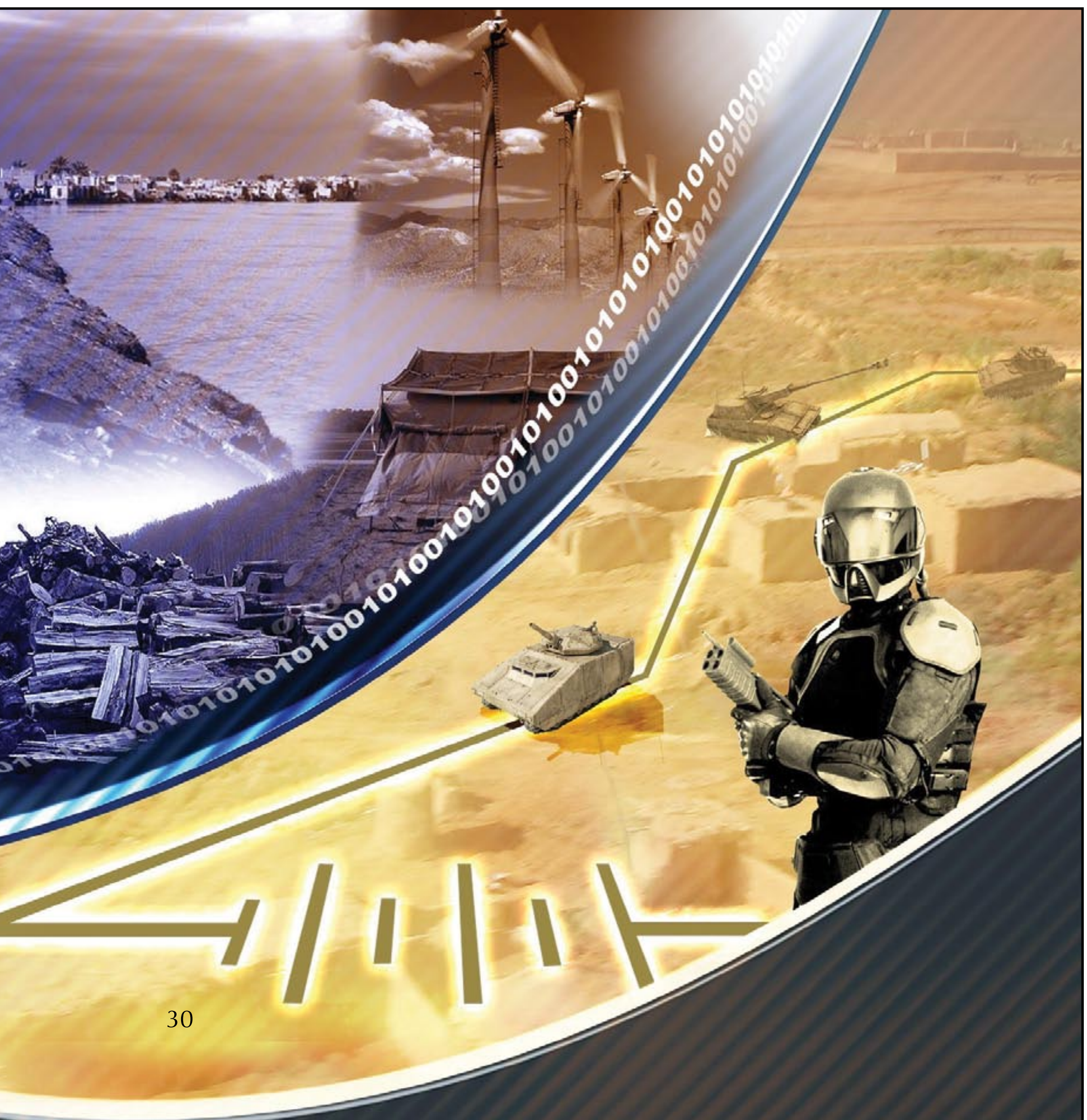
With such ease of operation, one might ask, "Why can't I just go out and buy a fuel cell?" Fuel cells are starting to appear on the commercial market, but a number of challenges inhibit widespread availability. Cost and durability are two major challenges. Others include size, weight, and thermal and water management. Fueling hydrogen fuel cells, in particular, is a challenge because production, transportation, distribution, and storage of hydrogen are difficult, especially on the battlefield. Producing hydrogen using a reformer is also technically challenging. A hydrogen reformer is a device that extracts hydrogen from other fuels, typically methanol or gasoline.) Aside from these technical issues, the infrastructure is not available to support large-scale conversion of military systems to operate on alternative energy sources such as fuel cells.

Over the next few decades, however, fuel cell size and cost will decrease. Reformer technologies will improve to the point that the generation and storage of energy in the form of a fuel—most commonly hydrogen—will become realities. Moreover, this fuel can be renewably derived from water and clean energy. The coming "hydrogen economy" will enable energy systems that are safer, cleaner, and more versatile than the systems in use today. In the future, fuel cells will power numerous electronic devices. Fuel cells also will play a critical role in helping to displace fossil fuels as the primary source of our future military energy infrastructure.

Fuel cells are an extremely attractive source of energy for tomorrow's battlefield. They will provide the warfighter with increased mobility, and they will enable information systems to function reliably and efficiently during lengthy battlefield missions. Because of its compactness, the proton exchange membrane fuel cell, in particular, will be a prime candidate for vehicles and other mobile applications.

Biomass energy. Biomass refers to any plant-derived organic matter available on a renewable basis, including dedicated energy crops (such as corn), trees, feed crops, agricultural crop wastes and residues, aquatic plants, animal waste, and municipal waste. Biomass energy technologies seek to use these renewable biomass resources to produce an array of energy-related products, including electricity; liquid, solid, and gaseous fuels; and heat and chemicals. Biomass energy (bioenergy) has tremendous potential for development, in part because biomass stores its energy until it is extracted. As a result, biomass offers tremendous opportunities for creating sustainable resources that provide energy sources to the future battlefield.

Bioenergy is not really new; energy from plants and plant-derived materials has been used for centuries. Wood, for example, is still the largest bioenergy resource available today. Currently, there are four classes of bioenergy systems: direct-fired, co-fired, gasification, and modular. Most systems are direct-fired; biomass fuel is burned in a boiler to produce high-pressure steam that causes a turbine to rotate, thereby producing electricity. Co-fired systems involve substituting biomass for a portion of the coal used in an existing power plant furnace. Gasification systems operate by heating biomass in an environment in which solid biomass breaks down to form a flammable gas. A modular system is perhaps the most important bioenergy system to EoD. Modular systems employ some of the same technologies mentioned above, but on a much smaller scale.



Renewable energy sources for the future battlefield.
(Art by Eric Proctor of the Sensors and Electron Devices Directorate of the Army Research Laboratory.)

This could permit sustainment of units deployed in remote areas where biomass is readily available but electricity is scarce.

Other forms of energy. In addition to the expanded use of fuel cells and biomass on the future battlefield, other forms of energy generation and storage are viable and will become more readily available. Renewable energy generated from sources such as wind, light, sound, and water is sure to appear on future battlefields. The emergence of Future Combat Systems and associated unattended ground sensors will require alternative forms of energy to alleviate and potentially eliminate the need for an infrastructure (batteries) to supply energy to these sensors. Units engaged in stationary field operations also will be able to generate energy from nonorganic waste, such as plastic packaging. This would decrease the personnel, fuel, and critical transport equipment needed to remove and dispose of such waste.

Harnessing the energy content of waste generated during military field operations would reduce military logistics requirements in two ways: It would provide fuel for on-site energy generation, and it would dispose of waste that otherwise might have to be transported from the battlefield. This form of energy generation and storage could replace much of the fuel needs for electrical power generation in the field, thereby saving the military services millions of gallons of costly diesel fuel. It also could significantly reduce the logistics resources required to deliver fuel to deployed forces.

Energy Distribution: Smart Grids and Microgrids

It takes energy to move energy. Energy generated at certain locations (often remote) must be distributed for use. Pipelines, ships, trains, and trucks carry fossil fuels from point to point, while power lines carry electricity from point to point. Significant energy is expended transporting fuels, and current power grids suffer from electrical resistance and load unpredictability.

To be more efficient, energy distribution networks must have new materials and advanced logistics systems. Large-scale use of distributed and intermittent renewable resources, such as solar energy and wind, requires intelligent, networked grids to deliver power efficiently over long distances. Lengthy and vulnerable supply lines fuel large diesel generators that supply energy to myriad devices that support military operations. Current energy distribution systems cannot adapt to changing energy demands and generally are inefficient as a means of transporting or transmitting energy. Energy transport and transmission and distribution systems must be safe, secure, reliable, sustainable, and cost effective. Smart grids and microgrids offer the potential to meet all of these criteria for the future Army.

Smart grids. Smart grids promise intelligent, efficient energy distribution because they will be able to adapt to ever-changing energy demands. Truly intelligent electrical grids should be able to accept and feed electricity to remote sites. As energy demands increase on the future battlefield, the Army will need distributed storage and generation smart grids that can detect usage levels and immediately adjust their operation for greatest benefit. Intelligent distributed energy generation is certainly within the realm of the possible, but it will require some advanced technologies.

Smart grids must have the ability to deal with intermittent renewable energy sources such as remote solar and wind farms and, at the same time, accept energy from constant sources such as fuel cells. Smart grids will be adaptable and have the ability to support computer software upgrades, along with new hardware such as superconducting fault current limiters, transformers and storage devices, digital power controllers, and next-generation nanotechnology transmission lines. Smart grid management will use digital control, automated analysis of problems, and automatic switching capabilities such as those currently employed by the Internet. Advanced routers that can break energy into packets for distribution over various routes to relieve congestion (comparable to those used in computer networks) also will be necessary.

Smart grids will be interconnected to a web of other infrastructure grids, including water, gas, telecommunications, transportation, automation, and fuel systems. As part of an integrated infrastructure, smart grids will require computer simulators and threat simulators to monitor complete grid activity. Inexpensive electronic devices will be attached to most elements of a smart grid. These devices will have memory and processing capabilities that can identify parts. Their location will be detectable by a global positioning system, and they will communicate wirelessly with central command and control centers. Real-time sensing and control of future grids is needed for complete end-to-end generation, storage, and distribution of energy.

High-temperature superconductivity and nanoscale technologies are expected to deliver several breakthroughs that could revolutionize smart grids. "Quantum wire," which is woven rope made from carbon nanotubes, could have electrical conductivity that is higher than that of copper at one-sixth the weight and twice the strength of steel. (See "Designer Materials" in the November–December issue of *Army Logistician.*) A grid made up of quantum wires would have no line losses, thus alleviating the need for certain emergency energy-generation capabilities.

Microgrids. Unlike smart grids, microgrids are smaller "community" networks of diverse energy-generation

Artist's concept of a satellite beaming energy from space. *(Art by Eric Proctor of the Sensors and Electron Devices Directorate of the Army Research Laboratory.)*

sources, such as solar energy, wind, and fuel, which have the potential to transform the "electricity network" in the same way that the Internet changed "distributed communication." More specifically, microgrids consist of small collections of power-generating technologies that are suitable for a collection of users who are in close proximity to the generation source. These types of grids have EoD capabilities that make them particularly useful to an adaptable force.

Microgrids are often compared to peer-to-peer file-sharing technologies, in which demand is split up and shared around a network of "users." They could exist as stand-alone power networks within small communities, or they could be connected to larger power-generating communities. For example, they could be plugged into a smart grid.

Microgrids can provide safe and secure energy distribution for military operations because of the many energy-generation types that are incorporated into their distribution process. They are reliable because of their small network size and redundancy of generation and storage. They are sustainable because they use renewable energy technologies, and they are cost-effective because they use renewable energy sources. For military applications, microgrids are particularly attractive because they can deal more efficiently with fluctuating power demands.

The Deep Future

How can the envisioned EoD condition be achieved? In the far term, energy generation, storage, and distribution to the point of effect when needed could be achieved with a space-based satellite system. Energy generation could take place in space, on earth, or in the atmosphere from multiple sources. A space-based satellite system would allow energy to be distributed to warfighters regardless of their location or energy requirements. Because energy distribution will be space-based, energy generation sources (nodes) could be fixed, mobile, space based, or earth based.

The ultimate goal of EoD is the ability to distribute energy from any one of the many energy generation or storage nodes to any location, in sufficient quantity, on demand. Achieving that goal would mean near or complete elimination of fossil fuels and perhaps the entire current energy distribution infrastructure.

Logistics Benefits

The benefit of EoD to Army logistics is significant both on and off the battlefield. At the theater level, future energy sources will reduce the need for hydrocarbon-powered systems. This capability will enable the combatant commander to meet mission requirements with fewer support organizations in theater, thereby reducing the logistics footprint and increasing Army and joint force deployability and sustainability. The use of multiple energy sources will give the commander several options for energy generation and use (local sources or organically generated) and will increase operational readiness while reducing force vulnerabilities. Army installations will be able to minimize costs by generating energy using organic waste and other feedstock. This will allow for decreases in energy requirements, thereby allowing maximum use of all available assets to support the mission.

Distribution and delivery of energy will be affected significantly as well. Future advances in materials technology will enable more efficient storage and use of energy that may improve support unit deployability and battlefield distribution. These increased energy capabilities will relieve future combatant commanders of the tremendous burden inherent in distributing fuel in the battlespace. They will have more time to focus on other complex operational and logistics issues. From simplifying force-reception challenges to reducing vulnerabilities in sustaining stability operations, EoD promises to increase operational flexibility and strategic readiness significantly.

Some portions of EoD are achievable by 2030. A major breakthrough, particularly in fuel cell technology, is probable before 2030. Technology advances in photovoltaics (solar power technology), bio feedstock conversion, fuel cells, capacitors, remote refueling systems, satellite-based power units, fuel reformers, and energy storage are critical path drivers to EoD's ultimate feasibility and success. Some advances or breakthroughs will probably be available for "spiraling out" to the Army or joint force before complete EoD is accomplished. Depending on the technology adopted, radical changes to tactical and operational logistics capabilities may occur, which will trigger new and significant DOTMLPF implications.

Research is underway in all energy-related areas as the Nation seeks to eliminate its dependence on foreign oil. Several technical advances have occurred in the use of organic feedstock to produce electricity. Commercial large-scale waste-to-energy converters have been marketed, and it may be possible to reduce them in size so they can be used on the battlefield. Photovoltaics is a heavily commercialized area that enjoys significant developmental funding outside of the Department of Defense. Advances in solar power are occurring with breakthroughs in more efficient materials and designs. Multijunction, thin-film nanoscale solar cells are in development, promising up to 50-percent energy conversion. Recently, a major scientific breakthrough occurred in the stabilization and storage of anti-matter, a first step toward unlocking the door to the most powerful energy source currently known to man. In the coming age of directed-energy weapons, the implications for rearming and refueling are enormous.

Logisticians must demonstrate a willingness to investigate innovative concepts and technologies leading to onsite usable energy and power systems at the point of effect in the battlespace. We should develop a basic understanding of the scientific and technological underpinnings of these capabilities in order to influence policies and procedures that deal with the generation, storage, distribution, utilization, and standardization of new energy technologies. **ALOG**

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Prediction and Cooperation

BY DR. KEITH ALIBERTI AND THOMAS L. BRUEN

Editor's note: This is the fifth and final article on themes for future logistics innovation identified by the Army Logistics Innovation Agency's Futures Group. The fourth article—on energy on demand—begins on page 28 of this issue.

Of the five themes for future logistics innovation identified by the Army Logistics Innovation Agency (LIA), prediction and cooperation (P&C) is perhaps the broadest. While the other themes—quantum computation and communication, telepresence, designer materials, and energy on demand—have potential to improve logistics effectiveness and operational readiness significantly, P&C can be regarded as the most pervasive and promising of the deep future themes identified by LIA. In an era of accelerating change, particularly with respect to scientific and technological advances, the Army must understand and be prepared to take advantage of the opportunities ahead.

Evolving joint warfighting concepts, such as network-centric operations and sense-and-respond logistics, have laid the conceptual foundation for the articulation and development of capabilities that will allow future generations to capitalize on these efforts. Several Army and joint concept documents address the need for advanced decision-support tools that will permit faster and more effective decisionmaking. For example, the Joint Logistics (Distribution) Joint Integrating Concept (dated 7 February 2006) describes the ability to perform predictive analysis of sustainment requirements in order to enable sense-and-respond logistics.

To ensure mission success, then, the Army must improve its capability to anticipate logistics requirements and forecast solutions. Logisticians need the ability to predict future conditions and environments so that they can proactively mitigate or otherwise eliminate future adverse conditions, such as an ambush of a resupply convoy, poor local weather conditions that reduce visibility, or failure of component parts. Hence, the implications of developing P&C capabilities go far beyond simply reformulating logistics planning factors and optimizing the supply chain and distribution networks. Essentially, P&C is a set of envisioned future capabilities that will allow logisticians to predict future outcomes with a high degree of accuracy and that will provide opportunities for proactive intervention to ensure favorable outcomes of proposed courses of action.

The P&C theme entails a future operational environment in which reduced uncertainty about logistics requirements and course-of-action development increases the warfighter's freedom of action by minimizing unnecessary constraints in planning or pauses in the execution of missions. P&C is predicated on global connectivity in a network-centric operating environment that will enable logisticians to know, integrate, and synchronize all logistics business processes and expedite decisionmaking. Processes will enable real-time synchronization between resource application and the commander's intent in support of high operating tempo and distributed operations. P&C will allow logisticians to achieve full control of the supply chain and distribution system to attain desired battlespace effects with negligible delays.

P&C capabilities that are integrated across logistics, intelligence, and operational domains will be fundamental to future sustained combat operations. As a result, logisticians in today's Army need an understanding of emerging prediction capabilities and their supporting technologies in order to advocate and plan for the introduction of these technologies into the Future Force. Familiarity with the implications of advances in P&C will enable logisticians to communicate requirements to the research, development, test, and evaluation community.

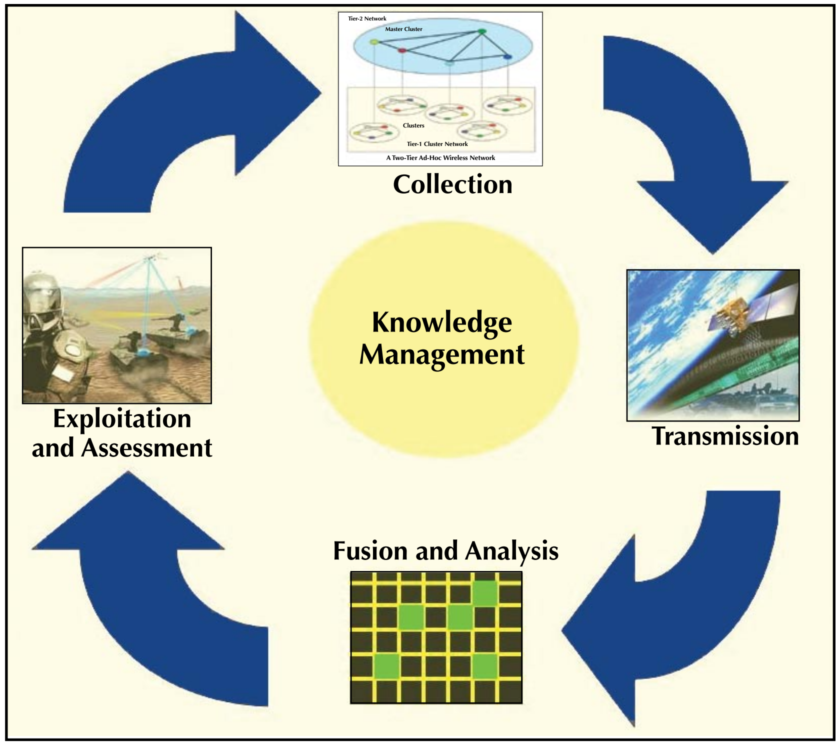
In this article, we discuss P&C with an emphasis on emerging and envisioned prediction capabilities. We also discuss a technology-centric knowledge management framework that will help lead to prediction capabilities of the future.

P&C Overview

Prediction is the act of foretelling based on observation, experience, or scientific reason. General prediction theories and models serve as the basis for drawing inferences from available data. Hence, prediction is based on information, or knowledge, that is used to project future courses of action with a certain degree of accuracy. Cooperation entails seamless, automated translation and communication among organizations, platforms, and digitally equipped agents that enable total interoperability and synchronization among different legacy software systems, networks, and devices.

Together, prediction and cooperation require a globally integrated network that transparently tracks and predicts processes. P&C supports cooperative interaction to sense and record the physical environment

Knowledge management involves the collection, transmission, fusion and analysis, and exploitation and assessment of real-time logistics data throughout the logistics pipeline.



while comparing current input features with historical data to derive predictable patterns over time; P&C also provides the capability of acting on those patterns. Entities operating in a P&C-enabled environment will sense and understand contextual meaning, communicate their state and mission, and act to influence the environment.

The ability to locate, identify, and convert data of any kind into required information and vice versa fosters total interoperability and synchronization among disparate software, networks, and devices. This and the extrapolation of given data into the future (using advanced decision-support capabilities) are essential to achieving the following P&C capabilities that will sustain combat operations on a global scale—

- Project, with a high degree of accuracy, the outcomes of proposed courses of action.
- Enhance generation of hypotheses and analysis of courses of action.
- Permit identification of anomalies and atypical patterns.
- Reduce delays in logistics status reporting and increase the quality and speed of decisionmaking.
- Assess the effectiveness of specific courses of action.
- Predict and take action to preempt logistics demand across the entire tactical-to-strategic continuum.
- Enable accurate predictions of reliability for components and systems.
- Enable humans and human organizations to cooperate more effectively.
- Provide seamless, automated translation and communication among organizations, platforms, smart objects, and digitally equipped agents, regardless of data types and contexts.
- Provide total interoperability and synchronization among different legacy software systems, networks, and devices.

Logistics Implications of P&C

The logistics implications of the envisioned P&C capabilities are profound. P&C will provide logisticians with the ability to know what is happening within all logistics business processes and to synthesize and act on that information. P&C will provide capabilities that permit future commanders to dominate in complex, chaotic, and time-constrained environments. The logistics concept of support will remain fully synchronized with the commander's intent in support of high operating tempo and distributed operations.

Accurate, timely prediction of unit needs will allow logisticians to properly mobilize and use resources within a short time period to achieve desired battlefield effects with minimum supply system delays. Capabilities that allow prediction and preemption of logistics demand across the entire tactical-to-strategic continuum will change the way the Army, as part of the Joint Force, sustains the fight against future adversaries. Predicting logistics requirements in real-time shortens the decision and planning cycle and, ideally, preempts logistics failures, thereby contributing to a commander's freedom of action. Areas such as visibility and control of the supply chain, advanced prognostics, enterprise-wide forecasting or forewarning, and advanced planning are the foundations of a P&C capability. A universal P&C capability will help decrease decision cycle time from weeks and days to hours and minutes.

Technology Behind P&C

P&C cuts across multiple scientific and technical areas and requires a multidisciplinary approach. From a sensors and information-fusion perspective, the envisioned P&C capabilities involve the development of advanced integrated sensor systems and knowledge management architectures applied across the entire logistics enterprise. This involves the collection, transmission, fusion and analysis, and exploitation and assessment of real-time logistics data or information throughout the battlespace and global logistics "pipeline."

Major Process	Current-Day Technology/Technique (not all-inclusive)
Collection	• Embedded diagnostic sensors • Electro-optic imaging • Wireless smart sensor networks • Remote sensing
Transmission	• Very Wide Area Satellite Networks • Wide Area Wireless Networks (WANs) such as AMPS, TACS, GSM, GPRS • Wireless Local Area Networks (WLANs) • Wireless Personal Area Networks (WPANs) such as Bluetooth and beamed infrared • Slave-to-Master Wireless Links such as proximity smart cards and RFID • Third Generation Communications such as WCDMA, OFDM, UWB
Fusion and Analysis	• Figure of merit (FOM) • Gating • Kalman filters • Bayesian decision theory • Dempster-Schafer evidential reasoning (DSER) • Adaptive neural networks • Cluster methods • Expert systems • Blackboard architecture • Fuzzy logic • Computational representation of human visual skills and decision-maker's reasoning processes
Exploitation and Assessment	• Human/computer interface standards for next generation displays and controls • Knowledge elicitation techniques • Hybrid computation intelligence

Legend
AMPS = Advanced Mobile Phone Service
GPRS = General Packet Radio Service
GSM = Global System for Mobile Communication
OFDM = Orthogonal frequency-division multiplexing
RFID = Radio frequency identification
TACS = Total Access Communication System
UWB = Ultra wideband
WCDMA = Wideband code-division multiple access

A number of technologies and techniques are available today to support the knowledge management framework.

From an information technology/command, control, communications, computers, intelligence, surveillance, and reconnaissance (IT/C4ISR) perspective, the focus is on enhanced logistics command and control made possible by the development of advanced decision-support tools.

Predictive methodologies will be applied within the greater context of battlespace awareness, yielding a fully integrated operations, intelligence, and logistics picture. Logistics networks with intelligent agent systems and sensors will support the decisionmaking capabilities commanders need to deal with the risks of increasingly complex variables. (Intelligent agents are software agents that have the ability to adapt and learn.) These cross-domain scientific and technical areas will support the Future Force fighting in a network-centric operating environment involving complex, heterogeneous, and interactive logistics phenomena. Better sensing and interpretation of these logistics data will reduce risk and uncertainty for the commander.

Technology-Centric Knowledge Management

One key to achieving P&C is a knowledge management framework centered on a multifaceted technology infrastructure. Knowledge management refers to the set of processes developed to create, gather, store, transfer, interpret, and apply knowledge. A technology-centric approach to knowledge management focuses on technologies that will enhance knowledge sharing and growth throughout the logistics enterprise. The table at left lists current-day technologies and techniques that support the collection, transmission, fusion and analysis, and exploitation and assessment of this knowledge management framework.

In addition to the existing technologies listed in the table, P&C will require advances in the cognitive sciences; data storage and retrieval; real-time, large-scale, multimodal sensing; the storing and accessing of historical and simulation patterns; onboard prognostics capabilities; physics of failure analyses; and predictive modeling. P&C also will require advances in the use of intelligent agents, integrated sensing and effecting, opportunistic optimization (dynamic reallocation of tasks within subgroups to optimize processes in a more advantageous manner), and automated ontology extraction (automated representation of objects or entities and the relationships among them).

Currently, Government laboratories, academia, and commercial firms are engaged in research efforts that support varying aspects of P&C. A great deal of research is being conducted in the areas of sensors and computational science, using mathematical models on high-performance computers. In addition, cognitive scientific work is progressing toward an understanding of the mechanisms underlying thought and intelligent behavior and their embodiment in machines. This effort is rooted in several fields, including artificial intelligence, psychology, linguistics, philosophy, robotics, human-machine systems engineering, anthropology, sociology, and neuroscience.

Another area with significant commercial, academic, and Government interest is intelligent systems or agents. Emphasis is on developing a "stimulus response" system that learns during its existence by sensing situations within its environment and learning which appropriate action permits the system to reach its objectives. Efforts are well underway to develop component hardware or software-based systems to assist users by collaborating and interacting on their behalf. Intelligent systems have some commercial viability in manufacturing, supply, and distribution chain operations as well as communications.

As mentioned in the first article of this series, "Quantum Computation and Communication," (*Army Logistician*, September–October 2006), quantum computers may enable new classes of models and simulations with processing power and speed that allow for exponentially more accurate predictions of logistics requirements and outcomes. So, just as several scientific and engineering disciplines are experiencing a degree of convergence and overlap, the future logistics themes also demonstrate a certain synergy.

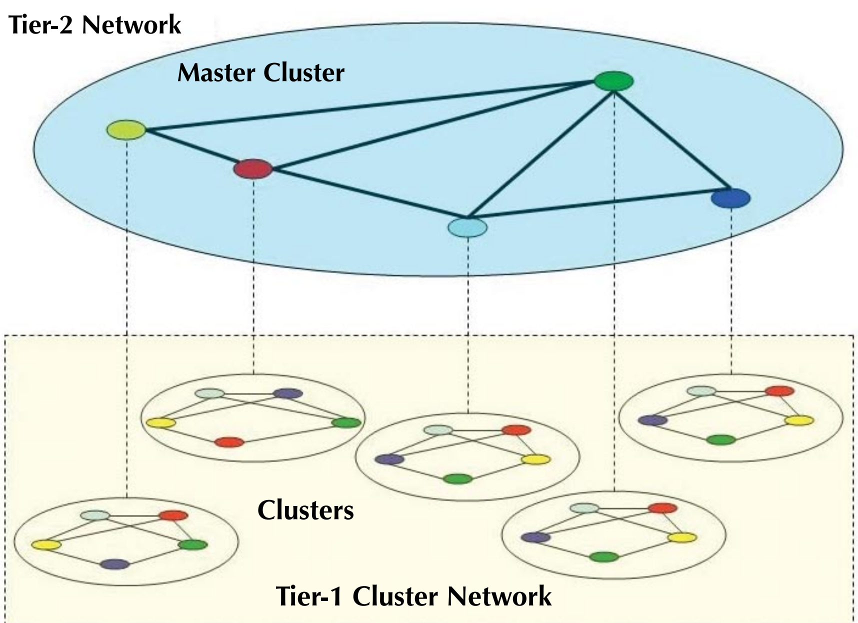
Future Technologies

Advanced sensor nodes will be the starting point for gathering real-time, continuously updated platform logistics data or information. In an operational context, communication among multiple sensor nodes is best achieved using ad hoc wireless networks, which do not require a base infrastructure to support communication among nodes. In the commercial sector, ad hoc wireless networks are not necessarily advantageous since the required necessary infrastructure, such as base stations and routers, are in place. However, for dynamic, evolving situations in which data are obtained from on-the-move sensor networks, ad hoc wireless networks are essential.

In an ad hoc mode, wireless on-board diagnostic sensors (each one representing a "node") will directly communicate with each other in a peer-to-peer fashion and will not require central access points or routers. Each sensor of an ad hoc network will have wireless communications capability and some level of signal processing and networking of data built in. Common to all ad hoc networks are the capabilities for sensor nodes to collect data, detect the occurrence of events, estimate parameters of the detected event, classify detected objects, and track objects. In addition, the sensor network will disseminate data throughout the nodes of the network as well as to end-users. Individual ad hoc sensor networks of 10,000 to 100,000 nodes, linked by a common communications protocol, will form the components of larger wireless networks.

Low energy, self-organized networks will be required for remote or hostile situations. Self-organized networks will include sensor nodes that can spontaneously create impromptu networks that dynamically adapt to device failures and degradation, manage movement of sensor nodes, and react to changes in tasks and network requirements. Self-organized networks will enable self-aware, self-reconfigurable, and autonomous sensor devices. In an operational context, sensor networks also will consist of sensors of varying types that can be organized into clusters. (See chart below.) The nodes of a cluster will detect locally occurring events, and the cluster will have sufficient processing power to make a decision that can be broadcast to other clusters or a master cluster.

This wireless network demonstrates how sensors are organized into clusters.



A Two-Tier Ad-Hoc Wireless Network

The broadcasting of logistics data or information will require the development of efficient ways to allow the multitude of wireless devices to communicate within the available radio spectrum. Cognitive devices that can figure out which frequencies of the spectrum are quiet and that can negotiate with other devices in the vicinity (a capability called spectrum sharing) will form the larger part of the cluster of sensor nodes. Spectrum sharing is a difficult problem to solve and requires very detailed mathematical models that present the cognitive devices with certain rules. Nevertheless, we expect that cognitive devices will appear within the next 10 to 15 years to alleviate crowded airways.

At the upper echelon, once data are collected, transmitted, and fused, they will be analyzed and used to prepare alternative courses of action. It is important not to lose sight of the fact that the P&C capabilities we discuss in this article will require vast amounts of information across a broad spectrum of domains from physical to cognitive. Bridging these domains requires not only advances in technology but also advances in decision-support tools that synthesize this vast quantity of data and information. Logisticians then will be able to anticipate logistics requirements, enable planning, and allow forecasting of operational solutions that will result in shortened decision cycles, allow for preemptive intervention, and influence mission success. These decision-support tools must incorporate the commander's intent.

Some advanced decision-support tools currently under investigation (in anticipation of the network-centric Future Force) include Multi-Resource Polymorphic Collaboration, Distributed Smart Enterprise Object Modeling, Joint Battlespace Infosphere, and an intelligent agent-based infrastructure for decision-support systems. All decision-support tools have the following common characteristics: inputs (data); knowledge and expertise to determine what data need to be analyzed; outputs (courses of action); and decisions that ultimately are made by the user.

Key to the overall decision-support process is predictive analytics. Predictive analytics involves the development and use of advanced statistical methods to process data, both current (real time) and historical, in order to make predictions about future events. Essentially, predictive analytics arises from basic prognostic techniques. Today, baseline prognostics techniques are available that allow for data mining and modeling of electronic systems using statistical methods. P&C, however, requires advanced prognostic capabilities not only to detect the early onset of faults (using nonlinear methods) but also to allow the prediction of device failures using the advanced physics of failure models.

Predictive analytics based on future prognostic capabilities will allow for advanced predictive, descriptive, and decision models. Predictive models will analyze data and data patterns to guide decisions; descriptive models will analyze relationships among the many different elements of decisions; and decision models will forecast the results of courses of action. Predictive analytics aids decision logic in order to maximize the desired outcomes of certain courses of action while minimizing other, undesirable outcomes.

Portions of P&C are achievable before 2030 and, with an architectural roadmap, could evolve over time to improve logistics capabilities as new technologies emerge. This would support acquisition of technologies through a spiral development process, giving users exposure to much-needed decision-support tools while providing feedback to developers on desired capabilities and effectiveness measures.

As P&C becomes a reality, its benefits to the warfighter will be significant. It will provide crucial decisionmaking information for operational commanders and enable logisticians to integrate intelligent agents into decision-support tools to control the logistics enterprise. As the Army confronts new enemies and acknowledges an uncertain future, it needs to proactively seek to exploit accelerating scientific and technological change in order to retain battlefield supremacy over our enemies. The Army logistics community must be prepared to articulate clearly the necessary investments in the development of future logistics capabilities in order to support combat systems and forces operating in an ever more complex strategic environment.

Soldiers' lives and our Nation's defense depend on the continuous development of predictive tools in order to maintain an exceptionally high state of logistics readiness that does not lag behind other factors of operational readiness. Indeed, because of the nature and complexity of the missions facing operational and tactical forces and the criticality of real-time synchronous integration of logistics with operations, logisticians may need to identify and exploit a wider array of science and technology than do their operational and tactical counterparts.

The intent of this series of articles was to provide members of the logistics community with a preview of future possibilities for Army logistics by describing interrelated areas of basic scientific research as they apply to various logistics functions. Going forward, the Army should realize that its challenges are as much cultural and organizational as they are scientific and technological. Solutions will require collaboration with the research, development, test, and evaluation community as well as with the larger Army and joint concept development and experimentation communities. The Army must ensure that innovative ideas are fully explained and incorporated into the fabric of the Army as it operates as part of the Joint Force. As it adapts to change, the Army can effect far-reaching improvements to logistics processes and readiness.

ALOG

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Implementing the Theater Medical Information Program During Operation Iraqi Freedom

BY LIEUTENANT COLONEL MARK L. HIGDON

Modern combat operations expose Soldiers to many potential environmental health hazards, including the possibility of chemical, biological, or nuclear attacks. The effects of exposure to health hazards during combat operations may not be apparent immediately. For example, the results of exposure to Agent Orange during the Vietnam War were not known for many years, and some veterans of Operations Desert Shield and Desert Storm are being treated for a potential "Gulf War Syndrome." History has taught us that comprehensive health surveillance is necessary to mitigate the loss of combat effectiveness caused by nonbattle injuries or illness. Quality assurance studies demonstrate that Soldiers treated at forward locations, where only handwritten records are prepared, rarely have their permanent records updated to reflect their treatment.

In 1999, Congress mandated that the Department of Defense (DOD) develop a system for collecting, storing, and tabulating medical data for all service personnel in an electronic health record (EHR). In response, DOD created the Composite Health Care System II (CHCS2) (recently renamed the Armed Forces Health Longitudinal Technology Application [AHLTA]). In 2003, a version of that system, the CHCS2–T (Theater), was introduced on the battlefields of Operation Enduring Freedom and Operation Iraqi Freedom. The goal of CHCS2–T is to provide commanders the medical surveillance and monitoring capabilities they need to evaluate force health protection needs. The use of CHCS2–T on the battlefield provides a comprehensive, historical, durable medical record for each warfighter encompassing all of his medical encounters.

The EHR fielded by the Army is part of a system called the Theater Medical Information Program (TMIP). TMIP is not a single system; rather, it encompasses several computerized models designed to create an EHR and transfer pertinent medical treatment information from the point of injury on the battlefield to the Soldier's permanent health record. Starting in 2003 during Operations Enduring Freedom and Iraqi Freedom, TMIP was fielded at various levels of the combat theater. This article outlines the experiences of the newly deployed, transformation-based 4th Sustainment Brigade in using the TMIP system integration during Operation Iraq Freedom 05–07.

At the core of TMIP development is the need for overall improvement of both force health protection and real-time health surveillance. Success of the TMIP is paramount to producing a seamless, durable EHR that accurately captures, tabulates, and monitors healthcare for warfighters throughout their military careers. TMIP is the military's answer to the need for a fully computerized medical health record for all Soldiers that is comprehensive and easily transferable from peacetime to combat operations.

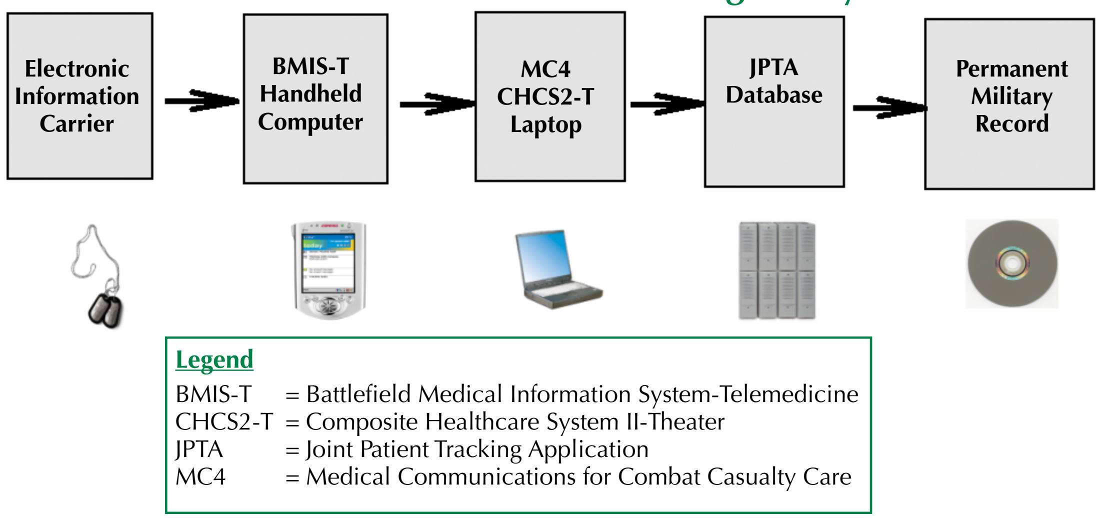
TMIP Capabilities

TMIP's primary purpose is to capture a Soldier's medical history in a usable database format. This information then can be analyzed to determine trends and identify potential hazards for all personnel, permitting preemptive actions such as immunizations

Theater Medical Information Program (TMIP) System	Computer/Device	Medical Echelon of Use
Electronic Information Carrier (EIC)	Dog tag card with computer chip	1, 2
Battlefield Medical Information System-Telemedicine (BMIS–T)	iPAQ pocket PC 2002	1, 2
Medical Communications for Combat Casualty Care (MC4) System	Laptop computer	1, 2, 3
Joint Patient Tracking Application (JPTA)	Centralized computer servers	4

This chart shows four TMIP data systems and the echelons of care for which each is used.

Basic Information Flow in the Theater Medical Information Program System



and prophylaxis treatments. TMIP, when fully implemented, will integrate four core data systems in order to capture and store medical information. The chart on page 39 shows the four data systems and the echelons of care for which each is used. The chart above shows the basic flow of information in the TMIP system.

The four TMIP computer systems are designed to communicate seamlessly with one another. The basic system includes a rewriteable electronic information carrier (EIC) in a card format designed to be worn on the dog tag chain of each Soldier. Personal historical and administrative medical data are preloaded onto the EIC and carried by the Soldier at all times. When the Soldier is treated in either garrison or the field, the EIC is scanned to load his medical history and administrative data onto the computer platform used.

The scanning device commonly used for the EIC is a handheld computer called the Battlefield Medical Information System-Telemedicine (BMIS–T), which is preloaded with pocket personal computer software. Scanning the EIC with the BMIS–T eliminates the need to spend time entering administrative data for each Soldier. Medics use the handheld BMIS–T to enter data during sick call visits and to document information that would be entered routinely onto a field medical card (FMC). The BMIS–T is most helpful in completing Post-Deployment Health Assessments.

Data from the BMIS–T are downloaded to the next TMIP step, a laptop computer system often called the Medical Communications for Combat Casualty Care (MC4) computer. This data transfer most often occurs at the battalion aid station (BAS) using the HotSync function common to most handheld computers. (HotSync is the process of synchronizing information between a handheld computer and a personal computer). The CHCS2–T computer system transmits medical information to the Joint Patient Tracking Application (JPTA) database through a standard NIPRNet (Unclassified but Sensitive Internet Protocol Router Network) connection. If possible, a local network of a unit's CHCS2–T computers is set up within a BAS to allow information sharing. If networking is not possible because of tactical conditions, information is stored on a handheld or laptop computer until conditions allow the transfer of data to the JPTA database.

The JPTA is a Web-based tracking and information management tool that reports data on Soldiers treated in forward operating areas. Compiled JPTA data can be accessed by anyone with a NIPRNet account and an assigned password. Passwords for the JPTA database can be obtained on line (usually within 48 hours of completing a registration form and password request). Commanders, physicians, and other healthcare providers can use JPTA data to ensure force health protection. Ultimately, the medical data captured by both BMIS–T and CHCS2–T are uplinked to the Soldier's permanent medical record. This eliminates the problem of lost records and saves time previously spent recording purely administrative data on multiple handwritten documents. The data compiled in JPTA enhance the ability of field surgeons to track patients during the casualty evacuation process and to review tabulations of disease and nonbattle injury data to help identify possible trends of illness or exposure. The powerful JPTA database also improves response times when replying to command inquiries about the health status of injured or evacuated warfighters.

TMIP captures all information about the healthcare given to Soldiers and eventually includes those data in their permanent records. Redundancy is built into the system by having multiple levels of information capture that could be used to update any of the lower tiers of medical data collection. Research possibilities and development of preventive medicine techniques will be enhanced by greater use of the system by all units. Army-wide implementation of the TMIP system is planned for 2007.

Implementing TMIP in the Sustainment Brigade

The 4th Sustainment Brigade deployed in support of Operation Iraqi Freedom 05–07 in September

2005. Before deployment, the brigade received all of the major components of the TMIP system except the EICs. Unfortunately, without an EIC, the handheld computer cannot be used as a replacement for the FMC. All initial echelon I (the first medical care a Soldier receives) treatment notes completed in forward locations were handwritten on the FMC.

A big obstacle to using the BMIS–T is its inability to transmit data wirelessly to the CHCS2–T computers because the Bluetooth technology involved is not secure. Currently, data transfer from a handheld computer to other TMIP systems requires a hard-wire HotSync. In the brigade's echelon 1 troop medical clinic, most medics did not fully use the features available with BMIS–T; most simply used their handheld computers to follow treatment algorithms during sick call. Bluetooth expansion, including a secure wireless transmission, would enhance system capabilities for medics who use BMIS–T as a replacement for the standard FMC.

The CHCS2–T computers functioned as designed, but they were sometimes slow. One of the most notable exclusions from the CHCS2–T software package was an alternate input method (AIM) forms capability, which is available in AHLTA. The AIM forms capability provides a format for inputting medical notes that is similar to the format used on the traditional paper chart. The template-based entry offered by CHCS2–T computers is time intensive and difficult to learn. The AIM helps standardize treatment for common illnesses, allowing faster documentation and quicker training. Given the inherent training difficulties that accompany the fielding of a new product, the AIM would enhance the CHCS2–T software.

Although slow in the initial months of use, uploading the brigade's medical data from the CHCS2–T computers to the JPTA database did not present any problems; the TMIP system functioned well. It took several hours for a completed note to appear on the JPTA Web site, but the information was accurate and complete. The delay in updating a note to the JPTA server (sometimes more than 3 hours) prompted the field surgeons to make phone calls to various medical facilities to obtain real-time casualty information.

One suggestion for enhancing the organization of the JPTA database is to organize casualty data for each unit on the JPTA site and include a summary screen that provides a unit snapshot of information so that field commanders can see where their Soldiers are and what is currently happening. The summary screen could include several data fields that could be customized for each unit. A virtual private network (VPN) would increase the depth of review available with JPTA. The JPTA data currently are limited to the theater of operations. By using a VPN, home-station medical databases could be accessed by forward stations to obtain needed medical information (such as medical profile information and historical radiological studies). A medical readiness module to track medical profiles both in garrison and in combat operations would eliminate the need for Soldiers to have copies of their profiles. The data would be available instantly to anyone having NIPR access to the JPTA, so field surgeons and commanders could track and review medical profiles more accurately. TMIP technical support was available at Forward Operating Base Taji, but it usually took several days for the provider to arrive and troubleshoot networking problems. Several of the delays the brigade experienced with TMIP could have been eliminated with increased availability of technical support.

Another way to enhance JPTA organization would be to integrate the TMIP system fully to all units. Expeditious fielding of complete TMIP systems and continued software enhancements are necessary to meet the needs of the modern Soldier, both during and after deployment. All commanders need the ability to compile accurate medical data quickly and efficiently in order to maximize combat effectiveness. The brigade's medics and healthcare providers quickly came to rely on the data management provided by the CHCS2–T.

Overall, TMIP is an outstanding concept that will eliminate the previous inconsistency and fragmented data common with handwritten records. Continued efforts should focus on seamless integration of both inpatient and outpatient data in the TMIP system.

Army-wide implementation of the EHR during both garrison and combat operations offers the mobility of information needed to enhance force health protection. The EHR is paramount to ensuring that commanders have full medical situational awareness and offers myriad healthcare reporting and tracking capabilities. Continued refinement of the durable EHR and TMIP are essential to meet the needs of today's warfighters. **ALOG**

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What to Pack: A Guide to Predeployment Equipment Planning

BY CHIEF WARRANT OFFICER (W–2) GREGORY W. BESAW

A deploying unit preparing for deployment presents many pitfalls. However, with realistic expectations and proper planning by its property book officer, it can avoid many of them.

Planning a unit's deployable equipment list (DEL) can be a challenging experience, even for seasoned commanders and property book officers. The process definitely can be intimidating when you consider factors such as an uncertain, constantly changing mission and difficulty in obtaining visibility of existing assets at your deployment site.

If you are involved in preparing your unit for deployment, you will not find a single source of information that covers every step of determining your DEL. The practices used in Iraq and Afghanistan change with every rotation, and they are not found in a field manual or Army regulation. This does not mean that you are left to fend for yourself. Many resources are available, including Department of the Army (DA) directives, Web-based data tools, and informal information networks. The key is to synthesize those bits and pieces of information into a coherent plan that best supports your unit.

Deciding What to Take

According to doctrine, the equipment a unit takes when it deploys is determined by its modification table of organization and equipment (MTOE). An MTOE allocates specific amounts of equipment based on a unit's designated mission, and the unit theoretically deploys with nearly everything in its motor pool and storage rooms. However, the Global War on Terrorism has drastically changed the way units are employed in battle, and most combat units no longer are matched against a similar foe. Rapid changes in enemy tactics require rapid changes in the way we fight, which, in turn, affects the force structure of units in combat.

To permit quicker force structure changes for deployed units based on immediate feedback from the field, the concept of a DA-approved mission-essential equipment list (MEEL) was introduced. Think of the MEEL as a mini-MTOE designed for a particular type of unit performing a specific mission in a specific location. As with an MTOE, the MEEL usually is developed for the battalion level, although separate companies also should have MEELs. Similar units in neighboring locations may have slightly different MEELs, based on their unique mission requirements. For example, an infantry brigade combat team will have a MEEL that is similar to that of other infantry brigade combat teams, but with slight variations depending on the unit's mission, the enemy's disposition, and the terrain on which the unit is operating. The equipment you will deploy with is determined by an analysis of the approved MEEL.

Many unit planners assume that an MTOE plays a significant role in developing a MEEL. Units often make this common mistake in their planning. Actually, the MTOE plays little or no role in the development of a MEEL. Support items linked to a specific weapons platform likely will remain on the MEEL; however, the deployment location and the centralization of the unit at one site may eliminate the need for field support equipment to support dispersed forces, such as field feeding, power generation, or other life-support equipment.

Realigning your unit for deployment also will greatly affect the amount of equipment it takes when it deploys. Although it is obvious that an artillery battalion that has retrained and is deploying as a military police unit will leave much of its MTOE equipment behind, combat support and combat service support units deploying in their traditional roles also may not operate according to their doctrine and therefore will leave a lot of their equipment behind. An aviation unit may consolidate or disperse units based on the availability of facilities and the needs of the ground tactical commander, which, in turn, could change a transportation unit's focus from long-line distribution to immediate local support. Such local, mission-focused adjustments play a more important role in determining a specific unit's MEEL than an MTOE that is generally similar to those of other units of the same type.

The Coalition Forces Land Component Command approves MEELs for incoming units at least 90 days before they deploy. For deploying units conducting a relief in place (RIP) with a similar counterpart, the MEEL is based on input from the outgoing unit at the midpoint of its tour. Since the unit in theater has likely stabilized its mission and equipment requirements at that point, the midpoint data provide the best estimate of the incoming unit's needs. This information is sent to the incoming unit for review and feedback, generally 5 to 6 months before its deployment date.

Your incoming unit receives a worksheet containing a list of the anticipated MEEL authorization levels for specific items, including on-hand quantities of theater-provided equipment (TPE) (specific line items designated by DA as permanent theater assets). Your unit reviews the MEEL level for each item of equipment and makes adjustments as necessary based on the commander's assessment. Expected mission changes after the RIP may increase or decrease the need for certain items. Once the MEEL level has been reviewed, your unit compares the listed quantities of TPE and reviews any potential equipment shortfalls.

The operational experts who plan equipment requirements must let the logistics planners know what the unit will need. If your unit will not have a certain mission, it should not bring gear that will only sit in a shipping container. Detailed communication between your unit and the outgoing unit will help with planning. However, remember that your unit's mission may grow, shrink, or change completely compared to that of the unit you are replacing.

Filling Shortages

MEEL shortages may be filled several ways. Your unit may bring its own organizational property, TPE assets may be redirected, or the outgoing unit may be directed to leave organizational property behind as a short-term loan (STL) or long-term transfer (LTT) (formerly called stay-behind equipment). STL is considered a loan—generally for 90 days or less—and is managed with a temporary hand receipt between the two units. LTT is for the duration of one deployment,

Preparing to Deploy

Predeployment

- Incoming and outgoing units establish initial contact as early as possible.
- Outgoing unit develops initial MEEL at midtour.
- Incoming unit representative visits theater to conduct initial predeployment site survey.
- Outgoing unit identifies current requirements.
- Incoming unit reviews initially available TPE.
- Incoming unit identifies expected changes to MEEL.
- Incoming unit identifies expected shortages based on TPE.
- Incoming unit develops initial unit deployment list (UDL)/DEL based on the formula: MEEL-TPE-LTT=UDL.
- Incoming unit identifies its LBE using the formula: LBE=Unit on hand (OH) equipment-UDL.
- Incoming unit receives the approved MEEL about 90 days before deployment.
- Incoming unit confirms current TPE and develops the final DEL.
- Incoming unit prepares for movement.
- Incoming unit identifies final shortages to the outgoing unit.
- Incoming unit submits operational needs statement for requirements above MEEL.
- Outgoing or incoming unit submits LTT nomination as needed.
- At least 30 days before deployment, the incoming unit PBO establishes timeline to split hand receipts.
- PBO initiates 100-percent inventory of all equipment before hand receipt split.
- Units prepare documentation for PBO to split the hand receipt according to local policy.
- PBO transfers designated equipment to derivative UIC.
- Rear and forward commanders sign respective hand receipts.

During Relief in Place/Transfer of Authority

- Incoming PBO moves into theater ahead of his unit to work with the outgoing PBO and identify any last-minute TPE or LTT needs in conjunction with the S–3/4 representative.
- Incoming PBO coordinates the transfer schedule, briefs incoming commanders, facilitates transfer of property between units, and maintains communication with the TPE PBO.
- Incoming commanders provide the TPE PBO with DA Form 1687, Notice of Delegation of Authority-Receipt for Supplies, and assumption of command orders and inventories property.
- Outgoing commanders conduct a change of command inventory on TPE/LTT items.
- Outgoing commanders correct all hand receipt deficiencies and prepare the shortage annex, adjustment actions, and financial liability actions as needed.
- Incoming commander signs corrected TPE/LTT hand receipt when it is complete, accepting current TPE and installation property UICs.

and the property is laterally transferred from the losing unit to the gaining unit's TPE property book account. STL and LTT will be returned to the losing component (not necessarily the losing unit) at the end of the designated period if it is no longer needed for future operations.

Several sources are available for determining TPE and LTT in theater. BattleWeb, a commercial asset visibility tool available through Army Knowledge Online's Logistics page, and the Army Materiel Command Logistics Support Activity's Logistics Integrated Database (LIDB) are both great for planners who do not have access to Property Book Unit Supply Enhanced (PBUSE). However, from a property book officer's (PBO's) perspective, I believe shared asset visibility in PBUSE is the most effective tool. The outgoing PBO should already have asset visibility of the TPE and installation property book section unit identification codes (UICs) he supports and should be able to request the same for the incoming PBO. This saves the hassle of emailing hand receipts and consolidated property listings weekly and allows the incoming PBO to run queries for specific items as often as his command requires.

If your unit needs equipment that is not on its property book and is not available for transfer from the outgoing unit, you must submit an operational needs statement though theater command, control, and communications channels to the DA G–3. If approved, DA will either procure or relocate the equipment to fill your unit's needs.

If the redeploying unit has organizational property in theater that will fill a MEEL shortage for your unit, either unit can submit an LTT nomination request through theater command, control, and communications channels for DA G–3 approval. This should be done with the agreement of both your unit and the redeploying unit. DA will review available TPE assets and the actual need. If the transfer is approved, DA will direct the transfer of the equipment to theater property books.

Good communication between you and your counterpart in the redeploying unit also will save you when problems arise. I developed a professional and personal relationship with the redeploying unit's PBO about 6 months before I arrived in country, which really helped smooth negotiations between units. Remember that the redeploying unit knows the theater, knows the mission, and knows what it takes to fight and win. Conversely, your unit may have other priorities from its higher headquarters, the opportunity to study the situation from an external perspective, and its own internal methods of operating. If your unit commanders are communicating effectively with their counterparts, all parties should have a good idea of the equipment available and potential shortfalls.

If everything works perfectly (and it won't), once the MEEL is approved, you should be able to match your equipment on hand against MEEL authorizations, subtract available TPE or approved LTT, and have a complete list of equipment to deploy as well as a listing of left-behind equipment (LBE) to remain at home station. LBE will be transferred to the rear-detachment derivative UIC under property book identification code (PBIC) "X" and type authorization code (TAC) "G." The PBIC "X" and TAC "G" combination alerts DA asset managers of the presence of LBE, which can be redirected to fill operational needs elsewhere in the Army or turned in for maintenance, rebuild, or overhaul while the unit is deployed.

MEEL approval often comes too late for the first units that deploy. It is timed for the arrival of most of the division, but the advance units may end up making assumptions and best guesses while the MEEL is being finalized. When my brigade deployed, we received the approved MEEL during railhead operations and had to leave at the port more than 100 wheeled vehicles that did not make the cut. The process has improved since then; it moved much faster as we prepared for redeployment and transition with the unit that would be replacing us.

Accounting for Property

Once you have developed the list of organization property to deploy and commanders submit their DEL to the transportation planners, you must conduct the 100-percent predeployment inventory required by the November 2005 interim changes to Army Regulation 710–2, Supply Policy Below the National Level. The PBO also must begin splitting the property book hand receipts into deploying equipment and LBE.

Your PBO should be one of the first people on the ground to confirm and assess possible new shortages of TPE and LTT. He also should work with his redeploying

Packed 463L pallets await shipment.

Soldiers unload an HH–60L Black Hawk medical evacuation helicopter from a ship at the Port of Shuaiba, Kuwait.

counterpart to start setting up the transfer of property between incoming and outgoing units. Serious accountability problems will occur unless competent personnel handle the property split and ensure that the process is properly synchronized.

Splitting the Hand Receipt

A major pitfall in maintaining asset accountability during a deployment is the timing of container stuffing and hand receipt splits. In retrospect, I feel I set my deadline too soon, since I was in the advance party and left a month earlier than most of the units. In several instances, property was on the forward hand receipt and scheduled to deploy, but there was not enough space for it. Some company sub-hand receipt holders also changed their loadouts without informing the commander or primary hand receipt holder. The result was a series of lateral transfers from rear to forward hand receipts to correct imbalances caused by property that was left in the rear but retained on deployed hand receipts or items that were packed at the last minute without the rear-detachment hand receipt holder's knowledge.

Ultimately, it is the commander's responsibility to ensure that everything he signs for on the forward hand receipt is actually there, but the hand receipt split also must be synchronized to coincide with packing containers. I was fortunate enough to have a retired chief warrant officer (W–3) as my civilian property technician to conduct the hand receipt split and allow my noncommissioned officer in charge and me to deploy early. When planning the PBO shop's personnel deployment sequence, the PBO must carefully weigh the capabilities of personnel, the benefits of early arrival in theater, and the possibility of problems with splitting the property book hand receipts.

Most of the difficulties that my unit experienced resulted from deploying equipment changes made after the hand receipt split, not from the actual process of splitting the hand receipt. On our next deployment, I plan to schedule the split late enough to have the units complete a Department of Defense Form 1750, Packing List, for each MILVAN (military-owned, demountable containers), which should be completed with line item number, national stock number, nomenclature, serial number, and quantity for all property book items. This will help ensure that the commander's hand receipt is based on the equipment that is in the containers and not on the commander's planned list of deploying equipment. Additional training at the unit level should also reduce the likelihood of personnel making last-minute equipment changes without informing the hand receipt holder.

Even if you have deployed to the same theater before, the learning curve will still be steep. Policies and procedures change often; what worked last time may no longer be effective. Communicate constantly with your counterparts in theater, but also make sure you are aware of changes in your organization's plans. With an open mind, extensive research, and a little foresight, you will have a smooth transition on your next deployment. **ALOG**

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SIGTRAKS: Tracking Logistics Information

BY GREGORY L. ALDERETE

The Army Field Support Brigade Pacific has developed a system to bring order to the mass of available logistics information and improve situational awareness.

Twenty years ago, Lieutenant Colonel Bob Madayag (now retired) observed when the first computers arrived at the Army School of the Americas, "It will be another 20 years before the real capabilities of this technology are realized." Little did I know then how accurate his prediction would prove to be. Compared to today's computer systems, those first computers were little more than digital typewriters or, for some users, confusing status ornaments. Today, Army transformation is pushing the digital boundaries, with real-time network-centric technology at the epicenter. In fact, the amount of information available to Army leaders and staffers is now so great that systems are needed to organize it into usable forms. The Army Materiel Command's (AMC's) Army Field Support Brigade (AFSB) Pacific has developed such a system to help organize logistics information, increase logistics situational awareness, and track critical issues. This system is SIGTRAKS—the Significant Issue Tracking System.

Information Overload

The Army faces no shortage of information, but the availability of more information is not necessarily a good thing. Email has become an endless flow of facts and figures with limited filtering, accounting, or tracking features. Staffers must sort through volumes of runaway emails, attempting to establish ownership and separate the relevant from the extraneous. Misdirected emails, laced with outdated or already resolved actions, steal time from many users who have to read them. It is not uncommon to have information unintentionally delayed or overlooked or to have critical information bypass key personnel.

Information overload, accumulating from multiple, dissimilar channels, complicates the flow of real-issue tracking. Information from reports in multiple texts, such as Word and PowerPoint, can be difficult to search for, sort, and summarize and has a limited shelf life before it is deleted, lost, or archived into obscurity. Leaders cannot lead and managers cannot manage without access to timely information. Timely, critical information that does not reach its intended audience is essentially worthless.

D Minus 90

In June 2003, AMC Forward Stryker at Fort Lewis, Washington, began assembling AMC's first brigade logistics support team (BLST). This integrated team of 15 to 17 highly trained AMC logistics specialists was tailored to provide habitual, dedicated direct support to a Stryker brigade combat team (SBCT). With an SBCT scheduled for deployment in 90 days, the greater concern at the time was BLST management of 85 program manager (PM) contractors and their systems. For example, of 79 communications systems, only 22 were supported by the Communications-Electronics Command (CECOM); the remaining 57 were supported by PM-managed systems contractors.

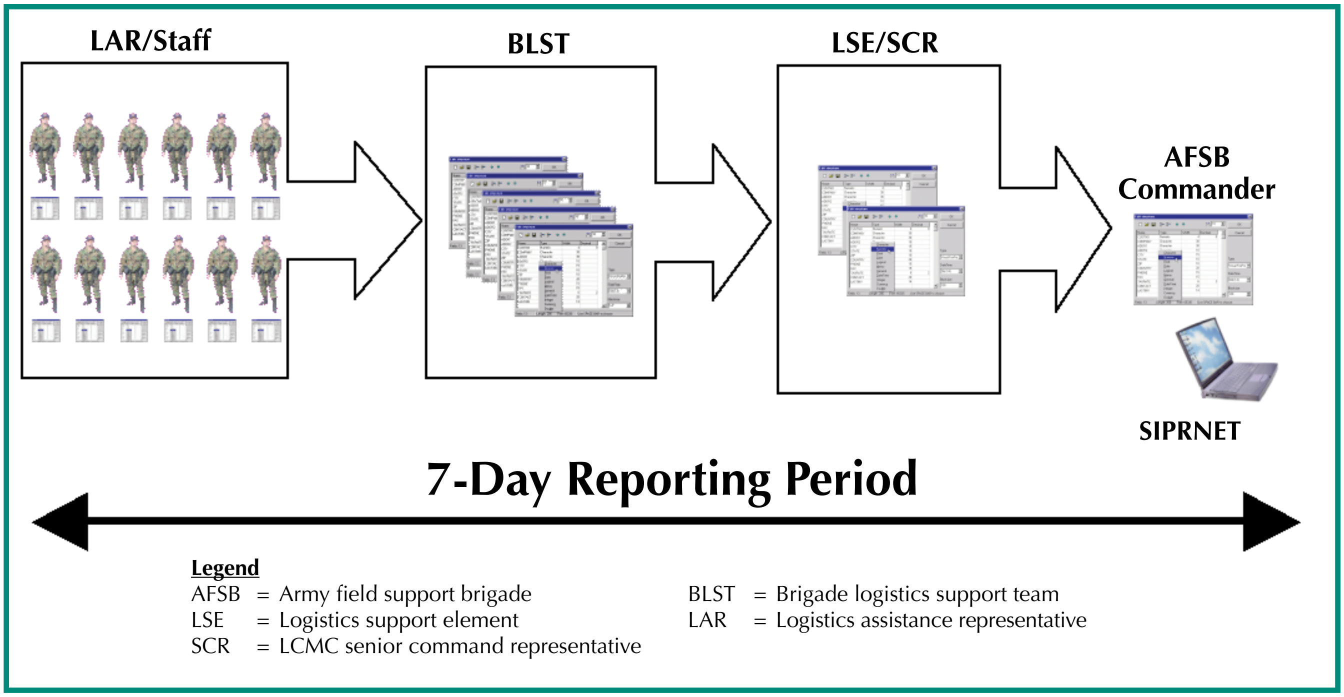
Clearly, in 2003, the lines of logistics responsibility, accountability, and authority were becoming doctrinally transparent among contractor and Government personnel. However, little consideration was given to how to collectively integrate SBCT equipment supported by PM-managed contractors into an effective centralized management structure within the BLST.

Operational Tracking System

The immediate solution was to establish an Operational Tracking System (OPTRAKS) on the SBCT Intranet, which enabled the brigade to submit, consolidate, and track all AMC and PM trouble reports through completion. "We must be able push information from the ground up," stated Richard Metcalf, who designed the initial operating system. This network-centric system synchronized AMC with the warfighter, sharing logistics situational awareness while tracking requested support.

The idea was to triage each trouble report and forward it to the right technicians for immediate resolution. The trouble report remained active until the problem was resolved to the satisfaction of both the initiator and the problem solver (either an AMC logistics assistance representative [LAR] or field service representative [FSR]). As the trouble report database grew, it quickly became a source of performance-based information used to resolve recurring technical issues.

OPTRAKS implementation ultimately resulted in an 18-percent decrease in FSR calls forward, which, in turn, reduced the logistics footprint. OPTRAKS was



Under SIGTRAKS, logistics issues are compiled weekly using the information shown above. Older issues are archived. Issues that cannot be resolved at or below the AFSB commander's level are reported to the LCMCs and the Army Sustainment Command.

used in garrison and combat, and, as of October 2006, it had logged over 6,000 trouble reports. The success of OPTRAKS was unparalleled.

Significant Issue Tracking System

An AFSB is the AMC regional center of gravity and the single face of AMC to the warfighter. It is responsible for integrating, balancing, and providing global reach back to AMC's life cycle management commands (LCMCs). The goal of each AFSB is to have one AMC person in charge with one focus—tactical support to the Soldier.

In November 2005, the AFSB Pacific operations officer, Hiep Nguyen, began modeling a prototype SIGTRAKS. The primary purpose was to integrate and rapidly move LCMC critical issues through the AFSB chain of command.

During the testing phase, AFSB Pacific tasked its stakeholders in Hawaii, Alaska, Washington, and several overseas locations to evaluate SIGTRAKS. Using a disciplined, measured approach facilitated rapid feedback from a diverse control group. The primary objective was to eliminate redundant or valueless reporting while maximizing useful output.

By March 2006, the verdict from LARs, BLSTs, LCMC senior command representatives (SCRs), and logistics support element commanders in the field was, "Implement SIGTRAKS immediately." Users at all levels adapted to using the system and quickly recognized its added value. They moved from simply being in compliance with SIGTRAKS guidance to committed supporters of the system. SIGTRAKS received command approval and was implemented in March 2006.

SIGTRAKS Supporting the Field

AFSB Pacific, in concert with the Directorate of Information Management at Fort Lewis, operates SIGTRAKS on a secure Department of Defense server, requiring both a login and a password.

SIGTRAKS, like OPTRAKS, operates in a collaborative real-time network, encouraging early, rapid resolution of logistics issues at the lowest level. SIGTRAKS empowers the user and maintainer to document, track, and resolve issues quickly or move them forward as required. Essentially, at the point of receipt, each AMC leader or manager must decide if the SIGTRAKS issue is solvable, should be moved forward, or should simply be filed for future reference. Only unresolved issues are forwarded to the next echelon and ultimately entered automatically into the AFSB commander's weekly situation report for the Army Sustainment Command. Approximately 10 percent of reported issues are approved by the commander and forwarded for general officer review.

SIGTRAKS was designed primarily to digitally empower the frontline user, the LAR. The first "face to the field" the Soldier sees is an LCMC LAR, who acts as an "entry point of success." The LARs are the foot soldiers of AMC, the de facto eyes and ears of the command. LARs operate at the tactical level as highly respected LCMC solution-oriented technical experts who bring unparalleled added value to their supported

DATE CONDUCTED	CODE	DESCRIPTION	NSN	QTY	TOTAL COST AVOIDANCE	DATE CLOSED	REMARK
5/19/2006	Maintenance	Unit has an FM Radio on aircraft 365 that won't transmit or receive. Unit traced the problem to the antenna embedded in the vertical fin. Unit was asked for a repair procedure instead of replacing the whole fin.	1560-01-344-6226	1	$27,483	5/19/2006	N/A
5/19/2006	Maintenance	DS2 was replacing the transverse beams on an aircraft and the factory shims debonded. Unit asked for a repair procedure so the airframe wouldn't have to go to the depot for repair.	0000-00-000-0000	1	$50,000	5/19/2006	Cost avoidance is just an estimate of what it would have cost for a depot repair team to come here from CCAD to do the repair.

This is a sample SIGTRAKS report. Note that it documents cost avoidances.

units. As such, they also are tremendous sources of information and combat enablers; by using SIGTRAKS, they can harness and expand daily logistics situational awareness for the AFSB commander and the LCMCs. SIGTRAKS focuses only on the current week's mission-related issues; previous reported issues are archived. (It should be noted that the current weekly, or 7-day, cycle can be adjusted to meet any determined period.)

Unambiguous SIGTRAKS submissions are available immediately for worldwide review by the designated AFSB chain-of-command, which includes regionally assigned LCMC SCRs. SCRs are indispensable assets to the AFSB commander for solving materiel readiness issues beyond the scope of the LCMC LAR.

SIGTRAKS reporting has eliminated the dreaded weekly nightmare of cutting and pasting text from disparate reports and multiple sources into a single, standardized Microsoft Word document. This feature alone saves countless administrative man-hours throughout the command. Anyone who has attempted to create a single document from many sources will have a profound appreciation of how such a simple process can be so frustratingly difficult.

Previous SIGTRAKS submissions can be updated easily for resubmission into the new week's cycle. Resubmissions automatically thread historical data and once again move through the digital chain of command. This action precludes the loss of valuable historical data, or "data dumping," caused by operational and personnel turbulence. It is not uncommon to have a SIGTRAKS submission with many updates over a period of several months. SIGTRAKS also uses tools and techniques to document cost avoidance, training received or given, trip reports, and meetings attended.

Continuing Developments

Initial analysis showed SIGTRAKS to be an extraordinarily intuitive, easy-to-use, affordable, Internet-based solution that significantly improves the control and flow of vital logistics information. AFSB Pacific is studying SIGTRAKS software exportation to other AFSBs, which will enhance its collective value at the LCMC level.

As the frontline executive agent of SIGTRAKS, AFSB Pacific is able to implement software recommendations submitted by users, often in less than 24 hours. SIGTRAKS is a work in progress designed for the user and by the user, and today it continues to be improved to meet new requirements. This type of software development is an example of post-development software support, or, as SIGTRAKS systems analyst Bob Farr aptly stated, "Building and flying the plane at the same time."

Through a process of natural selection, complicated, irrelevant, or ineffective logistics software programs will go the way of the dinosaur. The Army is transforming while at war. To avoid future shock, the logistics community must catalyze change from within. By applying spiral and evolutionary development, the Army is working to achieve its vision of combining interoperative systems to reduce information waste, increase operational efficiency, and enable focused logistics from the tactical to the strategic levels. SIGTRAKS contributes an important tool to the realization of this vision. **ALOG**

Gregory L. Alderete is the Chief of Plans, Operations, and Security at the Army Field Support Brigade Pacific, Army Materiel Command, at Fort Lewis, Washington. He served 24 years in the Army and is a graduate of the Army Command and General Staff College and the Army Acquisition Level III Certification Program.

Optimizing Logistics Through Operations Research

by Dr. Delia J. Valles-Rosales and Major Donovan O. Fuqua

Army logisticians often have to make quick decisions about how to support the warfighter based on incomplete data and ill-informed assumptions. Making such decisions is a necessary skill for logisticians, because an 80-percent solution that arrives on time is better than a 100-percent solution that is late. The ability to approximate a solution to a logistics problem and then accomplish the mission is a valuable skill for any logistician. However, when they have time to plan and analyze courses of action, logisticians need to look for optimal or improved solutions to logistics problems that consider all functional constraints. This is important because the best possible solutions save resources and time while maximizing a unit's ability to support.

Operations research (OR) is a branch of applied mathematics that uses algorithms, simulation, modeling, queuing, and stochastic methods to optimize or improve a real-world situation. OR was developed by a group of British and American mathematicians who were studying strategic logistics problems during World War II. Since that war, this branch of mathematics has been used in a variety of industrial and military applications.

For example, at New Mexico State University, an ongoing OR project for the New Mexico Chile Task Force is optimizing a supply chain network involved in the harvesting, transporting, and processing of red chile peppers. In the project, data and statistics fitting is used to assign probability distribution functions to crop maturation, harvesting rates, transportation rates, crop damage, and processing rates. After assigning valid queuing rules to the system, the research team was able to write a program using ProModel, a discrete-event simulation modeler that accurately mirrored the actual conditions. Using this program as a base, the team adapted the model to quantify the value of lengthening the growing season, optimizing transportation, and constructing storage based on the amount of crop loss.

The project's value was in creating a model of a supply chain that used accurate stochastic data to accurately describe and then improve on a complicated logistics system. Although writing a program is not a valid method of solving problems in an Army unit, logisticians can use OR methods to deduce and compare feasible solutions to common problems.

This article will describe a few available OR techniques. Using the references listed below, those interested can examine methods for improving systems within their work areas.

Analyzing a Network

A useful OR technique is finding optimal solutions to problems involving start nodes, arcs, and destination nodes. A basic problem in OR is the "transportation problem," in which there are known supply bases, known customer demands, and known costs to each route from supply base to customer. (The costs could be in time, risk, shipping costs, or something else that is considered important.) The objective is to minimize total cost while meeting all demands. The chart on page 50 (top) shows an example of a transportation network and a sample transportation network spreadsheet with costs.

This problem can be solved using either a program or a number of algorithms performed by hand. In this example, all demands equal the sum of all supplies in

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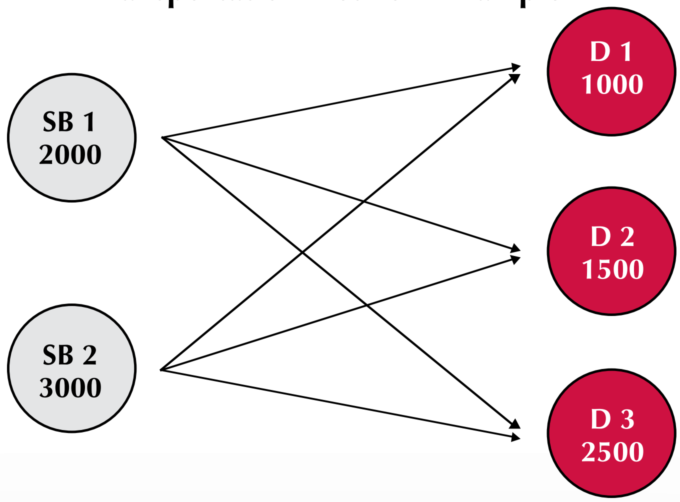
Transportation Network Example



Sample Transportation Network Spreadsheet With Costs				
	Demand 1	Demand 2	Demand 3	Total Supply
Supply Base 1	Cost = 8 hours	Cost = 2 hours	Cost = 5 hours	2,000
Supply Base 2	Cost = 4 hours	Cost = 3 hours	Cost = 6 hours	3,000
Total Demand	1,000	1,500	2,500	

At the top is an example of a transportation network, showing how each supply base (SB) supplies the demand (D) of each customer. At the bottom, a spreadsheet indicates the cost in time of each supply base meeting the demands of each customer.

order to simplify the spreadsheet. In more realistic examples, a dummy variable is added to balance the equation in order to perform either an algorithm or a linear program. After using an algorithm and checking with linear algebra, the optimal solution is shown in the chart below.

Networks, such as maximum flow networks (which are useful in describing port activities), decision trees, lattices, and other deterministic flows, can be used in many ways to solve logistics problems. For those interested in learning more, see the references listed on page 49.

Programming

In OR, programming is used to quantify a problem involving an objective function that is subject to one or more constraints in the system. An objective function attempts to perform actions that affect the output of a system, such as minimizing shipping cost, maximizing throughput, or maximizing material shipped to an area. Constraints are functions that place limits on the range of the objective function. These can include limitations on infrastructure capacity, warehouse space, cost, trucks available, and integer, or non-negativity, limits.

The chart (bottom left) outlines a scheduling problem that illustrates the usefulness of programming. In this example, a maintenance shop must complete four jobs in a week using three mechanics who are given different times to complete the jobs.

For this example, a number of constraints must be listed. First, each worker can only log a maximum of 40 hours during the week. Second, each job must be completed at the end of the week. Third, only one worker can be assigned to a job. For this problem, the decision variables are labeled as "Xij" (assigning "i" worker to "j" task) and will have a value of either "1" or "0" (that is, to either assign or not assign a worker to a task). The cost attribute is labeled as "Bij" (the time for "i worker to complete "j" task).

The resulting problem can be written as shown in the chart above right. It is solved by using an optimizing algorithm, called the simplex method, that uses linear algebra in order to solve series of linear equations. [In nonlinear programs (those involving objective functions and constraints with higher-ordered variables), other methods, such as interior point methods, linear approximation, and Hessian/Duality matrices, must be used.] In real-world problems

	Demand 1	Demand 2	Demand 3	Total Supply
Supply Base 1		1,500	500	2,000
Supply Base 2	1,000		2,000	3,000
Total Demand	1,000	1,500	2,500	

This chart shows the best way for the two supply bases to use their supplies to meet the demands of the three customers. The analysis, conducted by using an algorithm and checking with linear algebra, divided the base's supplies as shown to meet the demands.

	Job A	Job B	Job C	Job D
Mechanic 1	16 hours	22 hours	15 hours	24 hours
Mechanic 2	17 hours	19 hours	18 hours	23 hours
Mechanic 3	20 hours	27 hours	18 hours	24 hours

This chart illustrates a hypothetical scheduling problem in a maintenance shop. Each mechanic needs the hours shown to complete the four jobs. However, each mechanic can work only a 40-hour week.

$$\text{Minimize: } \sum_{j=1}^{4}\sum_{i=1}^{3} BijXij \textbf{ for } i\in\{1,2,3\}\ j\in\{1,2,3,4\}$$

$$\text{Subject to: } Xij = \mathbf{0 \text{ or } 1 \text{ for }} i\in\{1,2,3\}\ j\in\{1,2,3,4\} \text{ (only one worker per job integer restriction)}$$

$$\sum_{i=1}^{3} BijXij \le \mathbf{40 \text{ for }} i\in\{1,2,3\}\ j\in\{1,2,3,4\} \text{ (no worker assigned over 40 hours a week)}$$

$$\sum_{j=1}^{4} Xij = \mathbf{1}\ \ i\in\{1,2,3\}\ j\in\{1,2,3,4\} \text{ (each job must be completed during the week)}$$

The solution to the problem of scheduling the work of the three mechanics so they can complete all of their work in 1 week, with each of them working a 40-hour week, requires the use of an optimizing algorithm, called the simplex method, that uses linear algebra to solve series of linear equations. The bottom three lines incorporate the constraints on the schedule.

with multiple variables and constraints, it usually is not feasible to do calculations by hand. For this type of work, many computer programs like MATLAB and LINDO are available. The key to solving these problems is to set up the problem correctly in order to describe the situation and the desired type of solution accurately.

Simulation

Simulation involves using a combination of deterministic and probabilistic functions to model the problem and then predict actual system improvements after changes. Because of the large number of calculations involved and the need for multiple runs, simulations are almost always run on a computer. A number of excellent simulation programs are available, such as ProModel or Arena, that use graphical interfaces to help model an actual system. Simple models, however, can be run from Microsoft Excel.

The basis for the simulation is generating random numbers and assigning ranges of numbers to values that fit a probability distribution function (otherwise known as Monte Carlo simulation). Although this type of simulation has been used in many scientific disciplines, it was first used to calculate the properties of the neutron by Enrico Fermi and Stanislaw Ulam in 1930.

To use Monte Carlo simulation, you could generate a uniform series of random numbers from zero to one (U(0,1)) and then assign an equal range to each probability in the following way—

- 0.001-0.166: die roll equals 1.
- 0.167-0.332: die roll equals 2.
- 0.333-0.498: die roll equals 3.
- 0.499-0.665: die roll equals 4.
- 0.666-0.832: die roll equals 5.
- 0.833-0.999: die roll equals 6.

Using a computer-generated pseudo-random number generator (PRNG), you then could model the real situation of a die roll. More complicated simulations, for example, could model fuel usage in a division based on past data and assumptions about the current mission.

In a real-world logistics model, the simulation would look simultaneously at a variety of distributions where the means, variances, and distribution types are fit by examination of past data while adding in deterministic data based on known parameters of the future mission. By running the simulation in multiple iterations, you would be able to get a stasis, or expected solution, along with data such as network utilization, efficiency, and expected system variance.

OR is directly related to logistics because it focuses on optimizing real-world tasks, such as designing an efficient supply chain. We highly recommend that anyone who is contemplating an advanced civil schooling assignment look into industrial/OR engineering as an option. Most programs require an engineering or science background and coursework in multivariable calculus, differential equation, and statistics. We also recommend that anyone pursuing a master's degree review discrete/vector mathematics and linear algebra before starting.

For those either not interested in advanced civil schooling or not in that period of their careers, we recommend any of the reference books in the list on page 49. Operations research is a continuously evolving discipline that is directly related to the main objective of logisticians—efficiently supporting the warfighter. **ALOG**

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Major Donovan O. Fuqua is assigned to the 595th Transportation Group-Provisional (SDDC) in Kuwait. He completed an M.S. degree in industrial engineering/operations research at New Mexico State University while on an advanced civil schooling assignment and currently is working on his doctorate in engineering with a specialty in operations research and supply chain management and a minor in mathematics. He can be contacted at donovan.fuqua@us.army.mil.

LEDC Extreme Makeover

BY LIEUTENANT COLONEL CAREY W. RADICAN

The Army Logistics Management College's Logistics Executive Development Course is "under reconstruction." A pilot of the transformed course—with a new name and a new purpose—will be conducted this summer.

The Logistics Executive Development Course (LEDC) offered by the Army Logistics Management College (ALMC) at Fort Lee, Virginia, has been educating logistics professionals for many years. Over the last 10 years, a number of LEDC graduates have competed for and been awarded the Army Command and General Staff College's (CGSC's) Major General James M. Wright Master Logistician Award. They, and many other LEDC graduates, are now the Army's senior logisticians. To coincide with Army logistics transformation and continue its tradition of producing first-rate Army logisticians, ALMC is revising the LEDC education experience to meet the needs of leaders for the transformed Army.

LEDC Overview

Since 1970, LEDC has offered a thorough factory-to-foxhole overview for students who aspire to become military and civilian logistics managers in key positions within Army and Department of Defense logistics organizations. The course has built on each student's logistics foundation acquired through functional courses and personal experience. It has exposed them to the interface between the Army in the field and the logistics structure that supports it. In addition, LEDC has traditionally constituted the first part of a cooperative master's degree program with the Florida Institute of Technology.

Keeping Up With the Times

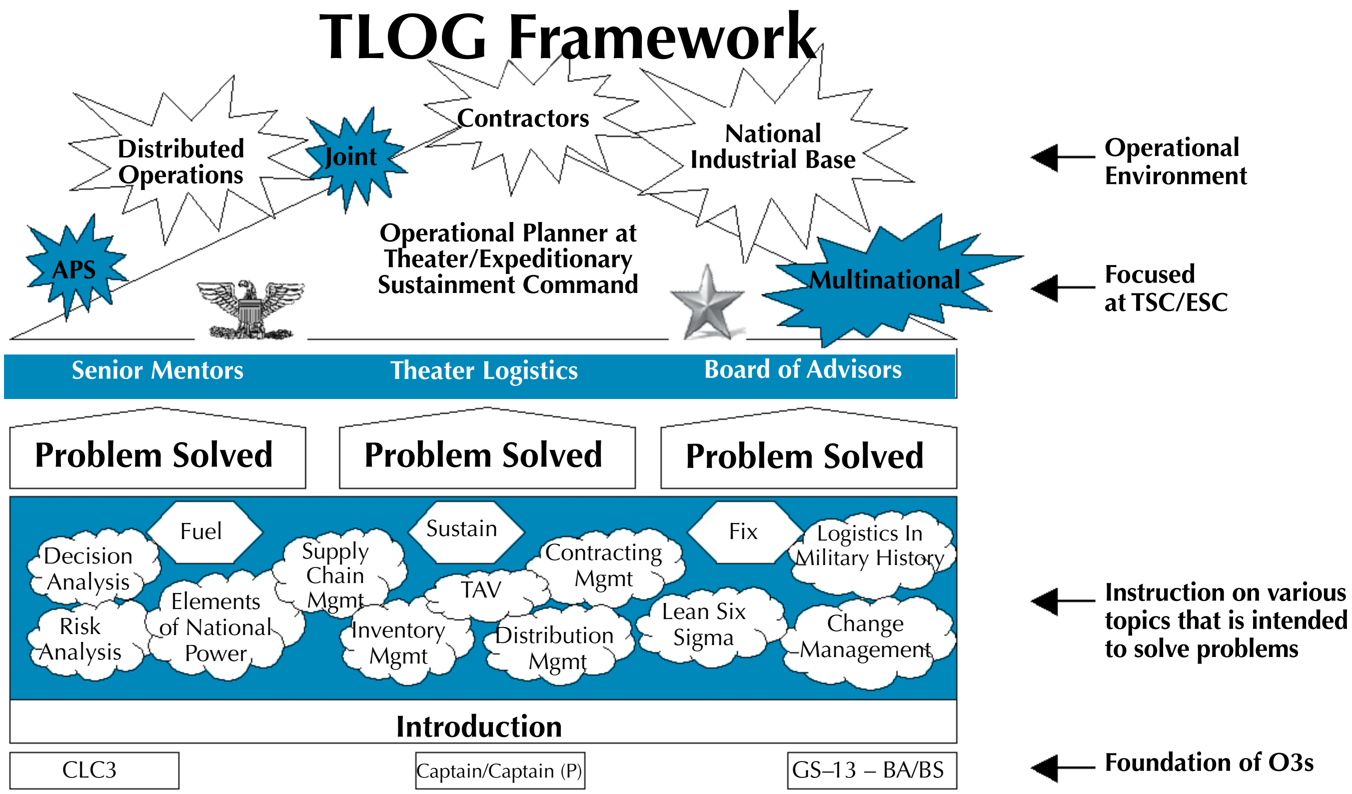
To align LEDC with the expeditionary mindset of the transforming Army, ALMC is revamping LEDC to educate select logisticians who will become the Army's joint, multinational, and multifunctional logistics problem-solvers at the operational level of war. The goal is to develop agile, innovative logisticians who know *how* to think by dissecting a logistics challenge and developing workable solutions, rather than *what* to think. The revised course framework will provide students with critical problem-solving skills and abilities to surmount complex logistics challenges in peace and war. Graduates will be targeted for key positions within theater and expeditionary sustainment commands.

New Course Design

The revised course, the Theater Logistics Studies Program (TLOG), will be conducted in small-group seminars similar to those used by CGSC's School of Advanced Military Studies. (The School of Advanced Military Studies uses the Socratic method of instruction. Students are given material to research, and they are expected to come to class prepared to conduct a professional discussion with the facilitator.)

Instruction will be hands-on; students will grapple with a theater-level campaign plan that begins with a theater-opening scenario in which they must work through planning for reception, staging, and onward movement. Case studies will be introduced to further challenge and expand the students' minds in areas such as providing disaster relief, resourcing unit rotations, and setting up tracking/interrogator networks for cargo or unit tracking. Presentations by logistics leaders from the Army, the Department of Defense, and industry will enhance the learning process by touching on subjects such as distributed operations, contractors accompanying the force, Army pre-positioned stocks, civil support, reconstitution, theater distribution, supply chain management, outsourcing, and reverse logistics. Visits to Defense Distribution Center Susquehanna, Pennsylvania; BAE Systems at York, Pennsylvania; and a port of embarkation will complement the classroom time and provide students with a visual representation of the sustaining base that supports the armed forces in the field. Skill set applications will be hands-on and case study-based and cover such topics as analysis to support decisionmaking, change management, optimization, ArcGIS, Lean Six Sigma, metrics for applied logistics, and querying for data. [ArcGIS is an integrated geographic information system (GIS) software produced by Environmental Systems Research Institute, Inc. (ERSI).] The diagram at right depicts the course framework.

The TLOG goal is to provide an unmatched logistics education that makes graduates highly sought-after assets (problem-solvers) for both the near and long term. They will be equipped to—



Legend

APS = Army pre-positioned stocks
BA/BS = Bachelor of arts/bachelor of science
CLC3 = Combined Logistics Captains Career Course
ESC = Expeditionary sustainment command
Mgmt = Management
TAV = Total asset visibility
TSC = Theater sustainment command

This chart illustrates the framework for the Theater Logistics Studies Program (TLOG). The course clients (shown at the bottom of the chart) are primarily senior captains and GS–13 civilians. The course introduction sets the stage for students by providing them with the theater logistics challenge up front. Various blocks of instruction (shown in the area above the introduction) are focused on skill sets, mini exercises, and information that will assist with solving the theater-level problem. The second half of the course will allow the students to demonstrate the integration of skills by applying them directly to the major practical exercise ("Problem Solved") and a number of spin-off case studies. A mentor, or board of advisors, program is incorporated into the course to foster the course's long-term development. The course is intended to produce planners for theater sustainment commands, expeditionary sustainment commands, and sustainment brigades. The Army's current operating environment is summarized in the umbrella of concepts across the top of the chart.

- Participate in the peacetime planning process.
- Coordinate expeditionary operations.
- Manage modular deployment operations.
- Plan theater and area logistics support.
- Direct logistics operations.
- Manage theater redeployment operations.

The 19-week TLOG pilot will begin on 6 August 2007 and include two small-group seminars. Senior captains with command experience and majors desiring to attend this pilot or future iterations of the course should contact their career managers at the Army Human Resources Command or contact the ALMC staff by email at ledc@lee.army.mil. Future adjustments to the course will be made as ALMC receives feedback from students. After serving in theater and expeditionary sustainment commands, graduates will be invited to return to ALMC to facilitate seminars in future courses.

ALOG

Lieutenant Colonel Carey W. Radican is the Director of Instruction for the Logistics Executive Development Course at the Army Logistics Management College at Fort Lee, Virginia. He has a B.S. degree in marketing and management from Old Dominion University and an M.S. degree in computer systems management from the University of Maryland University College. He is a graduate of the Quartermaster Officer Basic Course, the Combined Logistics Officers Advanced Course, the Combined Arms and Services Staff School, the Logistics Executive Development Course, and the Army Command and General Staff Officer Course.

ALOG NEWS

(continued from page 1)

THEATER CONSOLIDATION AND SHIPPING POINT-EUROPE OPENS

The Defense Distribution Depot Europe (DDDE) in Germersheim, Germany, opened its newest distribution facility, the Theater Consolidation and Shipping Point-Europe (TCSP–E), on 2 October. The TCSP–E acts as the primary conduit for sustainment materiel entering the European theater. As such, it rapidly consolidates and segregates shipments from multiple sources and prepares them for onward shipment to customers.

"We are honored that DDDE was chosen for this important mission," said Lieutenant Colonel Lance Koenig, DDDE Commander. "Our promise to the European Command (EUCOM) warfighter is that we will carry out the breakbulk distribution mission with the same professionalism and high standards that we have achieved while conducting DLA's [Defense Logistics Agency's] distribution mission."

As part of the Army's transformation in Europe, personnel strength in Europe was reduced and the focus shifted to warfighting functions. The transformation plan included the divesture of all noncore distribution functions, including the transfer of the Theater Distribution Center (TDC), which had been operated by the 21st Theater Support Command in Panzer Kaserne. A joint task force composed of action officers from the U.S. European Command, U.S. Transportation Command, U.S. Army Europe, U.S. Air Forces in Europe, DLA, and DDC recommended that the mission be moved from the TDC to the DDDE.

DDDE assumed responsibility for breakbulk surface and ocean containers in August, and, in early September, commercial air lines of communication (ALOC) pallets were transferred. Later that month, DDDE began receiving military ALOC pallets. The TCSP was fully operational by the end of October.

A worker at the Theater Consolidation and Shipping Point-Europe moves cargo that has been consolidated for shipment to a customer.

WIRELESS FOR THE WARFIGHTER CAPABILITY FILLS COMMUNICATIONS GAPS

The U.S. Joint Forces Command's Joint Systems Integration Command (JSIC) has developed a new capability that will allow joint warfighters to establish command and control more rapidly when they deploy to an area where no established networks are available.

Wireless for the Warfighter (W4W) will provide an advanced wireless capability that will enable deployed troops to set up, communicate, and disseminate critical data quickly. The W4W solution ultimately will provide 5 to 10 miles of secure, unclassified wireless and secure classified local wireless access so that warfighters do not have to be connected to a network.

JSIC developed W4W as a result of a need expressed by the U.S. Northern Command's Joint Task Force Civil Support (JTF–CS) for the ability to extend critical communications wirelessly from a forward command post to elements of a joint task force.

According to James Bohling, head of the W4W project, W4W will fill a near-term capability gap. "We want to be able to give [warfighters a] near-term solution that's secure and usable and jumpstart the process by providing that capability."

An important benefit of W4W is reduced "logistical clutter." "We're cutting out a lot of the administrative, logistical, and operational 'fat' typically associated with traditional wired networks," Bohling explained.

Bohling said that W4W will provide increased and easier access to network services. With these capabilities, joint task forces will be able to establish command and control in a joint operations area much quicker.

Deployment of W4W is expected to occur in the May–June timeframe.

MODULAR BRIGADE STRUCTURE TAKES SHAPE

On 1 October, as part of the Army Forces Command (FORSCOM) Modular Force Command and Control (C2) Plan, the XVIII Airborne Corps Headquarters divested command of the 3d Infantry Division Headquarters at Fort Stewart, Georgia, and the III Corps Headquarters relinquished command of the 1st Infantry Division Headquarters at Fort Riley, Kansas (recently restationed from Germany).

An objective of the FORSCOM C2 plan is to divest the XVIII Airborne Corps Headquarters at Fort Bragg, North Carolina, and the III Corps Headquarters at Fort Hood, Texas, of their traditional corps geographical footprint of divisions and installations for which they are responsible and of their former responsibilities for peacetime garrison requirements to provide administrative control (ADCON) and Title 10 support to divisions and brigades. This divestment of traditional corps responsibilities will facilitate their transition to the new modular corps design.

The XVIII Airborne Corps was scheduled to divest control of the 101st Airborne Division at Fort Campbell, Kentucky, in November, and the 10th Mountain Division at Fort Drum, New York, and the 82d Airborne Division at Fort Bragg within the next 18 months. The III Corps also will divest control of the 4th Infantry Division and the 1st Cavalry Division in the next 18 months.

The XVIII Airborne Modular Corps Headquarters, the III Corps Headquarters, and the I Corps Headquarters will retain a warfighting focus so they will be prepared to execute missions as a joint task force or joint force land component command with no habitually assigned or attached subordinate units. As such, they will form the C2 headquarters building blocks for expeditionary force packages in support of warfighting requirements. All division headquarters will report directly to FORSCOM, which will move to Fort Bragg by 2011.

Corps commanders will retain their positions as senior mission commanders (SMCs) and installation commanders (ICs) of their respective installations. When not deployed, the I Corps commander at Fort Lewis will provide ADCON and Title 10 support, including training readiness oversight, to attached FORSCOM units. At Forts Bragg and Hood, the corps commanders will serve as SMCs and ICs, but units will be attached to the Commanding General (CG) of the 82d Airborne Division and the CG of the 1st Cavalry Division for full or partial ADCON and Title 10 support.

As part of the new C2 relationships, each SMC will be supported by a FORSCOM mission support element (MSE) in the execution of his ADCON and Title 10 responsibilities. The MSE will be attached to the FORSCOM commander tasked to provide ADCON and Title 10 support. The FORSCOM MSE will work with the Installation Management Command (IMCOM) garrison staff to provide a fully resourced set of IMCOM and FORSCOM capabilities to facilitate continuity of ADCON, Title 10, and garrison support functions in support of the expeditionary force as determined by the required operating tempo.

ONLINE DATABASE HELPS COMMANDERS DETERMINE EQUIPMENT NEEDS

Commanders preparing for deployment have a new tool available to help them determine what equipment they need to take with them. A new common online database, called the Equipment Common Operating Picture (ECOP), provides easier access to mission essential equipment lists (MEELs).

ECOP applies to all units currently deployed or deploying in the future to Operations Enduring Freedom and Iraqi Freedom. It contains hundreds of validated MEELs; other Headquarters, Department of the Army (HQDA), equipment validations or authorizations; and HQDA equipping policy documents. ECOP can be used to create and submit operational needs statements digitally and to track their progress through the chain of command.

Information on ECOP is available on the Third Army Web site at www.swa.arcent.army.smil.mil. Units may register to use the ECOP database at www.armyc2apps.hqda.army.smil.mil/ecop. Secure Internet protocol routing is required to access this site. (See related article on page 42.)

FIELD MAINTENANCE PAMPHLET PUBLISHED

Department of the Army (DA) Pamphlet 750–2, Soldiers' Guide for Field Maintenance Operations, was released on 29 September. This pamphlet replaces DA Pamphlet 750–35, Soldiers' Guide to Motor Pool Operations.

The new pamphlet reflects changes to Army policy brought about by conversion to a modular force structure. It also provides sample field maintenance standing operating procedures and incorporates Standard Army Maintenance System-Enhanced (SAMS–E) forms for use instead of previously used manual forms.

The pamphlet was developed by representatives of the Office of the Department of the Army Deputy Chief of Staff, G–4, and the Army Ordnance Center and School. It can be viewed on line at www.apd.army.mil/pdffiles/p750_3.pdf and on the Army Knowledge Online and Army Web sites.

CADRE OF DEPLOYABLE SPECIALISTS ENHANCES CONTRACTING

The Army Materiel Command (AMC) has developed a centralized civilian deployment program to meet the increasing need for contracting support during reconstruction operations in Iraq and Afghanistan. The Deployable Civilian Contracting Cadre (DCCC) comprises highly trained and experienced civilian contracting officers on standby and ready to deploy.

DCCC personnel sign a 3-year agreement and are put in a deployment rotation. They cannot decline to deploy; however, if they do not deploy during the 3-year period, they still receive an annual retention incentive of 5 percent of base pay. On deployment, they receive a relocation incentive of 10 percent of base pay.

The DCCC will recruit only 25 new members a year. Members must be in the General Schedule (GS)-1102 (contract specialist) career field and in grades 11 to 15. Personnel in grades 11 and 12 must be Defense Acquisition Workforce Improvement Act level II certified, and personnel in grades 13 to 15 must be level III certified.

For more information, contact one of the following representatives: AMC at (703) 806–8239; Tank-automotive and Armaments (TACOM) Life Cycle Management Command (LCMC) at (586) 574–7282; Aviation and Missile LCMC at (256) 842–7284; Research, Development, and Engineering Command at (410) 278–0846; Communications-Electronics LCMC at (732) 532–8574; or Army Sustainment Command at (309)782–3191. Visit the DCCC Web site at https://www.us.army.mil/suite/kc/6322785 to view the DCCC standing operating procedures, brochure, briefing, and video.

EASY ACCESS TO TOOLS SAVES TOBYHANNA TIME AND MONEY

A tool crib parts attendant checks the inventory on the point-of-use vending machine.

Sheet metal workers at Tobyhanna Army Depot, Pennsylvania, no longer have to make a 10-minute trip from the sheet metal shop to the tool crib to get the tools they need. Instead, expendable items such as drill bits, work gloves, safety glasses, and a limited number of handtools now are available in a vending machine in their work area. By eliminating the time it takes workers to walk to the main tool crib, get a tool, and return to the work section, the vending machine is expected to save more than $16,500 a year in direct labor costs.

The CribMaster ToolCube vending machine offers secure modular storage for 171 sheet metal-specific items. The design can be changed to fit any mission by reconfiguring drawers to suit any size and number of tools. The machine also can generate detailed standard and custom reports and track assets. Its operating software is compatible with Tobyhanna's local area network, making it possible to compile data and update files electronically. "The software talks to the tool crib," said Tom Piontko, tool and parts attendant. "It tells us when the machine is getting low on supplies and needs to be restocked."

To use the vending machine, employees scan their identification badges and select an item. The vending machine provides access only to the approved quantity of the exact item requested. Continuous reviews of the machine's records pinpoint users' needs. Tool crib attendants can use the tool-issue history to fine-tune the inventory and stock items customers use repeatedly or identify those items not used at all.

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- Distribution-Based Logistics in Iraqi Freedom
- The Changing Face of Fuel Management
- A Medical Logistics Interface Tab for FBCB2
- Polymers History
- The AGR Instructor Share Program
- Load-Handling System Modular Fuel Farm
- Convoy Clearinghouse Research
- Leveraging Logistics Contracts
- SSA Support at Camp Taji
- Logistics Task Force 548 in Iraq
- Joint Asset Visibility: Why So Hard?

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